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From July 1, 1906, to December 31, 1906

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## PASSAGE OF THE HEPBURN BILL AND OTHER RAILROAD LAWS.

After the conferees on the rate bill had made two unsuccessful attempts to draw up a report satisfactory to the Senate they finally succeeded at the third trial and the bill was passed and received the signature of the President on the evening of June 29, the day before the adjournment of the session. Under the terms of a joint resolution subsequently adopted by both Houses and signed by the President the law does not become effective until 60 days after its passage, which will be August 29. The object of this resolution postponing the taking effect of the law is to give to the railroads time to make necessary amendments in their tariffs filed with the Interstate Commerce Commission so as to make them comply with the new law, which requires them to show all charges of every kind, including terminal charges, icing charges, and every charge that is made in connection with transportation. It is also intended to give the express companies and sleeping car companies time to prepare and file their tariffs.

The two main points in controversy in the conference were as to the pass amendment and the proposition to except pipe lines from the provision prohibiting carriers from transporting commodities produced or owned by them. The agreement finally reached as to the pass amendment permits the giving of passes to most of the classes of individuals fairly entitled to them and also permits their being given to some classes included in the original Senate amendment for purely demagogic reasons. The commodity amendment was finally changed so as to apply exclusively to railroads, thus permitting pipe lines to continue to transport their own oil.

In addition to the rate bill a large number of other bills affecting railroads were introduced during the recent session of Congress, but only a few of them were reported by the Committees to which they were referred. A bill of particular interest to cattle shippers and to railroads that carry live stock which became a law was that extending from 28 hours to 36 the time during which cattle, sheep, swine or other animals carried in interstate transportation can be allowed to remain in cars without unloading. A determined effort to defeat this bill was made by some of the humane societies of the country, but Congress was convinced that it was often more humane to allow cattle to remain in cars 36 hours than to unload them at the expiration of 28 hours regardless of whether or not they were at a point where they could be cared for properly.

A third bill of importance was that making railroads liable for the death or injury of employees when such death or injury results from the negligence of a fellow servant. This was noticed last week, page 689.

Another bill which made considerable progress toward enactment was that introduced by Senator La Follette proposing to make it unlawful for a railroad company to require its employees to remain on duty for more than 16 consecutive hours. This bill was favorably reported by the Senate Committee and was the subject of a prolonged debate during the latter weeks of the session. Senator La Follette endeavored to have it voted on before adjournment, but the best he was able to do was to obtain unanimous consent that it shall be voted on in the next session of Congress on January 10. It goes over until the next session with a large number of amendments pending. A similar bill introduced in the House of Representatives by Representative Esch was not reported from the Committee on Interstate and Foreign Commerce.

Several bills introduced at the instance of banking interests proposing to prescribe uniform bills of lading that would be negotiable were practically killed by the adoption of the bill of lading amendment to the rate bill. This amendment will make bills of lading negotiable and will hold the initial carrier responsible for the value of all goods lost or damaged the same as though the loss or damage occurred on its own road. A bill requiring common carriers engaged in interstate transportation to check baggage through to its destination where the presentation of such baggage is accompanied by the presentation of transportation *in any form*, to the destination, was passed by the House, but was pending in the Senate Committee at the end of the session.

Among the bills of interest to railroads that were not reported from the committees to which they were referred were the bill introduced by Representative Esch to require the gradual introduction by all railroads of the block system; the bill introduced by Representative Beall providing for the investigation of controversies concerning wages, hours of labor, or conditions of employment affecting interstate commerce; the joint resolution introduced

by Representative Jenkins requiring the Postmaster-General to compel the railroads within one year to furnish electrically lighted cars for the transportation of mail and the fantastic measure introduced by Senator Newlands as a substitute for the rate bill proposing to provide for the incorporation of railroads and navigation lines by the Federal Government.

## THE CORPORATION INVESTMENTS OF CORPORATION OFFICERS

When industry was conducted by master, journeyman and apprentice the only outlet for the ambition of the apprentice was to become a journeyman, and of the journeyman to become a master. Therefore, the goal of the lad who did not enter a profession was expressed as "going into business for yourself." This traditional phrase has not been heard so much during these late years of corporate development. Yet even in this day the attainment of a competence is considered commendable and to this end not only accumulation but investment. Those who study and are clearest headed in perceiving the possibilities of this and that phase of industry and commerce naturally see the opportunities for gain. If this perception be of workers on salaries and aggrandizement follow their investment of savings or secured credit, should there be objection if the effort and allegiance due to their paymaster be not diminished?

The investments of the servant of a corporation may be in the shares and securities of the corporation that employs him, or in the shares and securities of other corporations; or in real estate, or in some business that is not conducted under the corporate form. Participation by employees in corporate capitalization is urged as one form of the much praised profit sharing, and corporations that have given those on their pay rolls special facilities for becoming the owners of its obligations have been much lauded. It is argued that employees will work more heartily for the interests of the whole organization if they share in its rewards. To enlist the employee's fullest co-operation, it has been the custom of many corporations, when a man has demonstrated unusual efficiency in its behalf, either to make him a present or to permit him, under easy conditions, to obtain a permanent interest in its operations. It also seems pretty evident that a keen, well-balanced brain should know more about the possibilities of the business of which it is a part, and in case these possibilities seem to offer remuneration, to endeavor to participate in them. The origin of thousands of the fortunes of this country has been in the faith and courage of men who have devoted years of steadfast struggle to enterprises to which there has been opposed the consensus of opinion, until at last the purple flowers have been made to blossom on the thorns.

But there are other well-known phases of the ownership by an officer of shares and securities in his corporation. The use of "inside information" to hammer down their market values and thereby cause loss to innocent investors; the formation of "wheels within wheels" to wrest profit that belongs to these investors is criminal. The question is, should the ownership of its shares and securities by the officers and employees of a corporation be prohibited, or should the abuse of such ownership be made a breach of trust and penalized. The former would place the salaried servants of our corporations on the same basis as the officers of our Army, the Judiciary, and other servants of our Government, who for moderate compensation perform inestimable service; for which they obtain no further reward than that which pertains to useful work well done. In an ideal state of society this certainly would be an ideal status.

In a prosperous country, such as ours, there are in nearly every community openings for lucrative trade. There are always the possibilities of real estate; the railroad agent, who ought to be as bright and competent a fellow as can be obtained in the town, can usually judge from the receipts and shipments of freight what the business of the community is and what its prospects are. If it does not hamper his service to the company to do so, should he be deprived of the opportunity to risk his judgment as to the enhancement in value of a farm or a town lot, or may he not furnish part of the capital for a butter and egg business, or even retail a carload of coal? The division superintendent, division freight agent, general manager, or other officer may be the very first one to see that an increasing development of the region demands a cement plant or other building industry. If his service to the company is not impaired should both he and the community be debarred from the benefit of that perception? The executive officers of a railroad company, especially those in charge of traffic, are peculiarly in touch with the tides of commerce, the ebb and flow in the supply of and demand for commodities. When it is obvious that there is need for the opening of a new coal field, that conditions favor the success of a new steel mill, that there should be an extension of the cotton area, should they, provided they give neither time nor attention that belongs to the service of their companies, be deprived from obtaining a share of the advantage that may accrue from the new development which gives employment to increasing numbers? Under the corporate regime should they be withheld from purchasing holdings in the corporations under whose auspices the new development will be made?

Is not the perception of the needs of commerce, and action in accordance therewith the very essence of industrial progress and commercial development? The manufacturer may extend his sphere until he has established or participates in the retail stores through which his products are sold; or a progressive retailer may purchase the output of factories for disposition through his stores, and ultimately the factories themselves. So, also, with one corporation and another. The publishing company may purchase a paper mill; the steel corporation absorb mills, mines, railroads and steamboats. Those whose knowledge of business is the most intimate, who have the best sources of information, whose powers of concentration are greatest, and whose insight is keenest, are those who rise to the leadership of business just as the effective general rises to command in war. Hence we find that dominant directors in manufacturing corporations are also dominant directors in railroads and dominant directors in banks. But as the efforts of the general go for naught without the co-operation and devotion of his army, so also is the enterprise of the captain of industry without avail, not only unless the platoons and brigades of his corporation respond to his directions, but also not unless those directions are in the line of satisfaction to both the producer and the consumer. The progress of industry is bound up in the progress of the people; the captain of industry is as much the servant of the state as is the general.

When, however, the possibilities of gain from business investment are considered there should not be forgotten the possibilities of loss. The man of moderate salary, who has made investment in outside ventures that go awry, who has purchased stocks and bonds that are depreciating, passing dividends and defaulting, will almost certainly have his mind so distracted that attention to his regular duties will be impaired. What happens to the persistent dabbler in stocks on margin and the patron of the bucket-shops, everybody knows, but this is simply gambling and its practice should disqualify a man from creditable employment, the same as any other form of gambling. The question is, should the salaried worker be debarred from taking the chances of business gain because of the possibility of business loss?

When a servant because of interest in a patron treats that patron with greater consideration than his employer's duty to other patrons makes fair he is not performing the service for which he has been paid, is not rendering the allegiance that is his employer's right; and this is pre-eminently the case when that employer is a common carrier. That this evil, in various forms, permeates modern business is known to everyone. The legislature of New York has attempted to stem it by enacting a law that provides penalty for the giving to or the taking by an employee of a commission. The tip to the waiter that was at first intended to elicit especial attention, custom has made general until it is regarded as part of his wage. And so, likewise, with the fee to the porter and the bell-boy. More questionable is the fee to the baggageman who winks at excess weight. When a gratuity is offered to the employee of another for doing what he ought to do as part of his duty, the borderland of bribery is approached and if it lead him to do more than he ought to do, it is passed. Yet it is human nature to try to get the best cuts from the butcher. We know that salesmen for paid premiums by manufacturers for pushing their goods to the fore that buyers of all kinds from the hotel steward and the rich man's butler to the purchasing agent of a railroad company, are sought by insidious guile to accept an indirect commission, or a direct bribe. The gift to a railroad officer of stocks or bonds of a business which can thrive or shrink because of his attitude toward it, is evidently a bribe; ownership thus obtained cannot be classed as investment.

Were all business completely purged of such stultification the world would be vastly better, civilization would be advanced; and it is to be hoped that the extraordinary wave of moral indignation now sweeping throughout this country is beating upon shores that

may never again be free from its cleansing tide. To the efforts of public opinion the despots of governments and corporations alike are obliged to bow. While the great current of public opinion undoubtedly flows toward justice and the utmost good to all, its storm-tossed waves now and then may wreck the craft in whose crew there is no mutiny, nothing more than minor insubordination and petty peculation that a few days in chains or the bastinado would completely cure. The temperament of the American people is largely emotional and of late, while there has been much of well directed and altogether laudable investigation and hewing to the line, their emotion has been lashed into froth by those who would use it to further despicable ends.

The basis for some of the muck rake articles reminds one of the recent riot on the east side of New York started by one report of petty practitioners who wanted the work, that the throats of school children were being cut; and all because Board of Health doctors were making examinations and rendering needed service gratis.

In the ancient festival, by panoplied attendants the sacred bull in gorgeous canopy was led through the lines of the bedecked populace. But six years ago public opinion in the United States, dazzled by the glitter of new-made millionaires, walked admiringly by their side enraptured by their barbaric display. When the bull becomes enraged and breaks his leash he is overwhelming in his might but he recks little whom he gets upon his horns.

The scalpel that cuts the excrescences from the body politic should be guided not only by the clear eye and the steady nerve, but by the brain that can distinguish to the utmost between structure and action that is normal and healthful; and the tissue and function that are evidence of disease. Here it may not be out of place to say that our beloved David who has marched with his slungshot boldly up to the modern Goliath has had no business training; indeed, as is well known, he lost half of his patrimony in unsuccessful ventures and then placed the remainder in the hands of his uncle to be conserved; nor has he had the analytical training given by study of the law. The stirring up of the governmental agencies to that investigation and prosecution which the enforcement of the law has long demanded at their hands cannot but redound to the credit of the Government and of the country, but there is needed the counsel of the sage to ensure that while the tumors are being cut a vital organ be not punctured.

## THE GOLDEN RULE AND THE IRON RULE WITH FOREIGN FREIGHT CARS.

What might be called the psychology of freight-car service would be an interesting study for one who is possessed of an active subliminal mentality, and therefore able to guess the subliminal tricks of other personalities: men in charge of cars perform such astonishing tricks of reasoning. Wrongful diversion of cars is a great evil at the present time. The evil in its worst form is comparatively new. The per diem plan for settlement of interchange accounts is also new. Ergo, the new plan is responsible for the new evil. This seems to be the reasoning of most or all of those who have spoken most vigorously on the subject at car service meetings, yet no one of them shows any ground for his conclusion. Diversion is due to the promptings of the devil, just the same now as 10 or 25 years ago. These speakers seem to take a very superficial view. Those of whom they speak—the diverters—pursue an opposite course. No one accuses them of keeping on the surface of things. On the contrary, their thoughts are so far beneath the surface that no fellow can find them out; so obscure that a man, or, at least, a railroad, seems often to think that he does a certain thing when he does not do it. For example, in a certain Southern state, it is said, cars have been reported delivered to another road (to break penalty), when, in fact, they continued standing exactly where they were. Only a "paper" delivery was made.

Probably the diverter's reasoning is not very complete. Under the per diem principle an owner is sure to get some pay for his car, while it is away from home, instead of being constantly liable, as formerly, to be defrauded by an unprincipled borrower. Therefore, it is fair to keep the car away from home forever. That, apparently, is the logic, charming in its simplicity, which has been used during the past two years to justify thousands of unjust acts in connection with other people's property. The fact that the pay is very inadequate is ignored.

Yet everybody knows that the fundamental and original principle, that cars are exchanged, not borrowed or hired or lent, still remains the only legitimate basis for using freight cars in joint service. It is just as true now as in 1865—and just as important that the truth be recognized—that a car sent off from its home road is sent to carry or to get a particular shipment, and that its use for any other purpose is utterly unwarranted, except with the owner's consent. (Its use on the return journey to carry loads to intermediate points is universally assented to.) In the absence of car pools, or pending the difficult and probably slow process of forming pools, the only hope of improvement lies in a return to this fundamental idea, whatever may be the cost of so doing.

We exchange cars for specific shipments instead of leasing them unconditionally, for the very good reason that we have not been able to formulate any workable plan for conducting the leasing or letting equitably. It would be necessary to have different rates for cars of different capacities and varying rates to correspond at different seasons with the varying need for cars at home—as money-lenders in Wall Street change their rates for call loans from day to day. Rather than try to work such a big piece of clerical machinery, we stick to the plan of an arbitrary rate, which is often unjust, but which is simple enough to be workable.

But a low arbitrary rate could not be justly tolerated for a single day without the provision for prompt and automatic return of cars to owners. And, unless there is compensation in the division between the several roads of the charge for carrying the freight which the car is used for, the arbitrary rate must always depend also for its justice largely on the principle of exchange; on each road being a borrower and a lender in equal proportions. The greater the variety in the capacities of cars, and the greater the fluctuation in volume of traffic, as between active seasons and dull seasons, the more important does it become that each road own sufficient cars to provide for its share of the work, as measured by the time it takes to perform the work (loading, transportation and unloading). It may fairly be said that the need of sticking to a single arbitrary rate for car service is now stronger than ever, for the reason that the difficulties of agreeing on equitable rates for all the different kinds of service are more perplexing than ever.

If each car service manager could, without delay, telephone to every other car service manager, and if each could (*and would*) promptly make his agents and yard masters carry out the promises which he would make to return foreign cars which were thus telephoned for, all would be well. Is there any hope of approximating this ideal condition? This is a problem that must be faced, whether we do or do not adopt a general penalty for diversion of cars to a third road, for often it will be necessary to protest against or prohibit the misuse of your cars while they still remain in the present borrower's possession. It would be very nice to have an automatic penalty rate, to apply regardless of the road on which the car might be, and to be easily adjusted to the needs of the rush season; but that seems far in the distance. To be satisfactory, it would have to vary from, say, one dollar after 30 days to five dollars after 10 days, and agreement on a plan would be only the beginning of troubles. The necessary continual readjustment of the plan to changing conditions would be as difficult as to reform the conscience of a rate-cutting freight solicitor. The only course possible under present conditions is to follow each car, or small bunch of cars, as closely as would be done for the merchandise of an important or an overbearing shipper. A superintendent cheerfully (cheerfully in the technical sense!) follows a hundred refrigerator cars through every step of a thousand mile journey on his own road, even at the expense of a bunch of telegrams an inch thick. Is it not possible to do the same for cars on foreign roads? It might make bunches of telegrams far thicker than an inch, and might necessitate decorating the office walls with a new variety of toy cars, or a map larger than any yet heard of; but would it not be money well spent? It would be necessary, of course, for each road to brush up its conscience—or to buy one—for to treat inquiries for cars as we sometimes treat tracers for small shipments of freight would be a costly farce. This individual treatment is a necessity, in the absence of an agreement with each important foreign road which regularly uses your cars; and it would no doubt be to a considerable extent necessary even with such agreements. There must at least be an agreement to maintain in working order the conscience before-mentioned, for asking for the return of cars which the holder desires to keep will often be a good deal like having a fight with a friend—a very unhappy situation all around. There will be need of all possible support to be had from formal agreements, and from free discussion between roads; that is, between officers possessing real executive authority on the respective roads. In personal conduct the practice of the golden rule may depend on conscience and vigor of will, but if a great corporation is to substitute the golden rule for the iron rule now prevailing—

the rule that possession constitutes enough "points of law" to justify any kind of act that may seem desirable—there will be need not only of the qualities just mentioned (in the officers) but need also of sufficient machinery to enable different officers and different companies to see, now and then, how the respective corporation consciences are working.

The bigness of the country and the value of freight cars must be recognized, and commensurate means taken to deal with this great problem of sending cars hundreds and thousands of miles away from home. The car service manager is in a situation somewhat analogous to that of a merchant doing business with many other establishments in a large city. To meet the demands of modern business, and to overcome the obstacles of time and distance that are imposed by the enlargement of the city, the telephone companies, at enormous expense, have put the merchant into almost instantaneous communication with all of the thousands of fellow business men with whom he may wish to communicate. There is some "lost motion" in this great machine, for the number of possible telephone connections is a hundred or a thousand times more than will ever be used by any one house. The railroad, with its telegraph, must provide for itself, over a million square miles, what the local business man has provided for him over 100 square miles. Make an estimate of what it would cost to keep as close track of your freight cars as is kept by the Pullman Company of its sleeping cars. We suspect that the figure would not be so frightful as is generally imagined.

## NEW PUBLICATIONS.

*La Locomotive Actuelle.* By Maurice Demoulin. Paris: Librarie Polytechnique, 1906. 7½ x 11 in., 333 pages, 132 figures, 40 plates.

This volume is a general study of recent types of locomotives of high power, and is intended as a supplement to the Practical Treatise of the Locomotive Engine, by the same author, published in 1897. It owes its existence to the fact that since 1897 the locomotive has undergone a marked transformation, unique in its history, by which its power, stability and efficiency have been greatly improved. The book is intended to demonstrate that locomotives since their origin have been developed along lines laid down by necessity and circumstances, and this is brought out by the divisions of the subject. Examples of practice are given of locomotives in service in France, England, Belgium, Germany, Austro-Hungary, and the United States, to each of which a long chapter is devoted, while, grouped together, are those of Italy, Switzerland, Norway, Sweden, Spain, Portugal and Russia. In these chapters the merits of the various types are discussed and the service for which they are intended defined. The opening paragraph of each chapter is an introduction to the locomotive practice of the country and gives a brief outline of the tendency of that development and the results achieved. In the first two chapters there is a discussion of the general types of modern locomotives and the appliances, such as compounding and superheating, that have been introduced in order to increase the efficiency of the machine. These details are not only described in detail but are discussed from the standpoint of general effectiveness. The book stands, therefore, as a record of ten years of locomotive development and a register of current practice, bringing out, by the use of tables and other statistical data, the contrast between present conditions and those existing at the time of the appearance of the previous volume.

## Railroad Legislation in Massachusetts.

The Massachusetts legislature was prorogued June 29. In the closing hours there was a struggle between the Senate and House over the "merger" legislation which had been attempted. A whole week was added to the length of the session on account of this one matter alone, which was made the subject of a special message by Governor Guild. The end of the struggle was a hopeless deadlock between the Senate and the House, and so the governor was compelled to prorogue them without accomplishing the slightest legislation upon the subject desired. Several bills were offered providing that the New York, New Haven & Hartford must not hold street railway securities in Massachusetts and must dispose of present holdings. One bill gave only six months for disposal of the holdings. President Mellen was the principal witness, and presented the case so as to produce a decided effect upon the committee. He asserted that he was law-abiding in his purpose toward Massachusetts. He believed that the holdings of street railways in Massachusetts by the Consolidated were legal; he had obtained legal opinion to that effect and had paid a high price for it. But he had no purpose to break the law, and if the legislature should simply pass a declaration that it was against the policy of the state to permit steam roads to hold electric railways he would act upon that declaration and not hold them. He made some fun by naming two small roads which do not pay expenses and said that he could not get rid of them without going into bankruptcy. The committee, finally, after protracted discussion, reported unanimously a bill which directed the attorney general to take steps to learn whether the present holdings of the Consolidated are legal and in the meantime to prevent any further application of the merger policy. The radical members of the House tried to get around Mr. Mellen's influence, but conservatism developed and after two conference committees had found themselves unable to reach an agreement all effort was dropped and the legislature was prorogued, leaving the situation precisely as it was before the governor sent in his message.

Most important, aside from this, of the matters before the legislature was a complete codification and revision of the railroad and street railway laws. The codification became law just as reported by the committees, this report being the work, practically, of the recess committee which sat during the recess last year.

A bill was passed to give the railroad commissioners supervision of express companies which do business on railroads and railways. A resolve was passed, after opposition, for an investigation by the railroad commissioners into the use of chemical fire extinguishers by railroad companies. Similar agitation led to similar action for investigation regarding the introduction of block signals upon railroads and street railways, and a law was finally passed empowering the commissioners to order the introduction of block signals. A petition for a licensing board for railroad telegraphers was rejected.

Adverse action was taken on the petition for a law to regulate the loading of express, baggage and freight cars. Adverse action was taken on the proposition for more facilities for workingmen on morning and evening passenger trains in and out of Boston. The proposition that the people elect the railroad commissioners annually had no practical support. There was an effort to shorten the time permitted for the abolition of a grade crossing after the abolition had been adjudged necessary, but the effort failed, as it was thought that it was not wise to force abolitions faster than the means could be provided, and the state is already spending money for this purpose as fast as it can raise it. Legislation regarding the union station at Worcester is without practical consequence yet, because of the uncertainty, after many hearings by the special commission on the subject, where the new station shall be located. An adverse report was made on providing free passes for state and county officers.

Of importance to railroads is the enactment of the interurban electric railroad bill, which favors such enterprises as the Shaw line between Boston and Worcester. It had a strong majority in both the Senate and House. It permits such corporations to take private land by the right of eminent domain, just as a steam road may, and it proposes to facilitate electric lines between large cities, in competition with steam roads.

A bill has become law by which pupils of private schools are to be carried for half fare on the elevated and electric railways, same as the pupils of public schools. There was a claim that this bill was unconstitutional, but its friends took their chances, and the opposition thought it would be best to let the issue be settled in court.

The Senate has refused to revive the charter of E. Moody Boynton's bicycle railway from Boston to Fall River. The petition for municipal ownership of street railways came to nothing, and so did the petition for limiting the number of passengers in street cars. Leave to withdraw was the accepted report on the petition for limitation of the hours of street railway employees. The railroad commissioners are required to investigate regarding the use of lifting jacks, fenders and other means for protecting life and limb, and two of the three are now in Europe for that and other purposes.

## Chicago Track Elevation in 1905 on the Pittsburg, Fort Wayne & Chicago.

For a number of years the Pennsylvania Company has been engaged in elevating its tracks in the city of Chicago. The methods employed during the past season are of interest on account of the height to which the tracks were raised and of the narrow space in which work had to be done.

The P., F. W. & C. right of way is hemmed in by the Chicago & Western Indiana right of way on the west and by Stewart avenue on the east, and is about 60 ft. wide, which space was occupied by four tracks (except for a short distance), and a retaining wall which had been built before any filling took place. During construction it was imperative that traffic should not be delayed, and it was, therefore, necessary that two tracks should always be kept in condition for regular traffic.

The ordinances for track elevation in the city of Chicago provide for the elevation of the P., F. W. & C. tracks, and the consequent elimination of all street crossings at grade from the south Branch bridge of the Chicago river to the Indiana state line, a distance of 12.39 miles, as shown in Fig. 1. Fig. 1 also shows the track elevation work done previous to 1905, that done during 1905 and the work remaining to be done.

It should be noted that the work between 47th and 55th streets included the elevation and entire rearrangement of a large yard as a

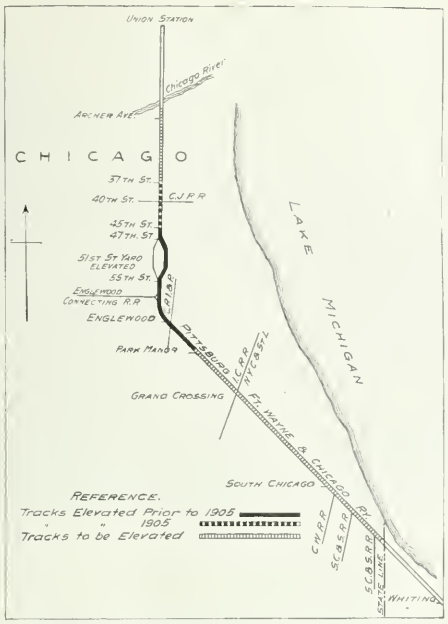



Fig. 1—P., F. W. & C. Ry. in Chicago.

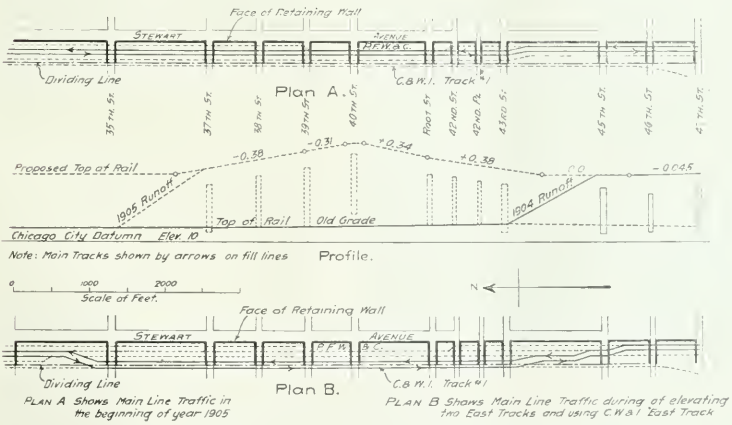



**Fig. 2—P., F. W. & C. Track Elevation in Chicago.**

*Showing track arrangement before and during elevation of 1905. Profile of proposed elevated tracks with temporary run offs.*

Fig. 5—Looking North from 40th Street, September, 1904.

gravity switching yard. This work was practically completed in 1904. At the close of the season in 1904 the tracks had been elevated from a point south of the Englewood station, at 63d street to 45th street, where a 1 per cent. run-off had been built to reach the old grade at 43d street. Thirty-fifth street is at present carried over the tracks on a steel viaduct, and is to be replaced by a subway. It was decided not to cut out this crossing in 1905 on account of risk of its remaining closed through the winter, and it was, therefore, decided to extend in 1905 the elevation work from 45th street to 37th street,

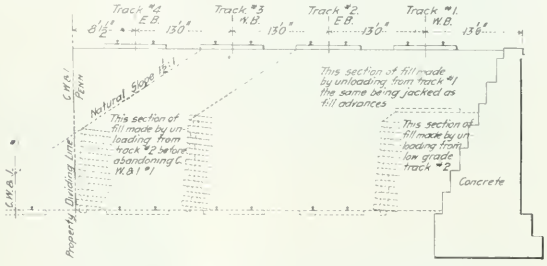

Track #4 E.B.
Track #3 W.B.
Track #2 E.B.
Track #1 W.B.
8 1/2"
130"
C.W.&I. Track
Natural Slope 1½:1
This section of fill made by unloading from track #2 before abandoning C.W.&I. #1
This section of fill made by unloading from track #1 the same being jacked as fill advances
This section of fill made by unloading from low grade track #2
Concrete
Property Dividing Line
C.W.&I.

**Fig. 4—P., F. W. & C. Track Elevation.**

*Showing method of making fill.*

with a run-off to 35th street. At 40th street the tracks are crossed by four tracks of the Chicago Junction Railway, and in order to abolish this grade crossing it was necessary to raise the P., F. W. & C. tracks about 23 ft. to provide the necessary clearance. This work is shown in detail in Fig. 2.

The grading, masonry, street work, trestles and the erection of the steel superstructures were performed by contract. All track work was done by the regular organization of the Maintenance of Way department, and a carpenter gang from the same department put in all stringers for abutment foundations, assisted in jacking up trestles as the grading progressed, and maintained all trestles under traffic. The regular track gangs were also used for building the crib-work for retaining the sand filling where needed.

The retaining wall along the east right of way line was started in 1904, and this wall was built between street crossings from 43d street to 23d place, gaps being left wherever industrial sidings left the right of way, and in one or two places where there were right of way complications. At the same time foundations for abutments at street crossings were put in wherever possible, the tracks being carried on stringers during this construction.

Before starting work in 1905 an agreement was made with the Chicago & Western Indiana by which the Fort Wayne obtained the use of the easterly track of the C. & W. I. for the first part of the season, and in return that company obtained the use of two of the Fort Wayne tracks, later on, for an equal number of track days. Under this agreement the main line traffic of the Fort Wayne was diverted on May 18 to the westerly P., F. W. & C. track and the easterly C. & W. I. track, this traffic being then handled as

Fig. 8—Looking North from 40th Street, August, 1905.

per plan B, Fig. 2, and three easterly tracks of the Fort Wayne were abandoned for constructive purposes.

At 40th street through the courtesy of Mr. J. B. Cox, Chief Engineer, the Chicago Junction Railway operated across the rights of way of the P., F. W. & C. and C. & W. I. with two tracks during the period of elevation, and the north and south tracks of this company were abandoned and removed and the two center tracks spread to permit trestle bents being placed between them. As the work progressed, the wye connections to the Chicago Junction Railway were abandoned temporarily and traffic between the two companies handled via another route.

The material used for filling was sand similar to that used in other elevation work in Chicago. It was obtained about 22 miles out on the line of the Fort Wayne. It was loaded into ordinary gondola cars by steam shovel and unloaded entirely by hand.

Nearly all concrete was machine mixed, paddle machines being used.

In accordance with plan adopted for carrying on the work, no effort was made to build abutments (except foundations) or piers until after all tracks were raised, and temporary trestles were built at each street crossing, piles being driven to a depth of 6 to 8 ft. below the bottom of the proposed excavation for pier and abutment foundations. At crossings where street railway tracks were in service steel I-beams were used for spanning the tracks, thus avoiding the necessity for spreading them to clear a pile bent placed between them.

Fig. 3—Cribbing at 47th Street, North.

On account of narrow working space it was necessary to use cribbing to retain the sand slopes, and for this purpose a crib-work of old ties was built. With such a crib considerable sand drifted through, particularly on windy days, but the expense of keeping it cleared away from track next to the crib was very slight. The general character of this crib work is shown by Fig. 3.

As soon as tracks were abandoned for traffic piles were driven for half-height trestles on track 1 at all street crossings. Trestles were then framed up except in center, where two spans were left open for street traffic. Following the pile-driver, track 1 was torn up and removed, the crib work was built, sand was unloaded from track 2 to build the bank up to half-height, or as high as could be built by shoveling from a gondola car, and track 1 was then relaid on this bank. After completing the trestles for track 1, those for tracks 2 and 3 were built to full height, and these tracks were torn up and removed. Sand was next unloaded from track 1 at its new elevation, and this track was jacked to full elevation, the bridges being raised on extra caps as the track-raising progressed. This work was done in short stretches to avoid closing more than one or two streets at a time, and the work north and south of 40th street was carried on independently, as this crossing could not be blocked by a low-grade bridge.

Fig. 6—Looking North from 40th Street, June, 1905.

Having raised track 1 to full height throughout, a trestle was built across 40th street, and, using this track for unloading, the bank was widened for additional tracks, traffic being transferred from low track to high track, step by step, as the work progressed. Fig. 4 shows these various steps as carried out.

The successive steps in the grading are also shown by the following illustrations: Fig. 5 shows the old grade crossing at 40th street and the wall north of it before grading was started. Fig. 6 shows conditions north of 40th street on June 29, 1905. No. 1 track relaid at half-height. Nos. 2 and 3 tracks in course of being removed, traffic on tracks Nos. 4 and 5 (C. & W. I. No. 1). Fig. 7

Fig. 7—Looking North from 40th Street, July, 1905.

Fig. 9—Chicago Track Elevation—Root Street from the East, July 6, 1905.

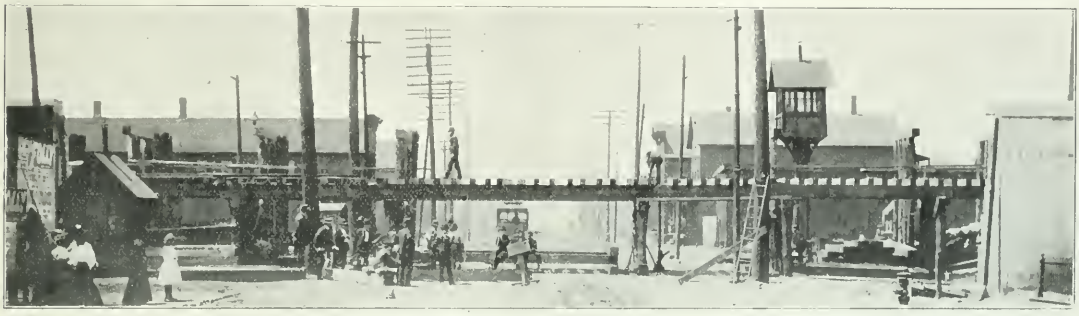


Fig. 10—Chicago Track Elevation—Root Street from the East, July 27, 1905.

Fig. 11—Chicago Track Elevation—Root Street from the East, August, 1905.

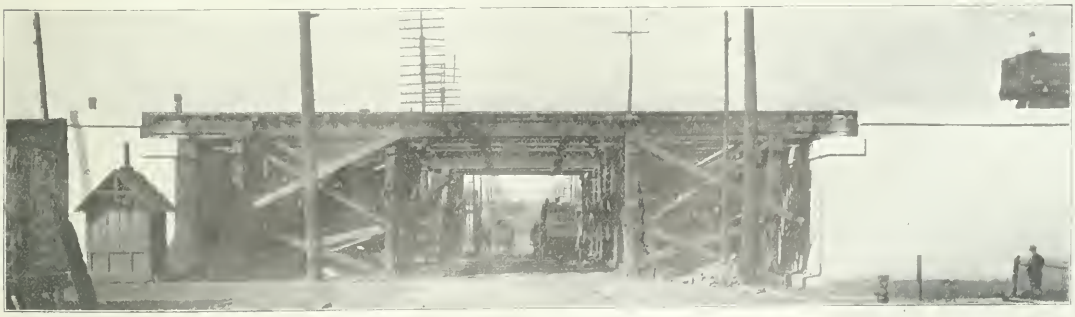


Fig. 12—Chicago Track Elevation—Root Street from the East, September, 1905.

shows conditions on July 20, No. 1 track raised to full height, Nos. 2 and 3 track spaces covered by fill, traffic on tracks Nos. 4 and 5 (C. & W. I. No. 1). Fig. 8 shows conditions on August 30, tracks Nos. 1 and 2 at full height, tracks Nos. 3 and 4 removed, traffic on tracks Nos. 1 and 5 (C. & W. I. No. 1).

The successive steps followed out at the street crossings are shown by photographs taken at Root street, as follows: Fig. 9, taken July 6, shows the grade crossing, with piles driven for No. 1 bridge at half-height, and for No. 2 at full height. (Frame bents were used just north of the street car track account of electric conduits in the street at this point). Fig. 10, taken July 27, shows the street closed, floor system in place on No. 1 bridge, ready for track and just prior to jacking. Fig. 11, taken August 6, shows No. 1 bridge raised to full height on extra caps, and street open again to traffic. Fig. 12, taken September 28, shows crossing after completion of abutments.

All plans for the work were prepared in the office of the Chief Engineer of Maintenance of Way of the North-West System, Mr. R. Trimble, under general supervision of the Chief Engineer, Mr. Thos. Rodd.

The work was in the immediate charge of Mr. D. M. Craig, Assistant Engineer, from the office of the Chief Engineer of Maintenance of Way.

### Proposed Baltimore & Ohio Station at Wheeling, W. Va.

Wheeling, W. Va., is the capital of the state and the junction of five lines of the Baltimore & Ohio Railroad. Extensive improvements are being made at this point, involving an expenditure of about $2,000,000. These include track elevation, bridges across Market and Chaplin streets and Wheeling creek, and new freight yards. They also include a new station, bids for which are to be received by July 16. A photograph of the proposed station is shown herewith. It will be a fireproof structure about 250 ft. long by 90 ft. wide and will have three stories and an attic. Because of the proximity of its site to Wheeling creek, it will have no basement, as any rooms below the ground level would probably be flooded during high water in the creek. For this reason a separate building is to be built for a power plant for heating, lighting and other power.

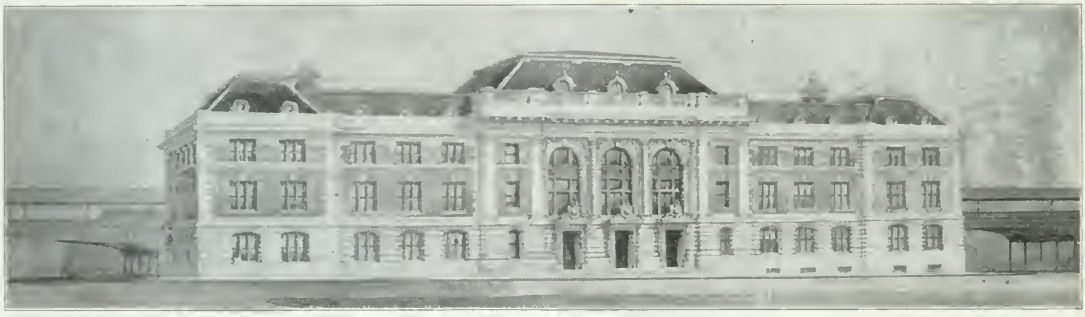
The design of the new station will be what might be called "American Renaissance." Mr. M. A. Long is the architect. The building will be used also for offices, but the station design will be preserved throughout. There will be a central pavilion, running east and west, with two side aisles connecting it to two smaller end pavilions. The principal or street front of the building will be to the north. To the south will be the tracks and elevated concourse. The tracks will pass the station on a level with the second floor. From the north, three massive doors protected by a bronze marquise will give entrance to the grand waiting room in the central pavilion. This room will be about 54 ft. wide by 82 ft. long and 30 ft. high. It will lead to the elevated concourse which is to be reached by four large concrete stairways. These stairs will bring passengers between the east and westbound tracks, and will do away with the necessity of crossing the tracks. Two umbrella sheds, each about 500 ft. long, will be provided for protection of passengers while waiting for trains.

The exterior walls of the building will be dark, semi-vitrified rough brick laid in Flemish bond. The base up to the window-sill course will be faced with light gray granite and the remainder of the first story walls faced with Bedford limestone. Above the first story, all cornices and trimmings will be white terra cotta, colored to match the limestone. The interior framing of the building, including the roof, will be steel, with terra cotta tile floor arches and partitions and cinder concrete roof slabs, covered with green roofing tile.

The first floor construction will consist of a system of reinforced concrete beams, girders and floor slabs, and the entire structure will be carried on concrete foundations of an average depth of 8 ft. In the west part of the first floor will be the express rooms and offices, and in the east end, the baggage room and parcel check room. Opening into the general waiting room from the west side will be the women's waiting room and the smoking room. The rest of the floor will be divided into offices. The grand waiting room will be two stories in height; the remainder of the second and third floors being used for offices. Two passenger elevators will serve the three floors, and two freight elevators will run between the track level and the first floor, one for baggage, the other for express.

All waiting rooms and halls on the first floor will have floors of excaustic mosaic tile and wainscot of dark green veined marble. All wood finish throughout the building will be quartered white oak. The large waiting room will have a heavily beamed ceiling richly decorated with architectural detail, and laid off in 15 deep panels, in the center of each of which will be a 500 candle power electric light. In addition to these lights, each large pilaster at the sides of the room will have an electric torch of 500 candle power. The building will be heated by a vacuum system of exhaust steam. The plumbing fixtures will be of the best grade of vitrious porcelain. There will be two fireproof safety vaults in the station.

The power plant is to be across the street to the east of the station, and, while the design has been kept subservient to that of the station proper, it is similar. A large pit will be provided for accumulation of ashes from the boilers and a small pneumatic crane will load the ashes into cars by means of steel hopper buckets. The coal bins for the power house will be under the elevated tracks and can be filled directly from bottom dump cars. The plant will be laid out for a boiler capacity of 1,000 h.p., thus providing for all present needs and for future requirements as well. Over the engine room will be a small machine shop and storage, locker and toilet rooms, with shower baths for workmen. The chimney for the boilers will be 125 ft. high.



Proposed Baltimore & Ohio Station at Wheeling.

### Foreign Railroad Notes.

The Simplon Tunnel was opened for regular traffic June 7. The passenger travel was heavy; but the trains were unable to keep to the timetable, and between Brieg and Milan the trains were nearly always behind time, sometimes as much as two hours.

Gen. A. A. von Wendrich, who brought order out of chaos on the Russian railroads during the famine of 1891, when he was given extraordinary powers, has been put in charge of the Siberian Railroad, which is said to very much need an executive of determined will and great capacity.

The successor of General von Budde as Prussian Minister of Public Works is Paul Breitenbach, since 1903 President of the Cologne railroad directory, and since 1878 in the state railroad service. He was educated as a lawyer, and served as a court officer and judge until his transfer to the railroad service. He is 56 years old.

In Germany conductors directing passengers to seats on their trains sometimes have a habit of "sizing up" the passenger by his appearance, and instead of asking "what class"? say "third class"? "first class"? or what seems to them the probable destination of a person of the dress and appearance before them—often to the disgust of the passenger. A gentleman with a package under his arm recently came in view of the conductor on the platform and was hailed "third class"? "No," says the passenger. "Fourth class then"? says the conductor. "No; fifth." "But there isn't any." "Well, first class then."

## Types of Railroad Mortgages.*

The main purposes of railroad mortgage bond issues are to secure funds with which to build, complete, improve or equip railroad lines, extensions and branches, or all of these together. These debts fall due from time to time, and must be replaced by similar bond issues; for, with few exceptions, railroad companies no longer expect to pay off their debts. So that a new purpose arises and gives its name to the corresponding bond issue, namely, "refunding"; or perhaps a mortgage bearing some other name, as "general" or "consolidated," is made large enough to provide for this contingency, and kill two birds with one stone. Again, when a railroad company passes through a period of reorganization, and the claims of rival bondholders are adjusted, their holdings may be converted into one or more new mortgage issues, one of which may bear the name "adjustment" to indicate its purpose.

The multiplicity of bond issues may be said to be due to inelasticity in provisions of mortgages which secure them. The fact that a bond issue which is secured by a first mortgage on certain specific property cannot be increased when additional funds are needed, results in the creation of new mortgages with inferior lien. Of course, if the amount of a bond issue could be indefinitely increased at the will of the railroad company there would be no occasion or use for a mortgage to secure the debt. However, in recent mortgages, especially those which are created in times of railroad reorganization, more elastic provisions are included. An "adjustment" or "general" mortgage now, in addition to providing for the company's needs at the time of its creation, will provide a large amount of bonds, perhaps $50,000,000 or even $100,000,000, for various corporate needs which might arise in the future. Thus the corporation can secure funds for certain purposes without creating junior mortgages. At the same time extravagance is prevented and the interests of the bondholders safeguarded by specifying the purposes for which the proceeds of such bond sales may be used, and the rate at which they may be expended for these purposes. Thus a mortgage which provides $50,000,000 for future needs of the company may stipulate that this is to be used only at the rate of $2,000,000 a year, and only for making improvements and betterments.

The necessity of evading the lien of these mortgages upon property is also in part responsible for the second type, namely, the "collateral trust" mortgage. Here the security for the debt consists of corporate shares or bonds, or both. Since corporate shares represent control of, and bonds usually represent a first lien upon, property, the "collateral trust" mortgage may be said to be an indirect lien upon certain property, the nature or priority of the lien depending upon the kind of securities deposited as collateral. When a railroad company is adding to its system by purchasing control of the shares and bonds of connecting railroad companies, thereby obtaining control of their properties, it is easy to see the usefulness of the collateral trust mortgage as a financial instrument. If these shares and bonds were paid for out of the cash funds of the railroad company, that is, out of its earnings, the company and its stockholders would be deprived of the use of both the principal and interest of the purchase price, these losses being compensated by the income received upon the securities which were purchased and the benefit which the railroad company derives from the interchange of traffic with its newly acquired subsidiary company. If, however, these shares and bonds of the subsidiary companies can be paid for, not in cash but in collateral trust bonds, the railroad company obtains all these benefits and at the same time retains the use of its cash funds; practically its only expense is the interest which must be paid on the collateral trust bonds. This type of railroad mortgage is thus a device whereby to make property which is acquired pay its own purchase price, so to speak. It is a great economizer of capital funds. By means of this device E. H. Harriman, through the Railroad Securities Company, obtained control, in 1896, of $10,000,000 of the 5 per cent. stock of the Illinois Central Railroad Company with an outlay of less than $1,500,000 of the cash funds of his company, the purchase being "financed" by an issue of $10,000,000 collateral trust bonds bearing 4 per cent. interest. This device enabled Mr. Harriman to buy the shares he desired upon the margin principle, without subjecting himself to the dangers of ordinary purchases on margins.

Where a railroad is extending its lines into other states, these must be built by companies having charters under those states. If these companies were to depend on their own credit to bring them funds for construction purposes, their securities would command a very low price; for what guaranty has the prospective purchaser that one of these companies will be able to earn even the interest on its bonds? A large proportion of subsidiary companies do not. But if, instead of offering the securities of these subsidiary companies to the public, they be brought into the parent company's treasury and made the collateral security for an issue of the parent company's collateral trust bonds, the latter can be sold to much better advantage; for they are a direct obligation of the parent company of the system, and have the earning capacity of the entire system behind them.

In 1902, the Chicago, Rock Island & Pacific Railroad Company bought nearly all the stock of the old Chicago, Rock Island & Pacific Railway Company, financing the purchase in part by an issue of bonds secured by a mortgage on this stock; in the same year the old railroad company acquired most of the common and preferred stock of the Choctaw, Oklahoma & Gulf in exchange for another issue of bonds which were secured by a pledge of the stock acquired. In 1898 the New York Central acquired most of the stock of the Michigan Central, and in 1900 of the Lake Shore & Michigan Southern, in similar exchanges; and in 1901 the Great Northern and Northern Pacific together acquired the stock of the Chicago, Burlington & Quincy, financing the purchase by means of an issue of bonds which were the obligations of both companies and were secured by a deposit of the C., B. & Q. stock. The original holders of stock in all these cases exchanged dividend-paying shares for interest-bearing bonds, giving up their right to control the management of their companies for the right to receive a fixed rate of income. Although the stock they surrendered became the collateral security of the bonds they received in exchange, its voting power is in the hands of the purchasing company. Only in case of a default by the latter in payment of interest on the collateral trust bonds, could the holders of these bonds get possession of their old shares and their voting power.

In such cases the question arises, how are the interests of these bondholders to be safeguarded? Where their collateral consists of shares of stock, the parent railroad company may use the voting power which it thus holds to cause its subsidiary company to enter into traffic agreements with other railroad companies, which agreements may prove burdensome to the subsidiary company, drain away its earnings and undermine the security of the collateral trust bondholders. Or, if the parent company find itself pressed for funds, it may use its voting power in the stock of the subsidiary company to mortgage that company's property for all that it is worth; the lien of such a mortgage would come ahead of the claim represented by the subsidiary company's stock, and in event of default on the collateral trust bonds, should their holders foreclose their mortgage, they might find the stock they thus secured practically worthless because of the mortgage claims which had been placed ahead of it.

With a view to avoiding such contingencies, recent collateral trust mortgages contain provision intended to prevent the purchasing company from using its voting power in the stock of the subsidiary company for the purpose of placing any new mortgage or other claim ahead of that stock which is deposited as collateral, or to limit its power to do so. The collateral trust mortgage executed by the Chicago, Rock Island & Pacific Railway in acquiring the capital stock of the Choctaw, Oklahoma & Gulf, forbids the former company to exercise its voting power for the purpose of authorizing consolidation or merger of the "Choctaw" with any other company, or to authorize the sale of any of its property, or any lease of it save to the Rock Island itself, and even in that case the lease is to terminate in case the Rock Island should default in the payment of the interest upon its collateral trust bonds. The object of the last provision was to enable the collateral trust bondholders to obtain complete control of the "Choctaw" company should they foreclose their mortgage and obtain possession of the "Choctaw" stock—of course, this would be impossible if such a lease did not terminate when the Rock Island defaulted. The mortgage further provided that the Rock Island was not to use its voting power to authorize any new mortgage or bond issue by the "Choctaw" company, except its consolidated mortgage bonds, which were limited in amount to $30,000,000; nor to increase that company's capital stock until after May 1, 1904, or as soon thereafter as 95 per cent. of the old "Choctaw" stock had been deposited under this mortgage, and then only when a like proportion of the new stock had been similarly deposited.

Some of the older collateral trust mortgages required foreclosure of the mortgage before the trustee could get full control of the collateral. This often meant disastrous delays. Recent mortgages, among them the Rock Island mortgage just described, permit the trustee to at once assume the voting power of the stock which constitutes the collateral, and at his discretion, or at the direction of a certain proportion of the bondholders, to sell the collateral without foreclosure or to foreclose the mortgage and all the collateral at public auction. The mortgage created by the newly formed Chicago, Rock Island & Pacific Railroad in its purchase of the old Chicago, Rock Island & Pacific Railway stock, permits the trustee, in event of default, to sell the collateral either at public or private sale or on the Stock Exchange. In all cases of sale at auction, the bondholders have the right to bid in the collateral and pay for it with the bonds which they hold. For this purpose these bonds are worth their face value, no matter how low their market value may be, and therefore place their holders in a position of advantage in the bidding. By this means, shareholders who exchange their

*From a paper by Thomas W. Mitchell in the *Journal of Accountancy*.

stock for bonds, may, in the event of insolvency of the purchasing company, regain possession of their old stock and with it control of their company.

The terms of the mortgage created in 1898 by the New York Central and placed upon the Michigan Central stock, prevent consolidation in any manner of the latter company with any other without the consent of 75 per cent. In interest of the collateral trust bondholders, and provide that in event of the merger of the New York Central and Michigan Central, these bonds are to become a direct lien upon the Michigan Central property. In event of default, the trustee may sell the collateral as an entirety, or may foreclose the mortgage, or may bring a suit in equity to compel specific performance of its duties on the part of the New York Central. Finally, the New York Central cannot place any mortgage upon any substantial part of its property without including in it, in favor of each of these collateral trust bonds, "a lien and charge prior and superior to the lien in favor of any other bond or debt secured by such mortgage," except that the collateral trust bonds secured by a pledge of the Lake Shore & Michigan Southern stock are to go into such a mortgage on a basis of equality with these "Michigan Central Collateral" bonds. By these means it is attempted to prevent the impairment of the security of the collateral trust issues which are based upon deposits of corporate shares.

The third type of corporate instrument is at the basis of what are known as "Car Trust Certificates" or "Equipment Trust Bonds." The case may be put thus: A railroad company needs additional locomotives, freight cars and other kinds of rolling stock, and its surplus earnings are not sufficient for their purchase. How shall it finance the acquisition of this rolling stock? Several possible alternatives suggest themselves. New shares of stock might be sold with the advantage of not increasing fixed charges. Or perhaps there are general or consolidated mortgage bonds in the treasury, which may be sold and the proceeds used for this purpose; or the purchase of the new equipment may be financed by mortgaging this equipment and selling new bonds thus secured.

In practice, the last is never done. The actual procedure is this: A syndicate of capitalists is organized (a joint stock company being formed) to purchase the desired equipment from the manufacturers and pay for it. This equipment is then "leased" to the railroad company for a certain number of years, usually less than ten. The "rental" consists of three parts, viz.: (1) a certain cash sum which is payable at once, and which represents the syndicate's (or Car Trust Association's) expenses and profits; (2) a certain sum which really represents the purchase price of the equipment, and which is divided into a certain number of equal annual instalments; and (3) the true semi-annual rental of the equipment which takes the form of interest on the unpaid instalments of the purchase price. Some of these "leases" provide that title to the equipment is to pass, or a bill of sale given, to the railroad company upon receipt by the vendors of the last instalment of the rental. Such an instrument, it will at once be seen, although it speaks in the language of a lease is not truly such, for a genuine lease does not contemplate the eventual transfer of title to the property to the lessee. It really is merely a conditional sale of the rolling stock, the title remaining in the vendor until the last instalment of the purchase money is paid. Others provide that at the expiration of the "lease" the railroad company may purchase the rolling stock and receive title to it upon the further consideration of one dollar.

Finally, this "lease" is assigned to a trustee, and the railroad company issues its own "car trust certificates" or "equipment trust bonds," usually in amounts of $1,000 each, and divided into series maturing at dates to correspond with the annual instalments of the purchase money as provided in the "lease." These certificates or bonds, thus divided into series, represent the several instalments of the "rental" or purchase money, and the interest which they bear represents the true rental of the equipment or the interest on the purchase money. These certificates or bonds, after certification by the trustee of the "lease," are delivered to the syndicate of capitalists and eventually find their way into the hands of the investing public. Upon the complete redemption of the last of these bonds and the payment of all interest charges, and perhaps the payment of an additional one dollar, it is expected that title to the rolling stock will be assigned to the railroad company.

Further conditions of such an agreement are that each of this particular lot of cars or locomotives shall be plainly marked with the name of the "lessor," that they are to be kept in good repair and any which may be destroyed are to be replaced, by the railroad company, that once a year an accurate statement is to be made to the "lessor" as to the number in actual service, the number and description of those destroyed and replaced by others, that the "lessor" shall have the right to inspect his property once a year; that the railroad company will not assign or transfer its rights or interests in such equipment, nor underlet it without the consent of the "lessor"—the "lessor" having the right to terminate the "lease" in case of unauthorized sale or transfer of this property, a transfer by bankruptcy being deemed a breach of this covenant; that in case of default in the payment of any part of the "rental," or a failure on the part of the railroad company to keep the equipment in good condition, and so on, the "lessor" may terminate the lease, declare the principal of all series of the "car trust certificates" due, and enter into possession of his equipment. For this purpose the railroad company must deliver these cars at such points as are designated by the "lessor" or trustee, bringing them there at the ordinary speed of freight trains.

Here is an interesting point in which one of these instruments differs from a mortgage. In the case of foreclosure of a mortgage, the trustee would sell the property to the highest bidder, apply the proceeds to payment of the debt, and if any surplus remained this would be repaid to the railroad company. In other words, the mortgagor has an equity in mortgaged property. But in case of the "lease" or conditional sale, the railroad company has no such equity. Sometimes, indeed, the agreement expressly stipulates that the surplus proceeds or unsold equipment shall be returned to the railroad company; but in one such case the court held that the instrument was a mortgage, not a conditional sale, and because it contained this provision the purpose of this device was defeated. Recently equipment trust agreements have appeared which discard the language of the lease. The agreement securing the Equipment Bonds, Series "E," of the Chicago & Eastern Illinois in 1905 is a case in point.

The reasons assigned for using the conditional sale as a means of financing the purchase of equipment are various and conflicting. One reason assigned for use of this instrument rather than the purchase money mortgage, is that usually the property of such a railroad company is already covered by mortgages which contain what are known as "after-acquired property" clauses; that is, a provision to the effect that the mortgage is to cover certain specific property which is conveyed to the trustee, and also "all rolling stock, equipment, trucks, etc., now or hereafter acquired." Such mortgages, it is urged, would automatically extend over any equipment that might later be purchased, and any new mortgage that might be placed upon this equipment to secure the payment of the purchase money, would have merely an inferior lien. Of course, nobody wants a junior mortgage upon mere rolling stock. This sounds plausible, and where a railroad company buys rolling stock of one party, borrowing the funds with which to pay for it, and later attempts to fund the debt thus created by mortgaging this equipment, no doubt this idea has force. But the court has universally held that, where such rolling stock was purchased and a mortgage upon it given to the vendor to secure payment of the purchase money, the sale of the equipment to the railroad company and the giving of the mortgage were both parts of the same transaction, and although the lien of other mortgages did extend over this rolling stock, the lien of the new purchase money mortgage was superior to that of the old mortgages. Hence this objection is of no practical force.

A better idea, from the standpoint of the vendor, seems to be the difference between the mortgage and the conditional sale as to the equity of the railroad company in the rolling stock in the case of foreclosure sale. In the case of the mortgage, the surplus proceeds from the sale of the property, after satisfying the debt and incidental expenses, must be paid to the mortgagor. In the case of rolling stock bought by means of a mortgage, if all but the last instalment of the debt had been paid, this equity might be very large. But in a true conditional sale, this entire surplus may be retained by the vendor. With the latter instrument the vendor has the chance to make a considerable gain, compensating the risk he runs of netting an equal loss if the proceeds of the sale should fall short of the amount of unpaid purchase money. With the mortgage he runs the risk of loss without the compensating chance to gain.

The reason for making this conditional sale read in the language of a lease is another matter. According to the law of most states the conditional sale, although binding as between the parties thereto, is void and fraudulent as against the claims of a third party, a judgment creditor, a purchaser of the property without notice of the existence of this contract, and even with notice in some states. As a result, in case of insolvency of the railroad, the vendor of rolling stock under such an agreement might find it impossible to regain possession and title to such property. To avoid these difficulties, these instruments were made to speak as if they were leases and the consideration paid was the rental of the property. However, since title was to pass to the railroad company upon the payment of the last instalment of the "rental," the courts were quick to see that these were, in substance, mere conditional sales, and corporate ingenuity had to find a new device. This was accomplished by prescribing the additional payment of one dollar, after the payment of all rentals, as the consideration for the assignment of title, and, strange to say, the courts of Pennsylvania, which had been the principal stumbling block in regard to the theory of conditional sales, recognized this instrument as a true lease, the vendor's title being good against all claimants. This leaves the railroad company two methods of purchasing equipment without subjecting it to the prior lien of old mortgages, the purchase money mortgage, and the last-described form of the conditional sale or "lease."

## The Pennsylvania Tunnels Under the East River.

There have been recently many rumors in the daily papers that the work of building the Pennsylvania tunnels under the East river to Long Island City was not progressing favorably and that on account of the serious obstacles which had been met some changes in the design and location of the tunnels or changes in the methods being employed for building them would be necessary before they could be completed. Through the courtesy of Mr. Alfred Noble, Chief Engineer for the railroad company, and Mr. E. W. Moir, of the firm of S. Pearson & Son, the contractors, we have been permitted to make a personal examination of the workings on both sides of the river and in this article some brief description will be given of the methods employed in driving the tunnels and the elaborate working plant of the contractors. It will also be shown on what little grounds the rumors of abandonment are based. For a full description of the project of the Pennsylvania Railroad to build tunnels under the North and East rivers with a terminal station on the Island of Manhattan the reader is referred to the *Railroad Gazette* of Jan. 16, Oct. 9, Oct. 16, 1903; Feb. 9, May 25, 1906. Only a brief description of the plans as related to the East river section will be necessary here.

Starting from the terminal station site at Seventh avenue, Thirty-first to Thirty-third streets, the station tracks will converge into two three-track tunnels, one under Thirty-second street, the other under Thirty-third street. Under the west line of Fifth avenue the three tracks of each tunnel converge into two and enter a twin-tunnel construction consisting of two tunnels formed in a single excavation. At Second avenue, the two lines are turned north slightly to shafts just east of First avenue. The shield-driven tunnels begin at these shafts, and thence the two tunnels will be entirely distinct across the river. The lines in the twin tunnels under Thirty-third street are known as lines A and B, and will be carried across under the river parallel to each other 37 ft. apart, center to center, and with approximately the same profile. The two lines under Thirty-second street, known as lines C and D, will likewise enter two separate tubes at the south shaft, and these two tubes will also be carried across under the river, converging toward lines A and B. The four subaqueous tubes pass through in two shafts just west of Front street, in Long Island City, and continue in approximately parallel tunnels up to East avenue about 2,000 ft. From East avenue out to Beech street the work will be cut and cover, and from Beech street to Thomson avenue will be open excavation. The tunnels between the Manhattan and Long Island shafts, with which we are particularly concerned, will be single-track tubes, with a cast-iron lining 1½ in. thick and 23 ft. outside diameter, surrounded with a thin sheet of grout and lined inside with 2 ft. of concrete. They will have an inside diameter of 19 ft. The concrete lining will be carried up on each side of the rails to form a bench 3 ft. 8 in. wide and 5 ft. 6 in. above the top of rail. In this bench will be inserted conduits for carrying telephone, lighting and power cables. Beginning at Fifth avenue, on the Manhattan side, the line descends on a 1.5 per cent. grade to a point about one-third the distance across the river, and from there begins to rise on a 1.25 per cent. grade to the open cut in Long Island City. The elevation of top of rail at the lowest point in the tunnel will be 8 ft. below mean high water. The total length of the subaqueous tunnel between shafts is approximately 3,900 ft.

The conditions of depth, character of soil, amount of cover over the top of the tunnel, etc., are perhaps the most difficult that have ever been encountered in similar work. The Blackwall tunnel under the Thames river, for which S. Pearson & Son were also the contractors, is generally considered to have been, up to the present time, the most trying work of this nature yet undertaken. The conditions confronting them in building the East river tunnels are perhaps even more difficult, but their experience in previous work is standing them in good stead.

The contract for building the tunnels was awarded them in March, 1904, and they immediately began active preparations for getting the work under way. An enormous plant of extensive and special machinery was required; in fact, this is the largest compressor plant in the world. Some idea of the size of the plant necessary may be had from the fact that for the Manhattan shafts alone a battery of six boilers was installed, having a total boiler horse-power of 3,000, or nearly 6,000 indicated horse-power available for the compressors. A more detailed description of the power house will be given in a subsequent issue. The work of sinking the shafts both in Manhattan and in Long Island City was begun early last year. A caisson 74 ft. 2½ in. by 40 ft. 2½ in. over the cutting edge was sunk over the line of tunnels A and B, and a similar caisson over the line of C and D. These caissons consisted of a rectangular steel shell with an inner shell, strongly braced together, and the intervening space, 4 ft. 11 in. wide, filled with concrete as the caissons were sunk. The plans provided for work under air pressure in case seamy or unsound rock was encountered at the lower levels. Circular diaphragms, 24 ft. 7 in. in diameter, were built in the sides to permit the starting of the shields through the caisson wall. The diaphragms were built up of ½-in. plate, supported by longitudinal plate girders, 3 ft. deep, riveted to lugs attached to the circular ring surrounding the opening. In both of the Manhattan shafts, however, solid rock was encountered when the cutting edge had been sunk about 50 ft, so that these diaphragms were not removed. Instead, the shields were erected at the bottom of the shafts on tunnel grade, those for lines C and D bing completed first. As the Manhattan shafts are used commonly by S. Pearson & Son, the contractors for the river section, and by the United Engineering & Contracting Company, contractors for the section westward from the shafts, a concrete bulkhead wall has been built in each of the shafts to a height of about 20 ft., in order that the working forces of the two contractors may not interfere with each other. Separate hoisting apparatus has been installed on each side of this bulkhead and the operations of both contractors are carried on entirely independently. As soon as the shields were erected and put in working order, headings were started out through the rock and the shields advanced far enough to put in a concrete bulkhead with three locks; two close to the floor level for passing men and material, and one under the roof for use as an emergency lock. The shaft for lines A and B was completed soon after the shaft for lines C and D, and as soon as possible the shields were erected and started out. The rock penetrated for the first 100 ft. or so was fairly solid in all of the tunnels, but the surface of the rock dips rapidly close to the bulkhead line, and before tunnel D had been advanced 200 feet, water-bearing sand and clay was encountered. At the present time line D has been advanced out beyond the pier head line about 600 ft. from the shaft. Line C is just emerging into the water-bearing material. Line B is out about 550 ft., and line A has not yet left fairly solid rock. So much for the progress already made on the Manhattan side.

On the Long Island side the work has been delayed somewhat owing to the fact that the caissons for the shafts have had to be sunk to their full depth because of the seamy character of the rock, which carries a considerable quantity of water. On the Manhattan side the shaft presents no novelties, for beyond the bulkheads and locks at the ends of the tunnels the methods employed for removing and hoisting material are substantially the same as would be used in any open excavation of a similar depth. In Long Island City, however, the caissons were sunk under air pressure for the last 30 or 40 ft. The caissons are substantially the same as those employed on the Manhattan side. They are 84 ft. 3¼ in. deep from the top to the bottom of the cutting edge, which is approximately 10 ft. below the level of the tunnel lining. Both caissons were sunk by the pneumatic process. After being sunk to a final depth, a concrete invert was laid under air pressure, and the roof of the working chamber then removed. The shields, air locks for the bulkhead, and similar parts, were lowered into the shaft in parts, and the shields assembled and completely erected in the shaft on the tunnel lines. After this was done the roof of the working chamber was again put on about 8 ft. above the diaphragm openings. A vertical steel shaft 6 ft. in diameter was carried up to the level of the dumping floor, about 18 ft. above the ground, and at the top another shaft about 6 ft. in diameter extending across in the form of a T was built on. An air lock about 10 ft. long was built in at each end of this cross shaft and a stuffing box for the hoisting cable put in immediately above the vertical shaft. Air pressure was then turned into the shaft and the space below the air-tight roof. After the air pressure had been put on, the shield diaphragms were removed. The air locks to go in the bulkhead were stored in slings under the floor. Several sections of the tuunel lining were put in place above the invert, starting with a bottom section near the back of the shaft and building up with successive rings until a complete ring was formed in the shield chamber, so as to give a bearing for the shield jacks when the shield was started out. At the present time the shaft for lines C and D is under pressure and both shields have been erected. A heading about 12 ft. square has been cut into the rock for a distance of 50 ft. ahead of the shield for line D, and work is being carried out on a similar heading for line C. Neither shield has left the shield chambers. The shaft for lines A and B has been sunk, the invert completed shields erected and the roof put on above the shield opening. The hoisting shaft and cross shaft at the top are about completed. Neither heading has been started, but work will be commenced as soon as the air locks are completed. In the C-D shaft a pressure of 18 lbs. is all that is required at present to keep out the water, and under this pressure only a small amount is coming in; so little that a 3-in. hose is ample to take care of the seepage. The rock is hard but full of small cracks, which bring in water quite freely.

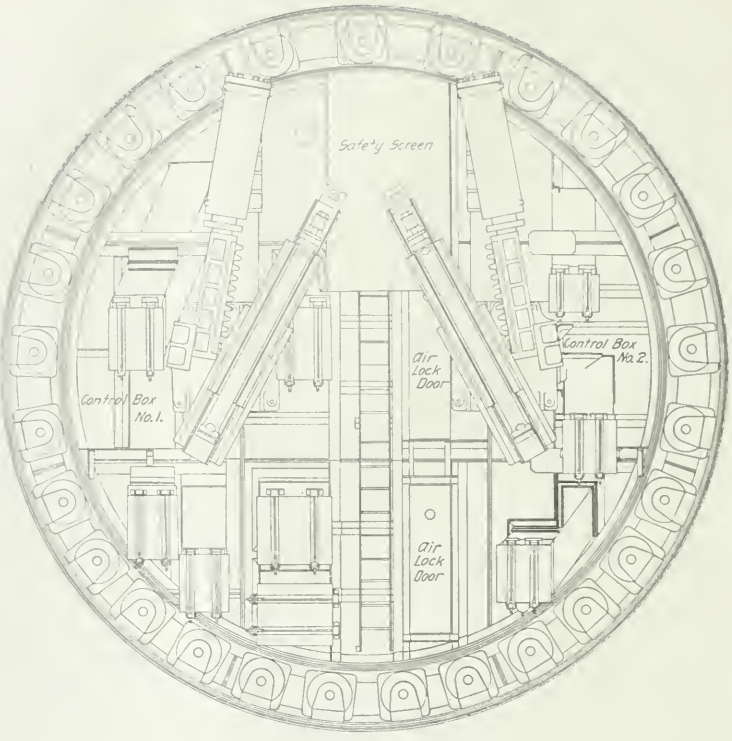
It was the original intention at Long Island City to start a shield for each tunnel from the shafts in opposite directions, one working out under the river and the other inshore. The caissons were built with this end in view. S. Pearson & Son, the contractors for the river section, also have the contract for the section about 2,000 ft. long extending from the shaft back to East avenue, and in order largely to avoid complication in working four shields

from the [illegible] shaft they erected to begin work from a small [illegible] at East avenue, and to work west toward the river, rather than away from the river. The first 1,500 ft. of this work presented no difficulties, as the soil encountered was not carry water, but when a point about 300 ft. from the river shaft was reached, they had to abandon working without air pressure and have begun to make plans for using shields similar to the ones used under the river for carrying the four tunnels up to the river shafts. These shields will be erected in shield chambers cut out at the end of the present excavation. Bulkheads and air locks will be put in back of the shield chambers, and the work carried on in the usual manner. The point at which the shields will be started is close enough to the main power house to avoid any complications in the transmission of hydraulic pressure for the shields or air pressure for the tunnels.

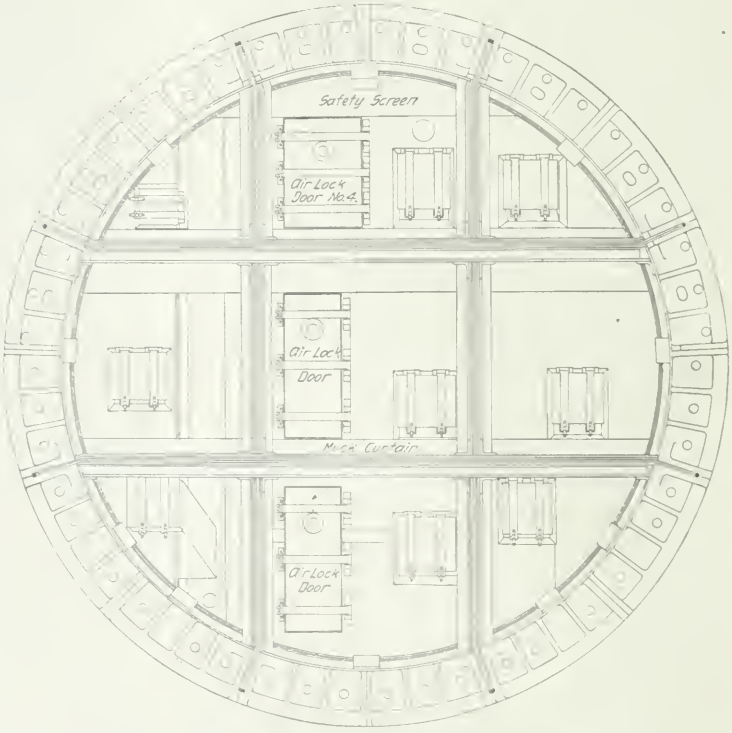
In a work of this kind the contractors' plant furnishes the most interesting details. S. Pearson & Son, contractors, have had, probably, more experience in tunnel building than any other firm in the world, and the completeness of their plant is remarkable. On the Manhattan side it occupies the entire space between Thirty-second and Thirty-third streets and First avenue and the river bulkhead line, and a considerable space north of Thirty-third street, and adjacent to the A-B shaft. An even larger area is occupied in Long Island City, where most of the material for use on both sides of the river is stored. The most important element of the working plant is, of course, the power house. A complete description of this will be given in a subsequent issue.

The shields used in driving the tunnels are similar in many of their essential details to the shields used by S. Pearson & Son in the Blacknall tunnel. They are 28 ft. 6½ in. outside diameter and 18 ft. long, built of steel plates and angles and fitted with a heavy cast steel cutting edge. Two central diaphragms 2 ft. 6 in. apart form an air lock between the face and the tail for use in case it is found necessary to employ a higher pressure in front of the shield than behind it. So far this has not been done. The working face is divided by two horizontal diaphragms into three floors and these are each divided by two vertical diaphragms into three chambers. On each of the three levels of the working face is an air lock for the passage of men and in each chamber is a muck chute extending down and back through the center air chamber with air tight doors at both ends. The accompanying drawings show the principal structural details of the shields and a more minute description is not necessary.

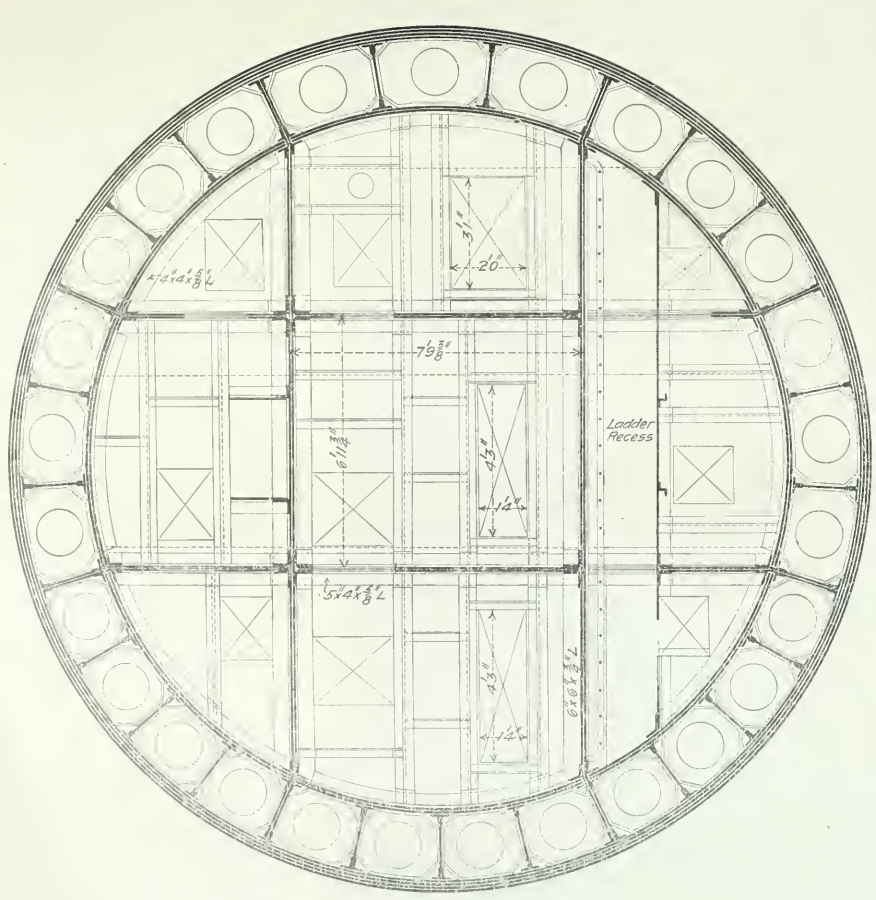
The shield is pushed forward by 27 hydraulic jacks 9 in. in diameter and 3 ft. 6 in. stroke. These jacks are spaced around shield between the outer shell and the central air chamber being massed closer together at the bottom. The forward end of each jack abuts against a continuous ring of three 2-in. plates, which is backed up by heavy webs extending to the back flange of the cast steel cutting edge. The pressure is thus transmitted directly to the cutting edge and the outer shell. Each jack has an area of about 60 sq. in. which gives a total pressure of 4,050 tons with a hydraulic pressure of 5,000 lbs. per sq. in. or 4,860 tons with a pressure of 6,000 lbs. per sq. in. The superficial area of the outer skin is 1331.28 sq. ft., which gives a maximum pressure of 3.75 tons per sq. ft. of skin area. The jacks are controlled in pairs by valves mounted in two control chambers in the after bulkhead. The valves for half the jacks are in the chamber on one side and



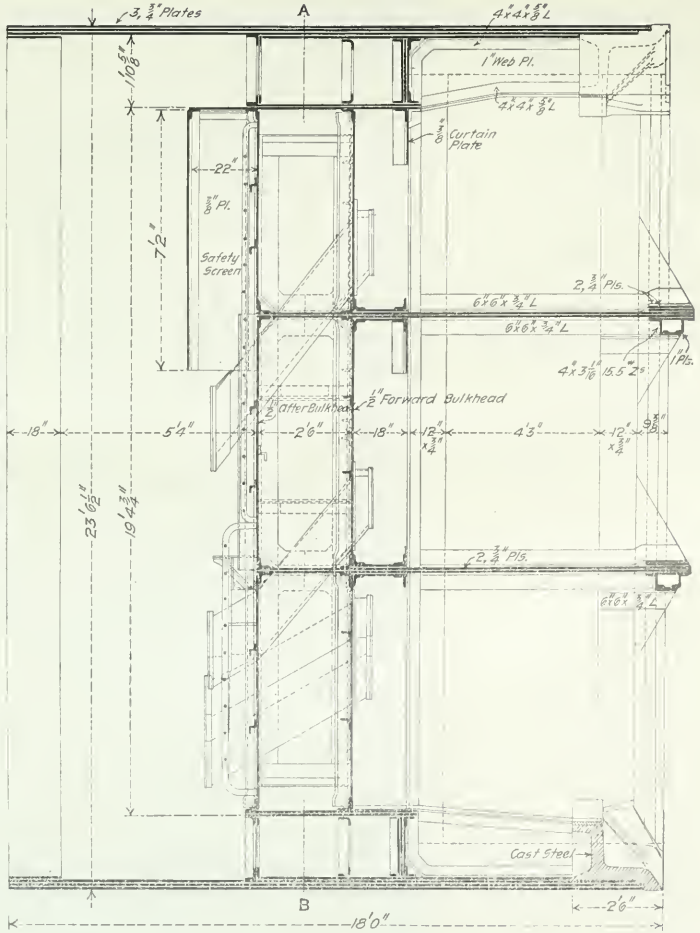

Back Elevation of Shield Showing Jacks and Hydraulic Erectors.




Front Elevation of Shield Showing Working Chambers.




Section A-B.



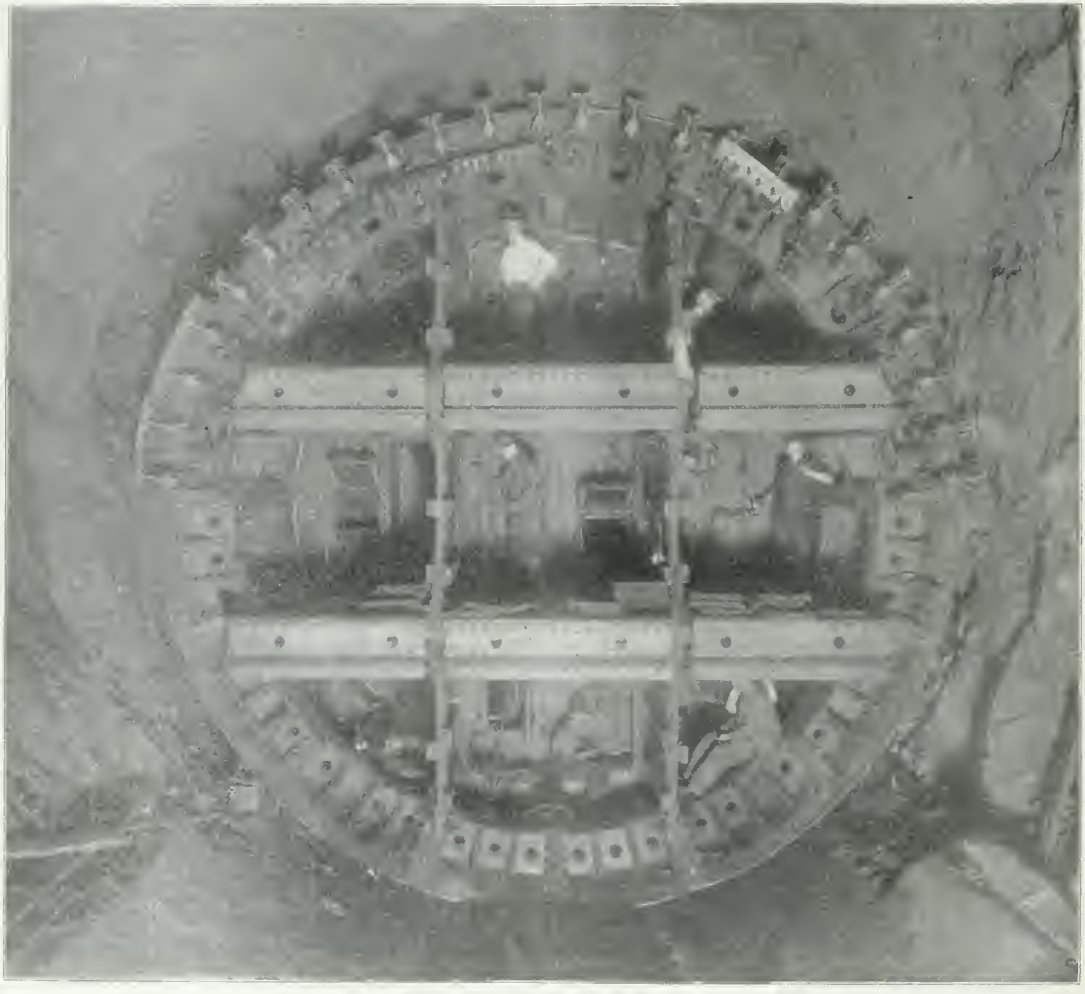

Vertical and Cross-Sections of Shields for the East River Tunnels, Pennsylvania, New York & Long Island Railroad.

the valves for the other half are in the chamber on the other side.

Mounted on the after bulkhead are two hydraulic erectors for putting in place the iron lining segments. The erectors each consist of two hydraulic cylinders having movement only in a vertical plane. One cylinder is fixed in position near the top of the bulkhead and the piston is attached to a heavy cast rack. The other cylinder is pivoted on a revolving trunnion on which is a sleeve having a gear which engages with the rack on the first piston. The pivoted cylinder picks up the iron segments from the trucks on which they are wheeled out to the shield and the fixed cylinder revolves the pivoted cylinder carrying the segment into the proper radial position. The pivoted cylinder then pushes the segment home and the bolts are inserted, holding the ring in place. This is done under the protection of the tail of the shield. As soon as a complete ring has been erected the jacks move the shield forward and grouting is begun back of the tail of the shield over the completed ring. The erectors are handled from the control boxes on each side of bulkhead. A pressure of only 2,000 lbs. per sq. in., however, is used in the cylinders. The photograph of the rear of the shield shows the erectors and the control boxes.

The arrangements for lifting the spoil from the bottom of the shafts and dumping it in scows in the river involve a large amount of trestle work of substantial character. The trestle work is built in two stories. On the upper floor is a runway or track for a locomotive crane, which extends out to the end of a pier just south of the Long Island ferry slips. This crane is used for loading and unloading scows moored to the pier. The hoists in the shaft, which are electrically driven, extend up to the upper floor, and the muck carts, which are run out through the material lock in the bulkhead in the bottom of the shaft, are run directly on to the hoist platform and lifted up to the top floor of the trestle. They are then run off on narrow-gage tracks, and with the aid of a switch back are run on to tipples, which turn them completely over and dump their contents into side-dump cars standing on a track below on the lower level. When one of these larger cars is filled it is hauled out to the end of the pier and dumped into a waiting scow. The spoil is being deposited at the Greenville yards of the Pennsylvania, in lower New York Bay. A system of continuous rope haulage is in operation between the bulkhead at the shaft mouth and the heading in each tunnel. On account of the air pressures employed, no draft animals are allowed in the tunnels.

The United Engineering & Contracting Company, which is working west from the same shafts, also has an extensive plant for the removal of the spoil from the tunnels. They use an overhead telpherage system, by which the loaded trucks run out of the tunnel mouth, are picked up by the telpher hoists, and when above ground are transported to a dumping hopper, under which carts are placed for removing the excavated material to scows moored to nearby piers.

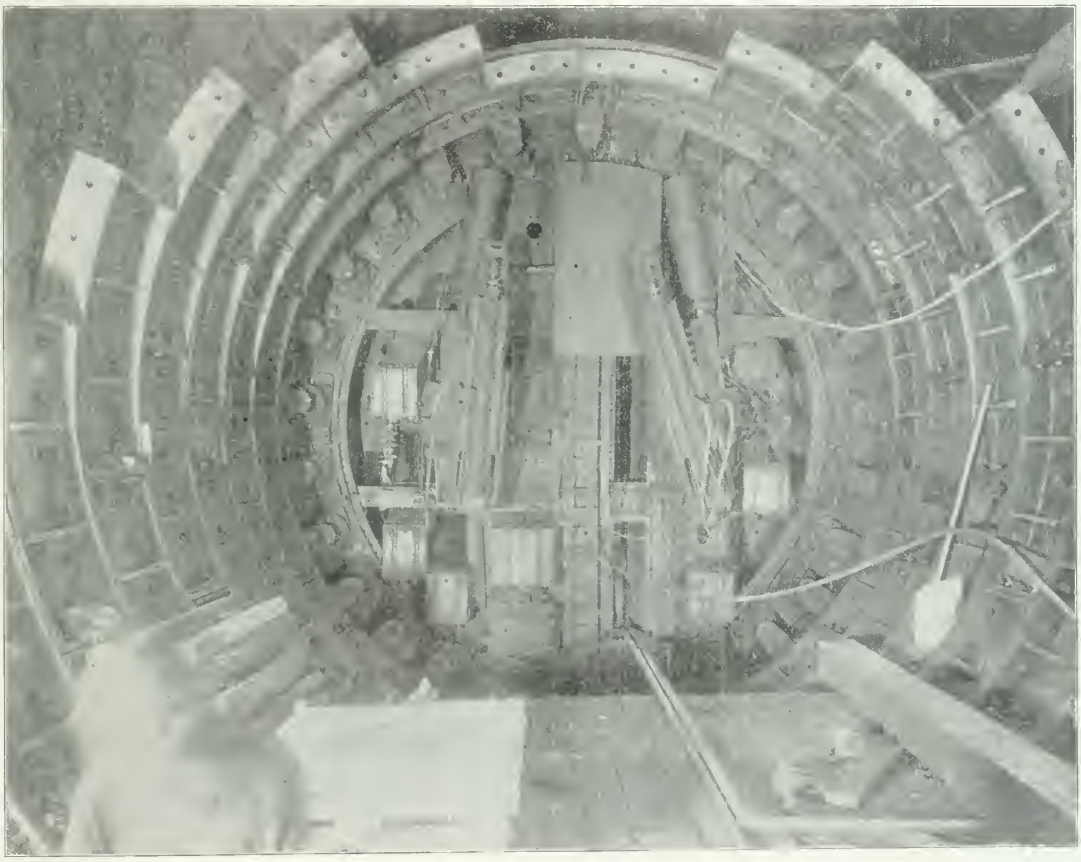


Front View of the Shield in Rock, Showing Cast Steel Cutting Edge.

Experience has shown that in work under compressed air, especially at the depths and pressures employed in these tunnels, there is certain to be a good deal of trouble with the "bends," or caisson disease, no matter how carefully the workmen are examined and cared for while at work. Very complete arrangements have been provided on both sides of the river for giving immediate attention and medical aid to any men overcome or injured in any way. As a part of the working plant at both the Manhattan and Long Island shafts the contractors have provided a completely

equipped emergency hospital and three medical air locks for the treatment of persons affected with the bends, under an equalized air pressure. The medical staff consists of a supervising medical director and four other physicians, one of whom is always on duty during the twenty-four hours. The medical quarters consist of a waiting room for applicants for work, all of whom are required to undergo a thorough medical examination before being allowed to enter compressed air, and an examination room which may be utilized as an emergency hospital. The physician in attendance is constantly employed examining applicants for work, and each man, if passed by the doctor, is given a numbered badge, without which he is not permitted under any circumstances to enter the workings. All of the men are periodically examined at frequent intervals to see that they are in a good state of health. Just off from the examiner's office is the air lock room, containing two medical locks, or caissons. These caissons are about 20 ft. long and 7 ft. inside diameter, and are built with an intermediate chamber at the outer end. The rear chamber contains two cots, one on each side, and mounted on the back wall are an air pressure gage, a thermometer, and a clock. A person afflicted with the bends is immediately taken to one of these locks and placed on one of the beds if in extreme pain. The inner door is closed and the attending physician raises the air pressure in the lock to a point where the patient feels some relief. By thorough massage the pain is soon relieved, if the case is not a serious one, and the air pressure at the same time is very gradually lowered to that of the surrounding atmosphere. In case a number of men are affected at one time, two can be put in the inner chamber of one air lock and two in the inner chamber of the other air lock, and by means of the outer chamber with the double doors the attending physician can leave one lock and enter the other without reducing the pressure in either. Ventilation is provided for by an automatic ventilating valve and by a positive ventilating valve, which can be used in case the automatic valve does not supply sufficient air. A bathtub is placed conveniently near the locks, so that a patient may be given a hot bath, if necessary. These two locks are for the use of the men employed by the contractor. A similar lock is placed in the quarters provided for the engineers and inspectors of the railroad company. These medical locks have been found to be of great value in giving immediate treatment for caisson disease. They were first used on the Hudson Company's tunnel under the North river, when S. Pearson & Son undertook that job in 1900, although they had been suggested before that time.

The quarters for the workmen are large and light and are kept scrupulously clean. Each man is provided with a locker for his clothes. These lockers are made of sheet iron and are built in rows placed back to back in the center of each dressing room. Under each bank of lockers along the floor steam pipes are carried, and the floors of the lockers are perforated, as are also the tops. Steam is kept on these pipes at all times, and the current of warm, dry air rising through the lockers soon dries out wet clothes and insures that the men will have warm, dry clothing before going into the workings, and that their street clothes will be warm and dry when they come out. Ample toilet facilities are provided, and each dressing room has in connection with it a wash room, with a number of shower baths, having hot and cold water. These rooms are all on the second floor of the staging above ground, and are connected with the top of the hoists, where the men come out of the shaft, by a covered passage way, so that they will not be exposed to drafts. The dressing room for the railroad company's engineers and inspectors is off in another part of the grounds from the workmen's quarters, and it is provided with every convenience also. Each man has a separate metal locker, also provided with steam-drying apparatus underneath, and a large washroom is connected with the dressing room.



Rear View of Shield, Showing Erectors and Iron Tunnel Lining in Place.

On the Long Island side substantially the same arrangements for the care of the men have been provided, but up to this time a much smaller force has been employed and the air pressure has been much less in the workings, so that a physician is not kept in attendance on that side of the river, nor are applicants examined there. All men applying there are sent to the Manhattan side for examination. The same arrangement of hospital locks, however, has been

provided. At the Borkingmen's quarters are practically a duplicate of those on the Manhattan side. Taken as a whole, the arrangements for the comfort and safety of the men provided by the contractors on this work are the most complete which the writer has ever seen, and certainly nothing more could be asked for on the part of the employers for the welfare of their men, so far as it is within their power to provide it.

From 50 to 45 men are employed in each heading during the entire 24 hours. Sunday work is carried on every other Sunday. They work six hours a day in two shifts of three hours on, three hours off, and three hours on, in pressures above 32 lbs. per sq. in., and 8 hour shifts below this pressure. The wages paid are about double the prevailing rate for similar work above ground. The common laborers, or "sand hogs," have been getting $3 a day, and the various classes of skilled labor correspondingly high wages. The conditions under which the men work are trying, and of course there is always present an element of danger, but every effort has been made to reduce the discomforts and danger to a minimum. The temperature in the headings is close to 88 deg. Fahr., and this cannot be materially reduced. The enormous volume of compressed air being forced into the tunnel enters at a comparatively high temperature, despite the use of the most efficient after coolers, and when grouting is going on back of the shield, the chemical action of the solidifying mixture of cement causes a marked rise in temperature. The inside of the iron tunnel lining is often so hot that the hand cannot be held against it. The ventilation, however, is excellent. About 5,000 cu. ft. of air per minute is being forced into each heading. With 30 men at work this is an average of 10,000 cu. ft. of air per man per hour, or ten times as much as is considered necessary for good ventilation. The air intakes of the compressors are above the roof of the power house, and the free air thus obtained is as pure as can be had. Any dust or foreign matter contained in it is filtered out in the process of compressing and passing through the after coolers. The pressure employed is 32 lbs. to 34 lbs at present.

In spite of all these precautions and safeguards there have been 11 deaths from "bends." This may be explained partly by the fact that the class of labor obtainable has been low, and that in the face of constant warnings and careful watching on the part of the foremen, the men persist in taking reckless and foolhardy chances on coming out of the compressed air. A competent lock tender is in charge of the man lock at the foot of the shaft and he has control of the speed with which the air is admitted or exhausted from the lock. Occasionally, however, a man will be in a hurry to come out and will come through the mud lock with a rapid reduction in pressure. A case of "bends" more or less severe is almost sure to result if a man is green at the work, though some of the old hands much prefer to come out quickly, saying that slow de-compression forces their "bends." Only recently two men came out after their first shift and immediately went into a neighboring saloon to quench their thirst. A large bucket of ice-cold beer caused an immediate attack of "bends." The contractors cannot be held responsible for the actions of their men when off duty, and it would be obviously impossible to attempt to examine each man every time he went down. So far as analysis will show, the air supplied in the tunnels is pure and very low in carbonic acid. No peculiarity of the soil through which the tunnels are being driven has been found which would account for any bad effects on the men working there thus far.

We come now to some of the difficulties which have been encountetred on the work and the methods employed for overcoming them. As was stated in the beginning, perhaps no more difficult piece of submarine tunneling has ever been attempted than this work. The contour of the bottom of the East river, the character of the soil underlying it, together with the limit of depth imposed by the maximum air pressure which could be employed, and the maximum grade permissible in the tunnel approaches, all combine to impede rapid progress. The contour of the bottom of the East river is somewhat peculiar. The strata of solid rock—mica schist—which underlies practically the whole of New York City, extends out about to the bulkhead line on the Manhattan side, at the level at which the tunnels are being driven. The depth of water increases rapidly from the shore out to the deepest point, about 300 feet beyond the pierhead line, where it is about 58 ft. deep. About the center of the river is a ledge of rock which comes up to within 35 ft. of the surface. This ledge of rock is a submerged extension of the same ledge which forms Blackwell's Island, about three-quarters of a mile up stream. The rock begins to come close to the river bottom again near the Long Island shore. Between this rock ridge and the pierhead line on each side are two deep pockets of very fine water-bearing sand, or quicksand, which, while it compacts to almost the solidity of rock when confined, is about as difficult a material to drive a shield through as could be found. There have been encountered thin strata of hard, well-compacted clay, running through the quicksand. The air works through the quicksand under the strata, and often some 200 or 300 ft. in front of the shield before it breaks through and comes to the surface. At the deepest point in the river the tops of the tunnels are only about 10 ft. below the normal bed of the river, and this 10 ft. is quicksand mixed with some mud. It was, of course, necessary to add some cover at this point, and permission was obtained to deposit a clay blanket to a depth not exceeding a minimum depth of the river at low water of 27 ft. This gave a blanket about 18 ft. thick, or 25 ft. of cover over the shield. When lines B and D had progressed out into the sand, work was begun on depositing this blanket from dumping barges and dredging. The current in the East river is quite strong, running four miles an hour at maximum tides; but little if any clay has been found to have scoured away. A mat about 350 ft. wide has been deposited over this hollow in the river bed, and so far has proved very effective. The principal difficulty in the work has been to prevent blow-outs over the top of the shield. The problem has been to maintain such an air pressure as could be retained under the top of the shield and at the same time would keep out most of the water at the bottom. The diameter of the shield corresponds to a difference in head of 10 lbs. air pressure between the top and the bottom. At mean high water the pressure at the bottom of the shield, when the shield has reached its lowest elevation, would correspond to about 41 lbs. An excess pressure of 10 lbs. at the top of the shield would, of course, cause frequent blow-outs. The method of determining the pressure to be used in the heading has been to disregard the lower half, roughly, of the diameter of the shield and to equalize the pressure to correspond to the elevation of the center or a little lower. This pressure is, of course, varied according to circumstances and the judgment of the foreman in the heading. At the present time, in the heading for line D, a pressure of 32 lbs. above atmospheric pressure is being used. With this pressure there is, of course, some little inflow of water at the bottom of the shield, but with the pumping apparatus in the shaft this is easily taken care of. The water is forced back out of the tunnel through the bulkhead at the shaft by the air pressure in the heading, and is pumped from a pump to the surface. When working in this soft material, the great weight of the shield, which is something over 250 tons, would naturally cause a constant sinking of the heading in such material as described. This is compensated for by tilting the shield upward at all times, the difference in the movement of the jacks at top and bottom being at times as great as 5 to 8 in. No difficulty has been experienced in maintaining the level of the tunnel at the heading, nor has any sinking of the completed portion back of the shield been observed. Advancing the shield in the quicksand has proved to be a rather difficult task. On account of its great weight it has been considered unsafe to jet in front of it, and, as the difficulty of driving piles in quicksand without the use of a water jet is well known, it will be appreciated what the difficulties are in attempting to force forward such a ponderous mass as the shield. Normally, a pressure of about 5,000 lbs. per square inch is used in the traversing jacks, but at times this has had to be increased to 5,500 lbs. per square inch. At these pressures considerable difficulty has been experienced with the packing in the jacks. It is believed that this is principally due to the presence of the fine quicksand which finds its way into every crevice in the workings. Under the enormous pressures employed, this sand will quickly cut out almost any kind of packing which can be employed. Its action is very peculiar. Some specimens of copper piping cut completely through in three or four hours by the erosion of the sand were shown to the writer. A small leak at a union in the pipe which was buried in the sand in the bottom of the tunnel had evidently produced a swirling action around the joint, and the sand stirred up by the small stream so formed had cut away the 3/16-in. copper pipe from the ontside, leaving it with much the same appearance as if it had been held on the edge of an emery wheel. The tremendous power of the hydraulic pressure employed will perhaps be best appreciated if the pressure is stated in terms of head of water in feet. The head is approximately 12,000 ft.

The method employed in mucking through the quicksand is interesting. The face of the shield is closed with shutters provided with small sliding doors through which the material is excavated, and which are normally kept open. The quicksand, of course, has an angle of repose of practically zero and will not permit excavating from the top. It is worked back through the shield through these doors and loaded on trucks, and the shield is slowly worked forward to keep up with the amount taken out from in front of it. No attempt is made to excavate a heading and then advance the shield into the heading. There have been a number of blow-outs which have temporarily delayed the work, and one caused some loss of life. On the 22d of June a blow-out occurred which flooded the completed portion of the tunnel partially and drowned two of the men working in the heading of line D. This blow-out was no more serious than a number which have occurred, but the men who were drowned were standing in the lower part of the shield, and one was not able to extricate himself and escape, being caught by his shovel. He kept another man behind him although all of the other men in the heading had ample time to reach the air locks and come to the surface. The blow-out delayed the work less than 24 hours. In that time the tunnel was pumped out and

work was again begun at the heading, after the bodies of the two men were removed. It was an accident which was liable to occur in any mining work through such treacherous ground, and one for which no one could be held responsible. Provision is made in the heading for stopping blow-outs, with bundles of hay and sand bags, and these have been effective in most cases.

The four tunnels on the Manhattan side pass under the Long Island Railroad ferry house and slips, and some settlement has occurred on the surface, which is noticeable but not dangerous. The ferry house rests on piles in made ground, and the brick walls of the building have cracked in places. Since the headings have advanced beyond the bulkhead line, however, no further settlement has been observed. The floor of the outer concourse has sunk 6 or 8 in. over the tube B, and the south ferry slip, which is directly over line D, has been temporarily abandoned on account of the pile fender sinking in the center and tilting badly. Work is now going on pulling these piles and redriving them. The river bed has settled firmly over the completed part of line D, and the damage done is only temporary. Over the shields for lines B and D the boil of escaping air is impressive, but not indicative of any danger. The immense volumes of air supplied to the headings escapes under the hood and tail of the shield, and works up to the surface in the form of a miniature geyser, but the disturbance in the river bed is purely local, and as the work proceeds outward the sand in the bottom settles and compacts as hard as before.

On the Long Island side the excavation is still in rock. The method employed may be of interest. After the shield has been erected and started out beyond the caisson the heading is driven out about 50 ft. This heading is about 12 ft. square and level with the bottom of the shield. The method of blasting the first heading is briefly as follows: Two vertical rows of holes about 4 ft. apart are driven in the face, tapering toward the center line. A top row of holes is then drilled, tapering downward. After these have been drilled other rows are drilled parallel to them, but tapering toward the center somewhat less, up both sides and across the top, until the approximate size of the heading has been reached. The center core, consisting of the two inner vertical rows and the lowest top row, is shot first, and the sides and top are then shot in afterward. The explosive used is transite, which is powerful and gives off little noxious fumes. As soon as the holes have been shot the mucking begins, and as soon as possible after the rock is cleared away from the face of the heading the drills are put to work again. After the heading has been advanced about 50 ft., drilling is begun from the first and second platforms on the shield and the rock shot down. As fast as this work proceeds the shield is advanced and successive tunnel rings put in behind it.

An effort is being made by all concerned to have the work finished as soon as possible, but it is not expected that it will be done in less than two years, and if unforeseen difficulties are met it may take much longer. The progress being made is quite satisfactory, however, and is as much as the engineers and contractors estimated on. An average of about 5 ft. in twenty-four hours is being completed in the work through quicksand on line D, and work on the other tunnels is progressing satisfactorily. If this rate can be maintained on both sides of the river, line D should be completed in 350 working days, and the other tunnels in a corresponding time. There is no reason to believe that any change will have to be made in the plans as they now stand. An experimental shaft was put down last summer at the foot of Thirty-fifth street and the test begun of the freezing process. A heading 7 ft. 6 in. in diameter has been driven out into the river and freezing has been going on continuously for about ten months.

*(To be continued.)*

## Canadian Railroad Expansion.

BY S. J. M'LEAN.
Associate Professor of Political Economy, University of Toronto.

Mr. J. J. Hill's plans to participate in the expanding traffic of the Canadian Northwest are the most recent tribute to the traffic importance of a section which, 30 years ago, was known as the "great lone land." Mr. Hill's recognition of the traffic possibilities of the Canadian West is not limited to the prairie section alone. In British Columbia he has in hand the Vancouver, Victoria & Eastern, which runs through the mineralized belt of southern British Columbia. This will open up a more direct line of communication between the British Columbian seaports and the Crow's Nest region and will undoubtedly have important effects on rates throughout the Rocky Mountain section. Already the result of this activity has been to force the Canadian Pacific to undertake the construction of a line from its main line at Spence's Bridge into the boundary country. The extension of the Hill road to Fernie will tap the coking coal, which is in demand further west in the mining country which the road traverses. A branch of the Vancouver, Westminster & Yukon, another Hill project, is to be extended to Edmonton by way of Yellow Head Pass. Other lines projected will enable him to tap the agricultural section both of British Columbia and of southern Alberta. In the new provinces of Alberta and Saskatchewan Mr. Hill proposes to build a line from Fernie, running north of the Canadian Pacific, and eastward through Manitoba to Winnipeg. It is not Mr. Hill's policy to build east of the lakes, and he has expressed his willingness to have the Canadian lines handle any of his Canadian traffic east of Winnipeg. The ramifications of his American lines are such, however, that it is probable that, with the exception of distinctly local traffic, the bulk of the traffic he obtains will go south of the boundary.

In the development of the Canadian railroad systems, stress has been laid on the development of transcontinental lines, not transcontinental lines in the American sense, but lines stretching from ocean to ocean. The lines have been and are being built with the idea of developing an east and west traffic. The charter of the Canadian Pacific was intended to force the traffic of the Northwest over an all-Canadian line to the seaboard. Although the protest of Manitoba led to the abrogation of this provision this phase of policy is still to be met. At present there is opposition in Parliament to Mr. Hill's projects in the west on the ground that they are intended to divert Canadian traffic to Seattle. The three great Canadian systems—the Canadian Pacific, the Canadian Northern and the Grand Trunk—have each adopted the ideal of a line stretching from ocean to ocean. The Canadian Northern will ultimately reach the Pacific; on the east it has provision for a terminus in Nova Scotia. When the Grand Trunk obtained the charter for the Grand Trunk Pacific and undertook to enter the Northwest it endeavored to repair an earlier error of judgment. For before the Canadian Pacific syndicate was formed, the Grand Trunk was asked to build the line. It refused because it could not see any traffic advantages in such construction. One of the leading advantages urged by the Canadian government in favor of the Grand Trunk Pacific legislation was that it would give an east and west line on Canadian territory and make Canada independent of the bonding system. There was granted by Parliament at its recent session the incorporation of the Grand Trunk Pacific Branch Lines Company. This charter gives blanket powers to build branches from Halifax on the east to Victoria and Dawson on the west. But while there is favor shown to all-Canadian lines, both British Columbia and Manitoba are desirous of obtaining additional facilities from any source. It is probable that the new provinces of the Northwest will adopt the same attitude.

At present the Canadian Pacific is the only line running east and west through the northern portion of Ontario. From North Bay there is a Grand Trunk line connecting with the Grand Trunk lines in the southwest and northeast of Ontario. The southwestern portion of this province is pretty thoroughly gridironed by the Canadian Pacific and the Grand Trunk. From Toronto east are the lines of the Grand Trunk and the Canadian Pacific and the Canadian Pacific main line makes connection down the Ottawa between Ottawa and Montreal. The railroad network of eastern Ontario will, however, shortly be rearranged. The James Bay portion of the Canadian Northern will soon be opened from Parry Sound to Toronto. This line is built on a maximum grade of 7-10 of 1 per cent. The portion of this line between Parry Sound and Sudbury will demand more time because of the heavy construction work. The Canadian Pacific also is engaged in building a line between Sudbury and Toronto. The Canadian Northern, too, has filed plans for a line from Key Inlet, near the mouth of the French River on Georgian Bay, to connect with its eastern lines. The same company has a line projected from Toronto to Hawkesbury by way of Ottawa. Between Toronto and Ottawa this new line will run about midway between the Grand Trunk and the Canadian Pacific lines. At present the Grand Trunk has not direct connections from Toronto to Ottawa. By its recent acquisition of the Canada Atlantic it obtained a direct connection from Montreal to Ottawa and now there is projected a direct line from Toronto to Ottawa. East of Ottawa the Canadian Northern will run from Hawkesbury over the Great Northern of Canada, one of its controlled lines. At present it runs into Quebec over the Quebec & Lake St. John tracks. But construction of some 80 miles of track, which has been arranged for, will take it into Quebec over its own tracks. Thence, though the route is not definitely laid out, the line is projected almost due east across northern Maine to a terminus in Nova Scotia. The controlling factors in this company already own lines in Nova Scotia on the east and southeast of Nova Scotia between Halifax and Yarmouth.

When the Grand Trunk came before Parliament to obtain power to build its westward extension it planned to build from North Bay on Lake Nipissing. The Government, however, insisted on a line further north, from Moncton, New Brunswick, to Winnipeg. This eastern portion of the line is to be built by the Government and leased to the Grand Trunk Pacific. Contracts for construction of parts of the line have already been let. Towards Moncton the route surveyed subjects the government railroad, the Intercolonial, to increased competition. This increasing of the competition to which the Intercolonial is subjected is in line with the earlier action whereby the Canadian Pacific short line across Maine was subsi-

dized. The Intercolonial bends north to avoid the northern angle of Maine. In the endeavor to obtain the shortest possible route for the Grand Trunk Pacific, which at the same time must be built wholly on Canadian territory, the line is at one point to run within 200 yards of the international boundary.

While the eastern portion of the Canadian Northern, as far as Quebec, runs through a well settled country, the eastern portion of the Grand Trunk Pacific will be a pioneer line running through unbroken and practically unsettled country. The route selected lies well within the northern limit of the cereal belt, which on the eastern slope of Canada runs as far north as James Bay. The country it traverses will at best be suited only for mixed farming. And a considerable period must elapse before any great tonnage of agricultural products can be obtained. There are, however, great pulp and power possibilities. From an engineering standpoint the line has the great advantage of easy grades.

While the experiment of the Dominion in government ownership has been distinctly unsuccessful, the reverse so far holds in the case of the line which the province of Ontario is constructing. The Temiskaming & Northern Ontario, which was undertaken as a colonization line, runs north from North Bay. It is gradually being extended northward with the intention of intersecting the line of the Grand Trunk Pacific. Later it is expected that it will be continued to the southern end of James Bay. The line, which is being built by a commission, had cost up to the end of last December $7,500,000. For the past year its net earnings were $110,000. Its success has been mainly attributable to the traffic from the silver mining developments at Cobalt. The presence of the cobalt silver ore was revealed by the cuttings when the railroad was being built. On its way north the line runs through the clay belt in which mixed farming is successfully carried on. There is at present under consideration a proposal to use electricity as a motive force, the power to be obtained from the Montreal river.

Portions of the lines which the Grand Trunk Pacific and the Canadian Northern are building are recognized to be simply bridges. To a considerable extent this applies to the construction north of Lake Superior. The Canadian Northern has filed location plans for a line from Sudbury to a connection near Port Arthur, a distance of 560 miles. It is also devoting attention to the acquisition of lake ports. It already has terminals at Port Arthur and it will also have a port at Batchawaung Bay on Lake Superior, as well as ports at Parry Sound and Key Inlet on Georgian Bay. The lines north from Sudbury will open up valuable iron deposits which will be carried by a short rail haul to Lake Superior. The Grand Trunk Pacific has terminals at Port Arthur. A line running south from the main line for about 220 miles will connect with them.

It is when the Northwest is entered that the real strategic center of the present railroad activity is reached. While the surveys of Sir Sandford Fleming, in the early seventies, favored a line running to the north, the Canadian Pacific was finally built through a section in which railroad construction could be more rapidly carried on and railroad subsidies more rapidly earned. With the entrance of the Canadian Northern, which has been built up piece by piece with skilful financing on limited capital, attention was turned to the northern belt. Southern Manitoba is well gridironed by railroads and so the entrance of the Grank Trunk Pacific and the Canadian Northern into Winnipeg means simply additional facilities. To the new provinces these lines are colonizing instruments. In December, 1905, the Canadian Northern had reached Edmonton, the capital of the new province of Alberta, opening up on its way a rich wheat belt in Manitoba, Saskatchewan and Alberta. The line through this section has been called the "railroad of a hundred wheat stations." Construction west of Edmonton is not yet being carried on. It is desired first to let settlement catch up with construction. The Canadian Northern has been criticized for extending its lines east of the lakes, and it has been urged that it should confine itself to delivering its northwest traffic to existing lines east of Winnipeg. Objections of this nature were made by the Grand Trunk, in the early eighties, when it was opposing the extension of the Canadian Pacific lines into eastern Ontario. The entrance of the Grand Trunk, from which line the Canadian Northern formerly received traffic, makes it all the more important for the latter to obtain its own eastern connections. By having lines of its own it will have the advantage of being able to quote through rates. While the bulk of the Grand Trunk Pacific mileage between Winnipeg and Edmonton, its present objective, is under construction, the Canadian Northern has the advantage of having its line already in operation.

It is the lure of the northern wheat fields that is attracting this railroad construction. The advantages of the Canadian hard wheat belt cannot be surpassed. The most northerly of the lines projected falls far within the northern limits of the cereal belt. While this dips down to about 49 degrees near the mouth of the St. Lawrence, it runs to 62 degrees near the Rockies. And it has been shown that wheat can be grown in the far western section as far north as 61 degrees. When all the necessary discounting of the various wild estimates of the real estate boomer in regard to the wheat possibilities of this section are made, it is still readily apparent that there will be wheat tonnage more than sufficient not only for the lines at present under construction, but for additional lines as well. While attention is being turned to the wheat belt it must not be forgotten that the country possesses also mineral resources. In northern Alberta there are deposits of asphalt. North and west there is petroleum. Beds of coal and iron are found further south. In view of the deficiency of satisfactory fuel in various sections of the Northwest the plentiful deposits of lignite in northern Alberta are of value. Although it is low grade, it is cheap and as settlement to the East increases, an increasing tonnage from this source can be worked up.

The section of territory between Edmonton and the Pacific is a question mark so far as the routes of the Canadian Northern and of the Grand Trunk Pacific are concerned. The latter has selected as its Pacific terminal Prince Rupert on Kaien Island, where 10,000 acres have been obtained. Kaien Island is situated about 25 miles south of Port Simpson, which was originally spoken of as the terminal. Some years ago negotiations were carried on by Mackenzie and Mann, the promoters of the Canadian Northern, looking to obtaining assistance from British Columbia for a line of railroad to Bute Inlet, near the northern end of Vancouver Island. The railroad was to cross to the island and by construction and the acquisition of the Esquimalt & Nanaimo road an entrance was to be obtained into Victoria. The project fell through and the Esquimalt & Nanaimo has since been acquired by the Canadian Pacific. Between Edmonton and the Pacific the line which the Grand Trunk Pacific has in mind is approximately 1,040 miles long. On the prairie section the maximum grade is to be 4-10 of 1 per cent.; while for the mountain section the grade of 1.75 per cent., which the earlier surveys gave, is to be replaced by one of 1 per cent.

The Canadian Pacific enters the Rockies by the Kicking Horse Pass. North of this is the Yellow Head Pass, which was favored by Sir Sandford Fleming when he was making the Canadian Pacific surveys in the early seventies. Still further north are the Wapiti, Pine and Peace passes. The Peace Pass, the most northerly, has an elevation of 2,000 feet. Use of this pass would take the Grand Trunk Pacific about 460 miles north of the Canadian Pacific. The Yellow Head Pass is about 200 miles north of the Canadian Pacific. The surveys made rule out the Yellow Head Pass and favor the more northerly routes. Which route will be adopted is not yet decided. The railroad will have great advantages in being able to haul maximum trainloads. For, while the Canadian Pacific has a maximum elevation of 5,299 ft., the Grand Trunk Pacific maximum elevation is only 2,400 ft. The Canadian Northern has not yet determined on its route through the Rockies. Its surveys, however, seem to favor the Yellow Head Pass. The advantages to be obtained from the pre-empting of passes has been occupying the attention of Parliament. An amendment to the railroad act has been considered, whereby, when a railroad has monopolized a pass, other roads may, subject to the jurisdiction of the Railway Commission, obtain running rights. The Grand Trunk Pacific has been endeavoring to obtain a subsidy from British Columbia as a condition of building eastward from the Pacific. But until the final surveys are in, nothing will be determined in this regard. The railroad, however, controls the charter of the Pacific Northern & Omenica Railway, which will enable it to undertake this eastward construction if it deems fit.

The stronger financial position of the Grand Trunk Pacific, backed as it is by the Grand Trunk, will probably enable it to be opened through to the Pacific sooner than the Canadian Northern, and so the nature of the country to be opened up by it is of interest. West of Edmonton the great Peace River country will be traversed. There are conflicting accounts concerning this country, but it is known that large portions of it are well adapted to successful wheat growing and that it has magnificent stock raising possibilities. The valley of the Peace river is heavily timbered. Coal lands are also traversed. The railroad will have coal deposits near at hand sufficient to supply fuel to its western lines. The interests which control the Crow's Nest Pass Coal Company have also acquired large areas of coal lands. A good tonnage from this source is in sight. On the way to the coast the railway will open up the rich gold fields of the Oslinca and the Omenica which are now difficult to work on account of lack of transportation facilities.

The wheat belt of the Canadian Northwest starts about 400 miles further west than the eastern limit of the wheat belt of the American Northwest. As the Canadian wheat belt is opened up the rail rate becomes an increasingly important factor in determining the direction in which the grain will move. By the time the Edmonton district is reached, grain rates to the head of the Lakes amount to little except on paper. In this section producers look to the British Columbian mines for sale of their agricultural products. When the railroads push west of Edmonton, attention will have to be turned more and more to the Pacific coast as an outlet. There has been a small beginning in the way of shipments of winter wheat from the semi-arid belt of southern Alberta to British Columbian ports. The words of Mr. C. M. Hays, at the half yearly meeting of the Grand Trunk in March 1904, "There are many of you here to-

day who will live to see the Grand Trunk Pacific hauling as much of its grain towards the Pacific for consumption in China, Japan and that territory as will be hauled in this direction," point to one of the traffic problems the railroad expansion in the west will emphasize. With a view to this the Grand Trunk Pacific intends to have its own steamers on the Pacific. The question of outlets for grain eastward also attracts attention. Almost from the beginning of railroad construction in the Northwest there has been a strong belief in the efficacy of a grain outlet by Hudson Bay as a regulator of grain rates. From Winnipeg to Liverpool via Hudson Bay is 600 miles shorter than via Montreal. The Hudson Bay Company has been handling traffic by way of Hudson Bay for nearly 300 years. In 1884 a committee of the Manitoba legislature in reporting in favor of this route claimed that the shorter mileage would attract not only the grain of the Canadian, but also of the American Northwest. The shipping season by this route is short and much elevator accommodation would be needed at terminals. Other considerations such as heavy insurance and freight rates have to be considered. Also, vessels would have difficulty in obtaining westbound cargoes. However, the advantages of this route are a fixed article in the transportation creed of the Canadian Northwest. A line has been subsidized and has been undertaken by the Canadian Northern. During the latter part of 1905 surveys were made and preparation has been made for construction beginning at Erwood on the Canadian Northern line in Saskatchewan.

While the new lines are thus active the Canadian Pacific has been consolidating and improving its lines and seizing hold of strategic points. By extending its branch lines, country that will be opened up by the new railroad systems will be tapped. Large expenditures are being made in the west. Double tracking between Fort William and Winnipeg will be completed in 1907. At the same time grade reductions to a 4-10 of 1 per cent. maximum are going on in the territory between Winnipeg and the Rockies. The company is pursuing an active educational campaign; pure seed is being distributed, and the success of the winter wheat experiments in southern Alberta is a result of the Canadian Pacific's activity. A great impetus has already been given by it to the dairying industry in Alberta. The strategic importance of the west has also been recognized by vesting more control in its Winnipeg offices so that much greater discretion is now given to Mr. William Whyte, the Canadian Pacific executive west of the Lakes.

## Mr. Cassatt.

It is a relief nowadays to run across a really "big" man who didn't sell newspapers when he was a boy, and who never worked 24 hours a day. As an apostle of accomplishment, Alexander Johnston Cassatt, President of the Pennsylvania Railroad Company, has nothing to learn from Russell Sage, and he is a much more comfortable model for the fun-loving American youth.

In addition to being the head and dictator of the greatest railroad system in the world, Mr. Cassatt is President of six other companies and a director in 23; and he has a very large personal fortune to look after, for he was a ready-made man before he started in to make himself over again. He came of a wealthy family, and he might have lived in luxury all his life without ever turning a dollar out of railroading. When he was born in Pittsburg, in 1839, fortunes were not so colossal as they are to-day. Mr. Cassatt is estimated to be worth at the present time $80,000,000, and at least $79,000,000 of that he made out of railroads. The king upon his throne is not a more closely guarded man than he, and it is much easier to get an audience with the President of the United States than to gain admittance to the private office of Mr. Cassatt in Broad Street Station.

This sanctum is a large room, about 40 x 30 ft., guarded by four negro porters and flanked round about by one secretary, three stenographers, and three officials who have the title of "assistant to the president," but who in themselves are large systems. They are to Mr. Cassatt what the larger planets are to the sun. The President's office is furnished in mahogany. The President sits in a mahogany chair, upholstered in leather, before a flat-top mahogany desk. He does not like roll-top desks because he frequently wants to spread out large maps and plans before him. In one corner of the room is a large geographical globe.

All the orthodox rules of business have been cast aside by this Napoleon of transportation. He deals in millions as other men deal in hundreds, and he does it without worrying himself much. His office hours are rarely longer than from 9.30 in the morning to 3 in the afternoon, with an hour and a half or two hours for luncheon in the handsome private dining room adjoining the office. There is a bathroom in the suite, also, and the President often finds time to refresh himself with a plunge. But despite his pre eminent position, Mr. Cassatt is one of the most diffident of men. He is very easily confused, and rarely indulges in wordy battles. The manner in which he forestalled the Vanderbilts by acquiring the Long Island Railroad and then proceeded to establish passenger and freight terminals in the very heart of Manhattan by means of a tunnel system costing $100,000,000, proved his genius for immense accomplishments. He thinks out his schemes while riding about his stock farm "Chesterbrook," near Berwyn, turning his attention readily from a plan to fasten control upon a new soft coal territory to a spavin on the leg of a favorite hackney.

It is doubtful if an abler civil engineer lives in America than Mr. Cassatt. He is no rich idler, no high-born incompetent. His education is well grounded. It was trimmed off by a course in the German university of Darmstadt, and finished in the Rensselaer Polytechnic Institute of Troy, from which he was graduated in 1859, a well-equipped civil engineer at the age of 20. He had a clear head, a wonderful talent for mathematics, and a constitution that seemed to be designed to stand anything.

If this were a sketch of your old-fashioned business man, it would be recorded that he husbanded his strength, but he didn't. He has always smoked large, black cigars, and has never been a Prohibitionist—in fact, he was a gay, rollicking blade in his youthful days, and there is nothing particularly sedate about him now. But when he worked, he worked, and when he played, he played, whole-souled in one as he was in the other. His first service as an engineer was in the location of a railroad in Georgia. He became identified with the Pennsylvania Railroad in 1861, when John Edgar Thomson was at its head. In 1870 he became General Manager of the Pennsylvania.

Two years after this Robert Garrett walked into the office of George B. Roberts, then President of the Pennsylvania Railroad, and exclaimed gleefully: "Mr. Roberts, we have secured control of the Philadelphia, Wilmington & Baltimore. We are not disposed, however, to disturb your relations with it." President Roberts was amazed and not a little discomfited by the easy assurance of Mr. Garrett.

That night there was a meeting of directors, and Mr. Cassatt was the presiding genius. He told them where he could lay his hands on a block of P., W. & B. stock, and before the directors rose from their chairs a check was drawn for $14,949,052.20 to buy it. The check now hangs in a frame at the treasury of the Pennsylvania Railroad, canceled to show that the money was there waiting when it was presented. At the time it was written, it was the largest check ever recorded. The Garretts were completely routed.

General Manager Cassatt was the first prominent railroad officer to take up the air-brake. He was also the first to recognize the merits of the block system, and he installed track tanks. In 1880 Mr. Cassatt had risen to the office of First Vice-President. Everybody supposed that when Mr. Roberts died he would be made President, but he wasn't. Frank Thomson got the place, and Mr. Cassatt withdrew from the road entirely, retiring to his stock farm and giving up his whole time to raising race horses. There is an excellent half-mile track on his farm, where he does a little private racing now and then, but he has stayed off the professional racetracks since his retirement from the Monmouth Park Association, when racing had fallen into bad repute. The fashionable horse shows all have their Cassatt entries and his stables are filled with blue ribbons. At the exhibitions his clothes are always a month or two in advance of the fashions. His shirts are always the very latest thing from abroad, and, if the truth be told, a trifle inclined to obtrusiveness. When Frank Thomson died, Mr. Cassatt, notwithstanding his 17 years of retirement, was chosen President on June 9, 1899.

Mr. Cassatt never made a speech before a large audience in his life, and frankly confesses that he can't. Among a small company of men he can talk forcibly and incisively, but when the crowd swells beyond the dimensions of a directors' meeting he becomes tongue-tied, and can't find the right word. That a man so bashful, so timid, could ever become a captain of finance seems absurd, yet such are the contradictions of the man.

At Broad Street Station and at his country mansion in Haverford, he lives in regal fashion, but in the old Davis mansion on his Chesterbrook farm he frequently entertains distinguished guests at meals which they cook themselves and which are served without waiters. He is impregnable in his office, but he will stop to chat with the humblest citizen of Lower Merion Township, where he has been superintendent of roads for years, and has constructed a system of highways which are unequaled anywhere else in the United States. He is an enthusiastic member of the New York Yacht Club. He has ridden horseback so much that his legs are quite bowed.—*New York Evening Post.*

## Foreign Railroad Notes.

An analysis of the passenger earnings and expenses of the Austrian State Railroads by V. G. Bosshardt indicates that for the ten years ending with 1904 the expenses exceeded the receipts in every year except 1895 and 1896, and that since 1900 there has been a loss on the business of a little more than $2,000,000 per year, making the cost of the passenger traffic 116 per cent. of the receipts. The validity of the result depends on the accuracy of the division between freight and passenger expenses. In Austria for

the ten years 59 per cent. of the train mileage, 27.9 per cent. of the car axle miles, and 26.6 per cent. of the gross (train and load) ton-miles were due to the passenger traffic, and Mr. Bosshardt takes the mean of these, which in 1904 was 37.44 per cent., as the part of the expenses due to the passenger traffic. In 1904 this makes the cost per passenger train mile 81½ cents (which certainly does not seem excessive); while the receipts per passenger train-mile were 65 cents, which is certainly very little. In this country they were $1.14.

Joseph Monier, from whom reinforced concrete is usually called "Monier" construction on the continent of Europe, was a gardener, and in 1867 took out a patent for making flower pots with a wire skeleton filled in with cement—little thinking that bridges and buildings could be built in a similar way. It has been shown that combinations of iron and cement had been used before Monier's day; but the flower-pots seem to have been first to make the process common. Monier died in Paris last March.

## Standard Code on the Michigan Central.

The Michigan Central, the last important railroad in the country to make compulsory the use of duplicate orders in train despatching, is now using the Standard Code, and, from the definitions and other features in the book, it appears that in making it up use has been made, so far as was found desirable, of all the latest decisions of the American Railway Association. A comparison of the book with the Standard Code in the form issued by the Secretary of the American Railway Association shows many changes. The very first page (the form of order putting the rules into effect) shows nine paragraphs, instead of the two in the Standard. The "General Notice," on the next page, is also considerably amplified. The "General Rules" have four paragraphs more than the Standard. There is a definition of a side track as distinct from a siding (why not "passing track"?). "Station protection signal" is used to define hand operated semaphores or automatic signals near stations. These signals have the letter S on them.

Rule 6 provides a number of signs different from those used by most roads, a dagger being used for day telegraph stations, a double dagger for night telegraph stations, section (§) for day and night telegraph stations, and T for telephone stations. Under rule 11b an engineman drops a lighted fusee to warn the men on the rear part of the train when the train has parted. Rule 14a provides eight long blasts as a distress signal. Rules 18 and 19 are considerably amplified. Rule 21a provides for the omission of white front-end signals by extra trains on certain double-track divisions. Rule 26a provides for slow signals to be set 3,000 ft. in the rear of a piece of track where speed must be limited; and the limitation is uniformly six miles an hour. Where any other rate is allowed, a properly lettered slow board will be set up.

Rule 86b allows an inferior train to run ahead of a superior train without orders, until instructed by signal or message to take the siding; but it appears from a subsequent note that this rule is not in use on all divisions. Rule 90 has three supplementary rules and rule 93a requires all train men within yards to obey the orders of the yardmaster. When passenger cars are being switched the air-brakes must be coupled and used, if practicable. Rule 95a requires all trains (unless otherwise directed) to have a train order or clearance card when beginning a trip. Rule 96a requires the train despatcher to advise opposing trains in certain cases where signals are taken down. Rule 99 has five supplementary rules and rule 101 requires the rear part of a separated train to be protected in front by torpedoes to prevent its own engine from running into it when returning. Rule 104 has seven supplementary rules. One of these requires freight engines to be detached before taking water, if the train has more than 15 cars.

Beginning with rule 83, the double-track rules are printed separately and in addition to the single-track rules. Rule D 101a requires an engineman, when the air-brakes are automatically applied, to display a lighted fusee from the side of the cab to warn trains on the adjoining main track of possible obstruction on their track. Rule D101d requires a flagman to be on the watch to flag both main tracks, if his train is parted or if he suspects any obstruction to the other track.

The despatching rules require orders to be sent to the operator at the meeting or waiting point, if practicable. When the typewriter is used for copying train orders, copies not written during transmission must be separately repeated to the despatcher.

Rule 210a. When delivering orders the operator will note plainly by figure upon the last order received the total number of orders for delivery to that train, and conductors and enginemen must use this figure as a check.

Rule 211a forbids the use of "19" orders for a superior train, restricting its rights, unless the train order signal is displayed at the meeting point. Under rule 221 the train order signal stands normally at proceed. This rule provides for the use of a hoop in the delivery of "19" orders. At night a green lantern will be used to indicate the location of the hoop.

The non-standard part of the code begins with rule 600. These are called "Special Rules." The first 38 of these rules deal with a variety of subjects and they are not addressed to any particular class. Rule 630 includes elaborate directions against the movement of cars of logs, telegraph poles, etc., with insufficient stakes, wires or cross pieces. Beginning with rule 700 there are brief chapters for each of the several classes, from trainmaster down to brakeman, firemen, crossing flagmen, etc.

## Preliminary Report of the Pennsylvania Railroad Special Investigating Committee.

The following is an abstract of the preliminary report of the special committee of the board of directors of the Pennsylvania Railroad Company appointed May 23d to investigate the charges brought against officers and employees of the company during the recent Interstate Commerce Commission inquiry. This committee consists of the following: C. Stuart Patterson, William H. Barnes, Effingham B. Morris, Thomas DeWitt Cuyler and Rudulph Ellis.

The report follows:

Philadelphia, 28 June, 1906.

*To the Board of Directors of the Pennsylvania Railroad Company:*

The Boards of Directors of the Pennsylvania Company, the Philadelphia, Baltimore & Washington Railroad Company, the Northern Central, the West Jersey & Seashore, the Pittsburgh, Cincinnati, Chicago & St. Louis, the Vandalia, the Grand Rapids & Indiana, the Cleveland, Akron & Columbus, the Long Island, and the Cumberland Valley, requested the committee to make concurrently a similar investigation of each of those companies. The committee selected as its counsel William D. Guthrie, Esq., of the New York bar, and Silas W. Pettit, Esq., of the Philadelphia bar. The official record of the testimony taken before the Interstate Commerce Commission in its recent inquiry has been carefully considered, that record being the only reliable source of knowledge as to that which really was said by the witnesses who appeared before the commission. The record shows that of more than 300 operators of bituminous coal mines, situated on the lines of the Pennsylvania Railroad, less than 10 operators in all have testified that they believed themselves to have been unfairly discriminated against, either in the distribution of coal cars, or in the matter of sidings connecting mine workings with the railroad line. Of the more than 123,000 officers and employees of the Pennsylvania Railroad Company, 51 were examined before the Interstate Commerce Commission, and of those witnesses, 21 were shown to have acquired, in various ways, interests in coal companies or properties, alleged, but not proven, to have received undue and unreasonable preferences in the distribution of coal cars, or in the construction of sidings. Despite public impression to the contrary derived from fragmentary publications of the evidence in the newspapers, the testimony of the witnesses examined before the commission does not prove that there have been, in fact, any undue or unreasonable preferences, either in the distribution of coal cars, or in the construction of sidings.

The full performance of the duty imposed upon the committee requires it to inquire into, and report upon, the conduct of all the business of a railroad system, which operates more than 10,000 miles of line, and which, in 1905, carried 123,431,325 passengers, moved 327,131,839 tons of freight, expended in purchases of real estate, construction, rolling stock, fuel, material and supplies $148,338,774, and paid in wages $120,644,876 to 195,429 officers and employees. The committee has entered upon an inquiry into the system and practice of the several companies in purchases of real estate; the letting of, and supervision over, contracts for construction; the purchases of material and supplies; the conduct of transportation, including the distribution and movement of coal cars; and the selection, discipline and fidelity of officers and employees.

The committee fully realizes the serious nature of the responsibility and the magnitude of the task placed upon it. Charges affecting the intelligence and the fidelity of the company's administration, and the integrity of a small number of its officers and employees have been widely disseminated. It is due to the shareholders and security holders that those charges should be so thoroughly investigated, that the owners of the properties may know whether those to whom they have committed the management are, or are not, faithful to the trust reposed in them. It is equally due to the great body of officers and employees that the many who are innocent should not have to bear the burden of the few who may be guilty; that those who shall, after fair and full examination, be found to have done wrong should receive proper punishment; that those who may have been indiscreet should be admonished; and those who have been, and are, loyal to duty should be relieved from unjust aspersions.

The obvious method of procedure is to determine in the first place what, if any, wrong has been done, and in the next place by whom the wrongful acts have been committed. The committee has, therefore, asked from every officer whose action could in any way

affect the distribution of coal cars, statements describing the organization for, and the rules and methods, both past and present, governing the distribution of coal cars; the reasons for giving special orders in any case or cases, explanations of the conditions attending the ownership of coal cars by shippers, the rules governing their use, and the compensation therefor; and all comments, explanations, or statements, which would be of assistance in ascertaining the facts. The committee has received from every such officer categorical replies to those inquiries, but until the company's records of the daily movement of cars can be examined and tabulated, it is obviously impossible to know the distribution of cars actually made, and wherein, if at all, such distribution varied from the rules governing the same.

That tabulation involves the examination and comparison of many thousand reports, and will require the services of a large clerical force, and the officers having the direction over, and the responsibility for, the distribution of the cars have requested that this work be done by accountants selected by and working under the supervision of the committee, so that the tables, when prepared, may be free from any suspicion of bias. The Audit Company, of New York, has therefore been employed, an accountant corporation well and favorably known in the financial centers of both Europe and the United States, and has been instructed to undertake an expert investigation of the facts set forth in and by the Pennsylvania Railroad daily reports, and the other records of coal car distribution, as rendered from each of its nine bituminous mine regions, during the period from January 1, 1900, to July 1, 1906, inclusive; to determine the percentage of cars allotted at all times to each coal operator, the over and short variations from the allotted numbers of cars shown by the figures of actual cars supplied; to furnish tabulations setting forth the monthly and yearly results in totals, of any such over and short variations; to add to those tabulations every fact obtainable regarding the reasons which may have led to the distributing of cars in a manner different from the requirements of allotted quotas; to critically and carefully investigate and report upon any and all special orders which may have been issued in any manner, or at any time, since January 1, 1900, affecting the distribution of coal cars; and to report at the earliest possible moment consistent with the accomplishment of a thorough and searching investigation. By direction of the President of the Pennsylvania Railroad every facility has been, and will be, given to the Audit Company in its investigation. The Audit Company has entered upon the performance of that duty and now has at work nearly 50 trained accountants. When the Audit Company shall have reported, the committee will be prepared to fully report upon the effect and operation of the past and present systems of car distribution, and the actions of all officers of the company thereunder.

At the present time it is proper to call attention to the inherent difficulties of the subject. In the supply, distribution and movement of coal cars the officers of the railroad have to regard the interests and just claims, not only of mine operators, but also of consumers, including other railroads, navigation companies, municipalities, gas companies, electric light companies, etc., who must have punctual fulfilment of shippers' contracts to enable them to perform their public services; the interests and just claims of the public who want the market adequately supplied with coal to meet their necessities; and also the interests of the shareholders of the railroad, which require the cars to be promptly loaded and moved so that as much revenue as possible may be received from the movement; and, chiefly, the officers must see that, whoever else fails to get cars, the shippers who have contracted to supply coal to the engines of this company have sufficient cars for that purpose, or otherwise the operations of the line would be in danger of being blocked. The fundamental difficulty in the question of coal car supply is that the shippers' demands are not so constant during the year as to justify an investment of capital in a sufficient number of cars to meet the possible maximum demand. There must, therefore, be a fair system of pro rata distribution, but whatever be the system, there will inevitably come periods when the demand for, will exceed the supply of, cars, because of increased marked prices, sometimes caused by weather, sometimes by strikes in other territories, or by suddenly increased industrial development. Under such conditions, priority must be given, first to shippers who furnish coal to the company's engines; and next, to those whose fulfillment of contracts will keep other railroads in operation, prevent municipalities from being left in darkness, or enable steamships to sail, etc. It is not to be assumed, without proof, that any special order was issued by any officer from any improper motive. On the contrary, the reasonable presumption is that every such order was issued only because of a sufficient business necessity.

The question of the independent, or privately owned, coal cars is not a new question, nor one which admits of an offhand solution. The Pennsylvania Railroad was chartered on the theory that it would build the line and the shippers would furnish their own means of transportation. The greater part of the coal tonnage of England is moved to-day in privately owned cars. The use of such cars on the Pennsylvania Line is not peculiar to a few favored shippers. They have been used from the beginning of coal transportation. There are now in use on the lines of the Pennsylvania Railroad Company 26,899 independent coal and coke cars owned by 59 different corporations or firms. All shipping companies of large capital desire to have their own cars, because, having them, they can protect their own contracts, and because they can direct the movements of such cars in their own interest. Cars so owned are also in some respects advantageous to the railroad; for the reason, that while individual cars, when sent off the line of the railroad must be promptly returned, cars owned by the railroad are in danger of being kept on other lines, because it is, in times of great demand for cars, cheaper for those other lines to pay per diem for such cars rather than build cars for themselves.

The committee has sent to every officer and employee, 2,501 in all, of the several companies whose individual action, or whose order to any subordinate, could effect any undue and unreasonable discrimination for, or against, any customer of his railroad, or could prejudice the interests of his company by favoritism in contracts, or in purchases of material or supplies, interrogatories, specifically inquiring whether, since January 1, 1900, he has been, in any way, pecuniarily interested or concerned, directly or indirectly, in or with any corporation, association, co-partnership, or individual whose mines, mills, manufactories, or enterprises, are located on the lines of the Pennsylvania System, or any of them, or whose coal, manufactures, or commodities are transported on those lines, or any of them; and also whether he has been in any way pecuniarily interested or concerned, directly or indirectly, in, or with, any corporation, association, co-partnership, or individual doing work for, or furnishing material, or supplies, to the Pennsylvania System; and also whether he has received any commission, compensation, gift, gratuity, or bonus, of any nature or kind whatsoever, from any shipper, or from any individual, natural or corporate, doing work for, or furnishing materials, or supplies, to the Pennsylvania System. Full and explicit interrogatories have been received from all but 92 subordinate employees, from whom full answers will be secured. The committee has investigated, or is investigating, the material facts disclosed in each answer. If further information shall be received, rendering it advisable so to do, similar interrogatories will be sent to other officers and employees.

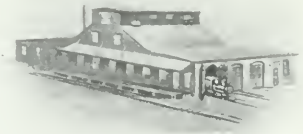
It does not need the authority of either a statute of the state, or a by-law of the company, to establish the principle that the duty of an officer or employee to the railroad company which he has undertaken to serve forbids him to gain a personal profit at its expense by participation in contracts with, or sales to, the railroad; and that that same duty equally forbids an officer or employee to unduly favor any customer, to the disadvantage of any other customer, of the railroad; or to place himself under such personal obligations to any customer of the railroad as may possibly interfere with the officer's or employee's full and faithful discharge of his plain duty. The committee will investigate every fact which is, or may be, brought to its attention, affecting the performance by any officer or employee of his duty to the company, or the performance by the company of its duties to the public; and will report its conclusions in every case to the President, in the confident assurance that no ownership, or practice, calculated in any way to affect the full and impartial discharge of the duties owed by the respective officers and employees to the company, or by the company to the public, will be condoned; and that every officer or employee, who, after full investigation, has been, or shall be, found to have failed in the performance of his duty, will be properly dealt with.

In its early history the great problem for the company was the development of industrial enterprises in the territory through which its lines ran, in such a manner as to create and secure traffic. To-day the problem is that of providing adequate facilities in line, rolling stock, and movement for the business of the country, which rapidly outgrows such facilities. While, under former conditions, it was right that officers and employees should have been encouraged to invest their own money in, or to personally assume financial obligations for the purpose of developing industrial enterprises on the line of the road, for the practical reason that, if officers and employees did not so invest, it would have been difficult to induce other people to make such investments; it nevertheless has been always understood that no such investment of money, or assumption of financial obligation was permissible if it affected the officer's or employee's performance of his duty. Under the conditions of to-day, as they have been stated, it is essential that all officers and employees should be absolutely free to discharge their duties impartially. Applying this principle to the coal trade as an illustration, the keen competition of to-day requires every officer and employee of the Pennsylvania Railroad to part with any investments which he has in the shares of any coal producing company, and also to part with any interest which he has in or with any firm or individual mining coal, on any of the lines of the Pennsylvania Railroad System; and every officer and employee should be required to refrain from any investments whatsoever, which may possibly prejudice or affect the interests of the company, or interfere with its full discharge of its duty to the public.

## Hicks Locomotive and Car Works.

The Hicks Locomotive and Car Works, of Chicago, formerly F. M. Hicks & Co., was incorporated in May, under the laws of New Jersey, with a capital of $1,200,000. The corporation took over the business of F. M. Hicks & Co., a co-partnership existing between F. M. Hicks and William McInnes. The officers of the new company are: F. M. Hicks, president; Elliott C. Smith, vice president; William McInnes, treasurer; E. Hope Norton, assistant treasurer; C. A. Ralston, assistant to the president. The business of the company is buying and selling second-hand locomotives and cars; repairing cars and locomotives for railroads, and for corporations and private owners lacking the facilities for such repairs, and building new equipment, including that from special designs, such as private or special cars.

Mr. Hicks began this business in 1897 and the modest nature of his beginning is indicated by the accompanying view of his first plant at Chicago Heights. But the business grew fast and the plant was rapidly enlarged. About four years ago (Nov. 7, 1902) some views of the works at Chicago Heights and a description were published in these columns, additions and improvements at that time having made of them practically a new plant. In the time that has since intervened, further enlargements of the buildings and additions to the equipment have been made. But the business outgrew the capacity of the plant and a material enlargement of some sort again became necessary. This enlargement was obtained by the acquirement of another plant located about half a mile east of the first plant, now known as the West Works. The new plant is the East Works, and is used exclusively for freight car work—both repairs and building new equipment.



ORIGINAL PLANT 1897

The East Works were bought about a year ago. The perspective view shown herewith, made from a wash drawing, includes two buildings which have not yet been erected; two-story building in the foreground, which is to be a storehouse and which at present is an uncovered storage platform; and the one at the left with the saw-tooth roof, which is to be the steel car repair shop. The original tract contained 20 acres. Additional tracts adjoining, aggregating 38 acres, have been secured, providing ample room for future growth.

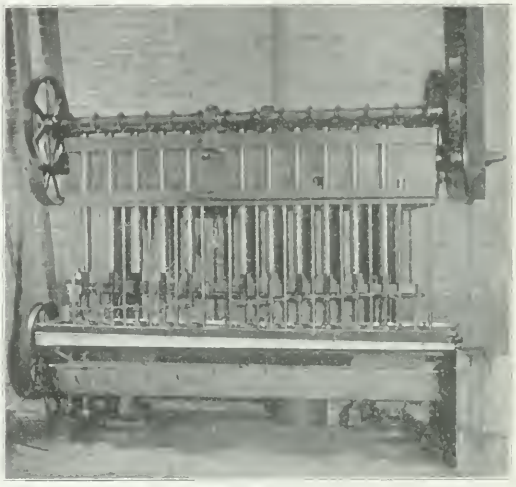
The buildings are brick and are of substantial construction. The plant was originally a tube mill, so that practically all of the equipment for car work had to be installed by the present owners. The ground plan shows the arrangement of departments. The transverse building, at the right in the perspective view, is 225 ft. x 65 ft. and the two longitudinal buildings adjoining it are 280 ft. x 60 ft. each. Between these two a space of 20 ft., originally open, was roofed over and is now used as the wood mill. The building containing the power station and blacksmith shop was extended 200 ft.

The present power station equipment was a part of the original plant. It consists of a 200 h.p. Westinghouse vertical engine belted to an alternating current dynamo, to furnish light for the plant. It is intended to replace the engine with another of 500 or 600 h.p. and to add another generator, direct-current, for power purposes.

Much of the works equipment is new, though some was brought over from the West Works. Additional equipment has been ordered, such as another six-spindle arch-bar drill in addition to the two now in use, and a 30-in. drill. Two 7,000 gal. oil storage tanks to supply the blacksmith furnaces are being placed and the foundations have been started for the steel car repair shop, 180 ft. x 400 ft. Eventually new steel cars will probably be built in this shop. The plant is at present busy building 300 stock cars for the Chicago Great Western and 300 gondolas for the Midland Valley. The present capacity of the plant is from 10 to 15 freight cars a day.

Reference has been made to enlargements and improvements to the West Works since the previous article. These works are now devoted to locomotive and passenger car work. A ground plan and a perspective view of this plant also are shown. The principal building changes have been the erection of the storehouse, the increase to two stories in the height of the south bay of the erecting shop, and the roofing over of the 24 ft. space between the boiler and erecting shops. The tool room was moved to the space formerly occupied as a storeroom and the office moved entirely to the second floor. The dry kiln was enlarged so as to increase about three times its capacity. The increased height in the south bay of the erecting shop provided new and much larger quarters for the brass department, which formerly had space on the second floor of the east bay. The hat racks, coach door locks, etc., for the passenger cars are made here, the castings being bought outside, however.

One of the most important and helpful of the equipment installations is a 6-ton trolley hoist which travels on an I-beam track from the storehouse through the erecting shop and down the



Staybolt Threading Machine.

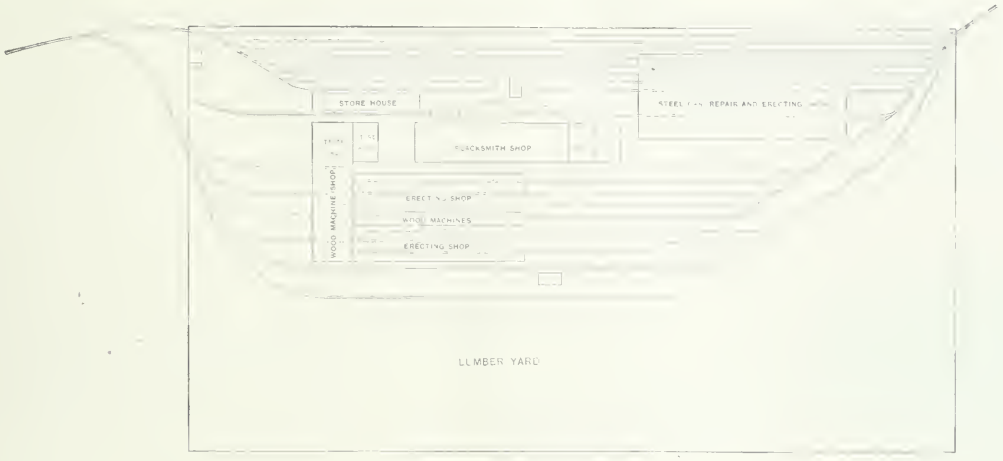
roofed-over areaway between boiler and erecting shops, already referred to. It greatly facilitates the handling and distribution of material. Other important new equipment includes a doublehead 72-in. boring mill, individual motor driven; a 6-ft. radial drill; a 30-in. x 30-in. x 8-ft. Gray planer; a Le Blond No. 3 milling machine; a turret lathe, a triple-head bolt machine and a 22-in. x 10-ft. lathe. It is the intention to have all of the larger tools individual motor driven in the near future.

In the blacksmith shop oil fuel was provided for the furnaces, a 1,500 lbs. steam hammer was installed and a Wangler rotary beveler. In the boiler shop another punch and shear was added; also an interesting staybolt threading machine, a view of which is shown herewith. This machine was adapted from a 12-spindle vertical drill. One spindle was removed to permit the addition of a bearing at about the middle of the transverse shaft in order to stiffen it, so that 11 spindles are available for staybolt work. One man runs the machine, which has a capacity of over 2,000 bolts a day.

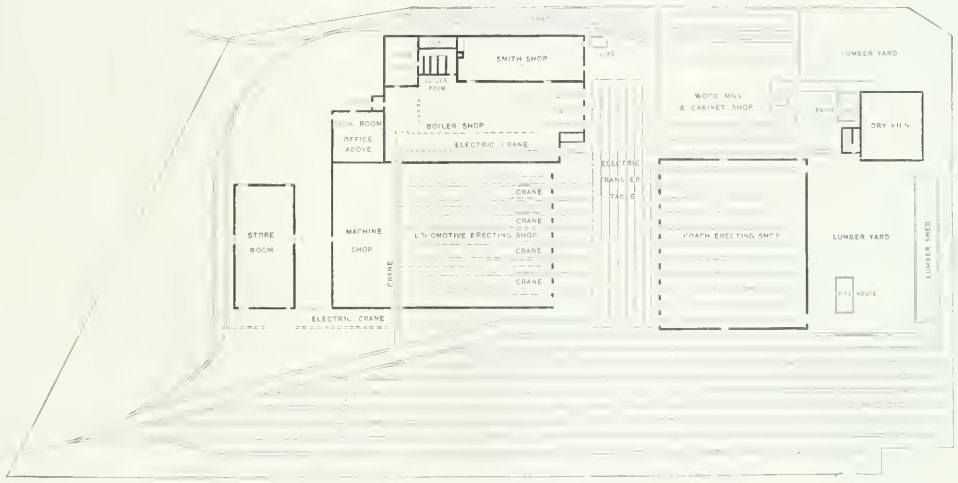
Hicks Locomotive and Car Works—East Works.

A number of up-to-date tools have been added to the wood mill, enlarging its capacity and improving the character of its output. These include a gainer and trim saw; miter saw and beveling jointer and facer; three-side moulding machine, for sash chiefly; four-side 9-in. moulding machine; carving machine; chain mortiser; heavy sticker, tenoner, and band saws.

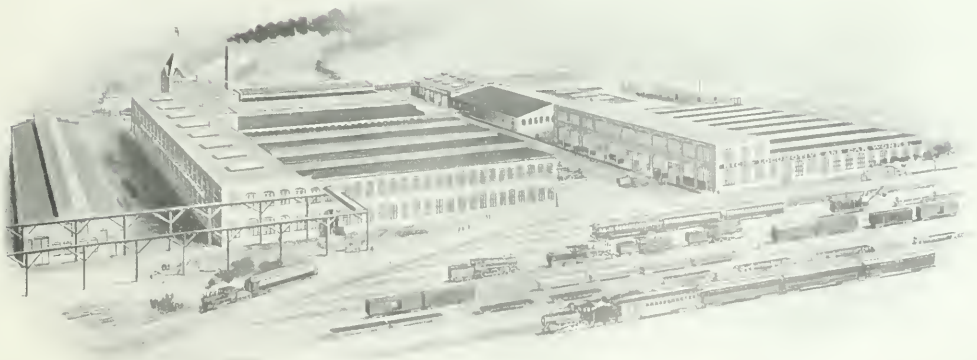
In the coach shop there are at present under way six electric-




Ground Plan of East Works.




Ground Plan of West Works.



Hicks Locomotive and Car Works—West Works.

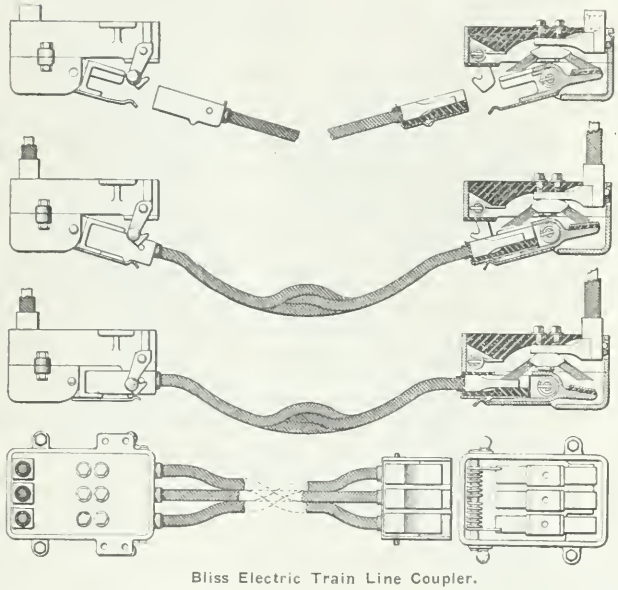
lighted coaches for the Atlanta, Birmingham & Atlantic; two coaches for the Munising Railway; three for the Marquette & Southeastern, and six cars for the Atlantic Coast Line—four baggage, two mail and two combination, and a private car for the Western Union Telegraph Co. A private car for the Long-Bell Lumber Co. of Kansas City has just been completed; also a car for the Kansas Fish Commission, and eight coaches for the Bessemer & Lake Erie.

Since the previous article the number of employees has been about doubled, there being over 900 now.

### A Lost Railroad in Siberia.

Near Irkutsk in Central Siberia is a series of rapids on the Angara river. After many disasters, the river transport companies decided in the early '70s to build a short railroad for transshipment of freight around the rapids. The 12-mile road was probably the first railroad built in Asia outside of India and certainly the first one built in northern Asia. The gage was 7 ft. and the rails were supplied by a native iron foundry. They consisted of a single thick web with flush sides held to the ties by iron spikes driven each side of the rail deep into the sleeper until the top of the spike was even with the top of the rail. Where these worked loose the rail was reinforced by several turns of iron wire bodily bound around and over rail and sleeper. The single locomotive had a square shaped water tank and was built by engineering students at a technical school in western Siberia. To "improve the draft and lessen the emission of live cinders" two smokestacks were built, one directly behind the other and about an inch apart. The ties were whole tree lengths unsquared cut from the forest through which the road ran. The operating force consisted of a mechanician, a fireman and a brakeman. A freight shed at each end of the road and a few flat cars constituted the entire buildings and equipment. There was no regular service, about two trips each way being made a week, as cargo offered. With the improvement of the roads through this region by the Russian government, traffic on this part of the river was gradually abandoned and the railroad finally fell into disuse. The locomotive was acquired by a farmer to be used once a year to drive a threshing machine, the cars were taken off on barges and towed away, and the line abandoned.

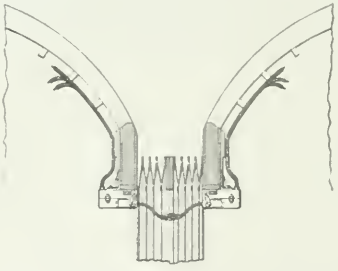
Some fifteen years later the locating engineers of the Trans-Siberian Railroad entering this part of Siberia, heard rumors of a railroad which had existed many years previously. This is a vast region of sierra, forest, tundra, steppe and—here and there—of rine (untrans'atab'e; literally, "quick mud"), and presented great difficulties for railroad construction. News of an abandoned line which had been successfully operated was, therefore, received with much interest and search was made for the road. The freight sheds were finally discovered and then the line of the road marked by the clearing in the forest, but no trace of the rails or roadbed could be found. The right of way was much overgrown with underbrush and, bordered with the dense forest, was almost as black and cold as a mountain tunnel, the sun being just visible lighting up the topmost branches of the giant firs. The railroad itself had completely disappeared. Not a rail, not a sleeper, only an occasional suggestion now and then of what had once been rude cross-drainage ditches. In an effort to find the track, picks were driven as far as they would go into the earth, only to bare masses of tangled roots. The railroad was lost. It could not have been burnt up, because there had been no fires, nor stolen and carried off piecemeal, for the region was totally lacking in population. Moreover, the old freight houses remained with their locks intact and packages of overlooked goods in good condition within them. It is believed to have been a case of gradual subsidence. The unballasted track through the forest, gradually depressed by a few years' traffic, naturally became a drainage conduit for the surface water of the forest, rendering in time the subsoil spongy throughout. The significance of the fact that the line was much overgrown lies in the fact that this undergrowth probably owed much of its origin and profusion to the taking root of the submerged tree-length ties. There was never any ballast and in some unusually warm summer it is probable that the watersoaked tree sleepers, weighted down by the cumbrous pig iron rails, sank beneath the surface and there sprouted.—*L. Lodian in Electrical Review.*



Bliss Electric Train Line Coupler.

### Bliss Electric Train Line Coupler.

The accompanying illustrations show the operation and application of the Bliss train line coupler for electric car lighting systems. This device differs essentially from the ordinary types of plug couplings in use. It employs a construction very similar to that used in standard circuit breakers. The contracts are made by pressing with great force a set of solid brass contacts against a set of laminated copper leaf brushes. This gives a large current carrying capacity and reduces contact resistance to a low point. There is practically no energy loss and very slight heating at the contacts. As will be seen from the smaller illustration, the coupler is mounted



Application of Coupler to Vestibule.

in the passageway of the vestibule, in the usual manner. The coupler proper consists of two parts, an upper fixed part containing three double laminated brushes and lugs for the attachment of the train lines, and the latching mechanism. The lower, or removable part, contains a pivoted knuckle, which forms the guide and support for the connector and also carries the jumper mechanism for use when a three wire train line system is used. The larger illustration shows the coupler in three positions in making the connection. The top view shows the pivoted knuckle dropped, ready to receive the removable plug. The insulated contact on the rear end of the pivoted knuckle is in contact with the rear ends of two of the copper brushes and in this position the jumper mechanism is properly connected. The second view shows the plug at the end of the flexible cable inserted in the knuckle. In this position the jumper connection is still made and contact with the front ends of the brushes has not yet been established. The third view shows the coupling completed. The front end of the knuckle is forced up and in doing so a sliding contact between the brass connector contacts and the laminated copper brushes is formed while the jumper connection at the back end is broken. The catch on the outside of the box automatically drops into position and holds the coupling firmly in place. To uncouple, the catch is lifted and the plug removed from the knuckle. This operation automatically connects the jumper and this connection is maintained until the connector plug is again inserted. By means of the spring catch on the bottom of the pivoted knuckle, provision is made for automatically uncoupling in case the train parts, without damage to the flexible cables or the couplers on either car.

The jumper is so constructed that it can be easily changed from connecting one pair of train lines to connect the other pair. This makes it unnecessary for the purchaser to specify in ordering which wires the jumper should be made to connect. Perfect contact is maintained at the brushes by the scraping action of the brushes on the solid contacts every time a coupling or disconnection is made. The device is made by the Bliss Electric Car Lighting Co., Milwaukee, Wis.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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## PROPORTIONING BRAKE-SHOE PRESSURES TO WHEEL LOADS

The layman is dazed, or becomes a radical judge, when doctors disagree. We have had some curious instances of differences of opinion in the conventions of the car builders and master mechanics, but probably none more pronounced than those expressed by two speakers who opened the same topical discussion before the respective associations. In one, the subject was scheduled as "The Desirability of Adjusting Brake Pressure to Light and Loaded Cars," and in the other as "The Necessity of Proportioning Brake Pressure to Wheel Loads." The first speaker held that there are more and stronger reasons against the desirability of adjusting brake pressures to loads than in favor of it. He also held that, if the retaining valve were to be used as it is intended, the present condition of the equipment would give the engineer entire and full control of the train. These remarks were accepted as the sense of the convention without comment. In short, the Master Car Builders' Association does not consider it desirable to adjust brake pressures to light and loaded cars.

When the same subject was before the Master Mechanics' Association the speaker took the ground that it was exceedingly desirable to make this adjustment, and called attention to the fact that a brake pressure of 70 per cent. on a light car of 50 tons capacity falls to 17 per cent. when the car is loaded, making a difference of four to one in the distance that the car would run before being stopped. It was not urged that it would be practicable at present to apply such an adjustable apparatus to general merchandise cars; but that it is quite possible to do so in the case of coal and ore cars that shuttle back and forth in light and loaded service.

This advocacy was likewise allowed to go unchallenged and, by inference, though not by formal action, as in the previous case, it would appear that the Master Mechanics' Association does think it desirable to adjust brake pressures to wheel loads.

It is to be regretted that the subject was not thoroughly discussed in one or the other of the associations; for, though only up as a noon-hour discussion, the subject is certainly one of importance. In looking over the records of the past we find that in 1885 it was urged as advantageous and necessary to apply brakes to both trucks of a freight car instead of to one only, which was current practice of the time; a suggestion that has been universally adopted in order to increase the total of the braking pressure and thus increase the efficiency. After the Burlington tests there were a number of attempts to secure an automatic adjustment of the brake-shoe pressures to the requirements of light and loaded cars. As the arrangement by which this was to be accomplished depended upon a mechanical connection on the truck whereby the leverage was varied in accordance with the compression of the springs, the working was unsatisfactory and the designs were never introduced. This is cited merely to show that as soon as the air-brake had gained a foothold in freight service, men began to think about making it equally efficient upon loaded as upon empty cars. It is difficult to see how there can be any doubt that such action is desirable. But to discuss the practicability of any device that may be offered is quite another matter.

A discussion of the question is especially pertinent at the present time in view of the stresses on the brake-beam. In the report of the committee attention was called to the changed conditions now existing as compared with those of 1889, when the 7,500 lbs. capacity was established as the minimum for a beam. Then the cars ranged in light weight from 18,000 to 34,000 lbs., with an average of about 25,000 lbs. Now the light weight of high capacity cars may be as much as 45,000 lbs., so that taking 70 per cent. as the shoe pressure of the earlier cars and 90 per cent. as that used on the modern ones, the brake-beam loads have risen from 6,200 lbs. to 10,125 lbs. This, for empty cars. Now, if a beam is to be designed to carry a 70 per cent. pressure of a loaded 50-ton car, it must sustain at least 21,250 lbs. if the car weight is placed at 40,000 lbs. and a 10 per cent. overload is allowed. Great as this burden is, it will be higher still in many cases where the cars are heavier or the weights carried greater; as in the case with cars that are being marked up 10 per cent. in nominal capacity where steel wheels are applied.

As strength and freedom from deflection or permanent set under excessive loading are essential qualifications for a brake-beam to meet, the problem is not a simple one. If room is scarce beneath a truck in which to place a beam of 25,000 lbs. capacity, when loaded at its center, it may be possible either to discard the beam altogether or else to apply the stresses near the ends and so lighten the structure. The same thing has been done, though for other reasons on electric cars where all of the space between the axle and the bolster is occupied by the motors. Here two pull rods have been used and a brake obtained that has worked with entire sat-

isfaction It goes without saying that if it is found to be desirable to put a load of 12,000 or 13,000 lbs. on the brake-shoes of each wheel, a means will be found to meet the mechanical requirements.

There is still another aspect of the case that should receive careful consideration, which, at first sight, may seem to make for the use of the lower limit of pressure. This view takes the possible effect on the wheels into consideration. While the effect of the exceedingly high pressures for long distances on grades would undoubtedly be the cause of much cracking, it must be remembered that such a condition is not apt to occur, since such pressures would undoubtedly stop and hold any car on any workable grade. The consequence would be that the engineer would soon learn to make a lighter application on the loaded trains, thus holding the train under control with no more injury to the wheels than occurs under present conditions of service. It is true that injury might be expected in cases where an engineer, knowing that he had an exceedingly powerful brake available, would allow a train to reach a very high speed on a long and steep grade, and then apply with full force in order to make a stop. This would undoubtedly result in some heating, but whether that would be sufficient, within the comparatively short interval during which it would be in operation to cause injury cannot be predicted accurately from data thus far secured.

It is clear, in view of the great weights carried by present day cars, and the high speeds at which all classes of equipment are likely to be run, together with the effective train control that these conditions demand, should be placed in the hands of the engineer, that this discussion of the desirability of proportioning brake shoe pressures to light and loaded cars deserves more attention and discussion than was granted it at the recent conventions of the two great mechanical associations.

## HANDLING HEAVY PASSENGER TRAVEL.

Now that the period of summer travel has come, bringing to railroads an increased and on certain days exceptional rushes of passenger travel, it may be interesting to observe one or two of the conspicuous cases of heavy travel and some of the methods employed in successfully handling the traffic. The summer has for most roads certain well marked high points of passenger travel, such as the first of July, the fourth of July, the first of August and the first of September, including Labor Day. At these times, usually crowded into one or two days, comes a great rush of travel. For example, on the New York Central on June 30, 1905, which fell on Friday, with the fourth of July on the following Tuesday, there were 38 through passenger trains run on the main line out of the Grand Central Station at least as far as Albany or Troy. The regular service was 27 through regular passenger trains, not including two solid mail and two solid express trains. On that day there were extra sections of nine trains run, two each of the Fast Mail leaving at 8:45 a. m., of a second Fast Mail leaving at 12:50, of the Twentieth Century Limited leaving at 3:30, of the Hudson River Special leaving at 4, of the Western Express leaving at 6, and of the Northern Express leaving at 7; four, of the Adirondack and Montreal Express leaving at 7:30, and two sections each of the Buffalo and Cleveland Special leaving at 8 and of the Western New York Express leaving at 9:20 p. m. This year as the Fourth of July came in the middle of the week the travel was not so concentrated on any one day. As an example of the rush of inbound traffic, on September 5, 1905, the day after Labor Day, eastbound there were two sections of the Adirondack and Montreal Express and six sections of the Buffalo Special, which regularly carries a large proportion of the Thousand Islands and Adirondack travel east of Utica. On the morning of that day there were 75 extra sleeping cars run into New York, largely from those two districts. Some of these were running continuously for two days, for instance, leaving Loon Lake one night, reaching New York the next morning, running back at once in special trains to Loon Lake and back to New York on regular trains the following night. A large percentage of all the outbound summer resort travel of the previous two months was coming back within 48 hours.

It is easy to see that with such bunching of travel as this it is most difficult to handle it smoothly. One particular difficulty formerly experienced was that so much baggage was suddenly presented for transit that the baggage system of the railroad gave way and baggage was delayed for days with consequent great confusion. This state of affairs has now been largely avoided in two ways: By running special baggage trains carrying baggage cars only, and by the extended use of special delivery checks (for which there is a small extra charge to the passenger) which enable the transfer companies at destination to claim their baggage immediately on arrival. Through the two weeks around the first of September when travel was so heavy into New York, two regular baggage trains were run every day on the main line of the New York Central, arriving at Grand Central Station at 11 a. m. and 11 p. m. Baggage cars were cut off from regular trains at Albany and these solid baggage trains run as sections of some of the regular trains On the days of the biggest rush of inbound baggage the express agents of the transfer companies went up the road as far as Albany in order to have their pieces of baggage sorted out and ready for immediate delivery to teams on arrival at New York. Tuesday, September 5, 1905, the day after Labor Day, holds the record for the Grand Central station baggage room in pieces of inbound baggage handled. The New York Central furnished 3,924 pieces, the New York & Harlem 379 pieces, a total of 4,303 pieces, and the New York, New Haven & Hartford, over which also special baggage trains were run, 4,047, a total of 8,350 pieces handled. On the same day there were 3,151 pieces of outbound baggage handled; 1,581 for the two New York Central lines and 1,570 for the New Haven road. The corresponding, though not as great, rush of outbound baggage was on the first of July, when 4,015 pieces were handled for the New York Central, 465 for the Harlem and 2,479 for the New Haven, a total of 7,259 pieces. These two days were each by far the largest for the year.

A time when the New York, New Haven & Hartford has rush passenger schedules not common to most other roads is on the days of the Yale football games at New Haven. At the time of the Yale-Harvard game at New Haven on November 19, 1904, extra trains were handled as follows: On the New York division 14 trains in and 14 trains out; on the Hartford division 11 trains in and 7 trains out; on the Shore Line division 5 trains in and 6 trains out; on the Air Line-Northampton division 1 train in and 2 out; on the Naugatuck division 1 train out; a total of 61 extra trains. On the day of the Yale-Princeton game at New Haven, November 18, 1905, there were run extra trains as follows: On the New York division 18 trains in and 17 trains out; Hartford division 3 trains in and 3 trains out; a total of 41 extra trains. On football or boat race days when special service is required to care for a large travel, the New Haven's practice is to make a special schedule or time-table for such additional trains as may be needed. The largest number of sections of regular trains run on the New Haven at times of heavy summer resort travel has been four against six on the New York Central. The New Haven's regular service, however, is unusually frequent and extra sections are run on several different schedules. On most roads where there are such heavy periods of travel the actual operation of the trains is governed entirely by block signals, so that the large number of sections does not complicate operation except by filling up the road. In cases where block signals are not used, such trains are run under the regular rights of sections of regular trains.

## STEAM AND TROLLEY IN MASSACHUSETTS.

History, in the matter of the relations of steam railroad and street railway corporations, has during the last few weeks been making itself at a pretty rapid pace in Massachusetts. The condensed story takes us back to the early part of the session of the Legislature of that state, when a bill, supposed to be in the interest of the Boston & Maine corporation seeking power in Massachusetts to absorb electric roads, was introduced. The usual committee hearings followed, attended with much discussion of the measure in the state press and with some stress laid on the inconsistency of allowing the New York, New Haven & Hartford Railroad Company to absorb street railway systems in Massachusetts *de facto*—by the device of "holding" companies—and at the same time not allowing the Boston & Maine to do the same thing *de jure*. The event in this first chapter of the proceedings was negative, not to say abortive. By a vote of 151 yeas to 41 nays, with 11 pairs, a motion prevailed in the lower house to refer to the next Legislature.

The second chapter was more dramatic. Just as the Legislature was on the verge of adjournment the whole matter was reopened by a message from Governor Guild which, we are bound to say, contained some traces of demagogism both in tone and substance. The Governor sharply attacked the whole theory of steam-electric mergers, denounced the policy of allowing outsiders to control trolley competition and asserted that the present control of electric

systems in Massachusetts by the New Haven corporation had been illegally acquired. The lower house, thereupon, passed a bill which expressly prohibited steam railroad companies from controlling Massachusetts street railway corporations and further directed that the railway stocks and bonds held by the steam companies should be disputed by December of next year. The measure fell between the two houses. The Senate refused to agree and, in effect, substituted a report of the joint railroad committee calling for an adjudication by the state Supreme Court of the question whether the New Haven company was in legal possession of its street railway holdings in Massachusetts and forbidding further acquirement of street railway properties until the decision of the court had been rendered. A conference committee failed to harmonize the two houses and the legislature adjourned.

But if direct and practical results appear to be negative, questions have been raised in Massachusetts of the utmost moment in both their legal and their material bearings on future mergers of steam and trolley lines and reaching, in the look ahead, far beyond the bounds of that state—a commonwealth, by the way, which in the past has had a good deal to do in the way of precedents of general railroad policy.

The technical questions involved, while cloudy and indeterminate, are interesting. The New York, New Haven & Hartford Railroad Company, an original Connecticut corporation, and by its charter, under control of a majority of directors resident in that state, actually owns comparatively few miles of steam track in Massachusetts, and, except by recent mergers of subsidiary lines, its steam line in the state is very trivial indeed. In this statement, however, a sharp distinction must be drawn between railroad property owners and that held by lease like the great property of the Old Colony system, with its costly Boston terminal. A statute of Massachusetts prohibits direct or indirect ownership of street railways by steam corporations. How far does such a state law apply to a company in the New Haven's legal situation? But more important is the query how far the law reaches the intermediary corporations through which the steam corporation exercises control of the street railways. With their intricate legal elements we cannot answer such questions even if we would. But it may be remarked that they seem to the logical eye complex enough to tie up the case for some time, with possible appeal on constitutional questions to the highest federal court; and beyond lies the legal *status* of the expedient of the transfer of interests from a holding corporation to individuals presumptively—though presumptive is far from legal proof—acting in the interest of the acquiring corporation. Touching somewhat indirectly on legal queries is the case of the Massachusetts Electric Companies which holds a large number of street railway properties in the state. The Street Railroad Commission of Massachusetts has treated this large holding company almost as an extra-legal corporation with the standing of an individual holder of the stocks and bonds of the controlled street railway companies. The Commission, for example, exacts, if we are not mistaken, no reports from the holding company, while insisting on separate reports from each of the companies that it controls. There is a difference, obviously, between the Massachusetts Electric Companies as an independent corporation and the same company under control of a steam railroad organization or of another holding company. But the distinction is statutory rather than logical.

In a secondary aspect of the case there is a mixture of moral and legal factors. The law of Massachusetts, as stated, prohibits control of a street railway by any one of its own chartered steam railroad corporations directly or indirectly. Whether that statute applies to any foreign railroad corporation—and its holding company or companies—or not the statute, nevertheless, declares the general policy of the state. It is argued, therefore, with force that, knowing the state's proclaimed policy, any railroad corporation like the New Haven that buys a street railway in Massachusetts does it at its own risk—certainly risks the charge of a moral violation of the law. To this view, on the other hand, there are some qualifications. As we recall it some three years or more have passed since one or two of the outlying Worcester street railways were bought up and consolidated in the Worcester and Connecticut Eastern system, itself openly controlled by the New Haven company. Why, in that case, did not the Massachusetts authorities act? Why, also, did it not interfere later when the Springfield system was acquired? Inert state authorities to some degree become partners in such transactions, and to that extent are estopped from raising the "moral" plea now. It is as if a landowner brings suit for the trespasses long past after allowing public passage through his property. The state of Massachusetts had a "policy," but did not enforce it. That a railroad corporation, under such conditions of inactive and foggy law, when threatened with long-distance electric rivalry, should have sought a safeguard for the future by the purchase of Massachusetts electric roads may or may not have been a breach of the spirit of the statute, but was a natural outcome of corporation policy. Such a condition also gives strength to the contention of the Springfield *Republican* and other Massachusetts newspapers that the state has enough of law bearing on the question already and had better appeal to existing statutes rather than to new legislation—which, by the way, must necessarily have some awkward and doubtful retroactive features.

The wider horizons of the subject of steam-trolley consolidation were also opened during the hearings before the Massachusetts Railroad Committee and the debates in both legislative houses. As was to be expected many words were used on the subject of "monopoly" and most of them misused. The underlying facts were forgotten that of late years the railroad corporations have grown both sensitive and responsive to the "monopoly" cry, and that the word is quite as sure to spell improved service on the absorbed trolley lines as on the short subsidiary and branch steam roads taken in during the past upbuilding of our great railroad systems. More strenuously was urged at the Massachusetts capital and in her press that steam railroad ownership of the street railways meant obstruction, if not check, on local trolley extensions, especially on such rival extensions as otherwise might be made in steam railroad territory. The argument is valid for new and rapidly developing regions at the West and fifteen years ago, at the first period of swift conversion of the old horse railway into the trolley, would have been valid also in the populous states of the East and Middle West. In the two latter regions it loses most of its force now, as regards the localized trolley, inasmuch as profitable trolley territory has already been so widely exploited; and in the case of Massachusetts, as the Railroad Commission returns have proved, investors have too often found out to their cost that the supposed "profitable" local trolley project has not turned out so in the sequel.

But the same argument—frequently used in the Massachusetts proceedings—as applied to long-distance electric rivals of steam lines had much greater plausibility, especially as the evident policy of the New Haven company in the purchase of large urban street railway systems in Massachusetts and Connecticut has been aimed primarily at checking projects for long-distance electric competitors. Here once again we find the argument, that sounds so coherent, modified seriously by the fads of railroad—and railway—history. In that history consolidation has been a fact as impressive and inexorable as the law of Kepler. Starting with the steam lines several decades ago and developing swiftly during the last two decades, it next has involved the street railways, and is now beginning to merge both sets of lines. The process seems destined to proceed as steadily and surely as the stars in their courses; and a little farther ahead is the vital theorem, nearing complete demonstration, that electricity is soon to span the gap between the trolley and the steam road and the local trolley car be entrained for the present steam trunk line. Suppose, for an example, that President Mellen's plan in Connecticut of "bunching" street cars for distribution and redistribution on his steam line prove a success. In such case is it not easily conceivable that a Massachusetts policy of obstructing present steam-trolley consolidation would find the state belated in receiving its benefits? Certainly the argument is a very strong one that, in the present period of electric transition, with, perhaps, vast and revolutionary results near at hand, Massachusetts will go wisely if she goes slow.

## German Tax on Railroad Tickets.

Next August there goes into effect a law of the German Empire imposing a tax on railroad tickets. As there has long been an agitation for a reduction of fares on German railroads, and as all but a small part of the railroads are owned and worked by the Governments, this may puzzle the average foreigner. It must be remembered, however, that the railroads are owned by the separate states of the Empire, and that the Empire itself has none except those of Alsace-Lorraine and has very few sources of income, the great bulk of public expenses and the chief sources of income attaching to the states. The ticket tax is not imposed on those costing less than 60 pfennigs (14 cents); from that to 2 marks the tax is 1.2, 2.4 and 4.8 cents for the three classes, respectively; double these rates for fares above 2 up to 5 marks; four times as much for fares from 5 to 10 marks; eight times as much from 10 to 20 marks; 12 times as much from 20 to 30 marks; 18 times as much from 30 to 40 marks; 28 times as much from 40 to 50 marks; and for tickets costing

more than 50 marks ($11.90), 40 times as much, or 48 cents, 96 cents and $1.92 per ticket for the three classes respectively.

Thus the tax is a higher percentage of the cost of the higher class tickets; if you pay 48 cents fare, you must pay 10 per cent. of it as tax if you take a first-class ticket; 5 per cent. if you take a second-class ticket of the same price, and only 2½ per cent. if you take a third-class ticket costing 48 cents. Moreover, the tax is higher in proportion for the costlier tickets, which means that long journeys bear a higher tax, proportionately, than short ones. As we have seen, a 2-mark first-class ticket pays 10 per cent. tax, but a 40-mark first-class ticket pays 13½ per cent., and a 50-mark ticket, 16 per cent. If your ticket (first-class) costs $12, you will pay $1.92 tax.

The assumption seems to have been that the longer journeys are chiefly by those who will feel the tax least, and not enough to cause a considerable proportion of them to take lower-class tickets.

The most notable feature of the law, however, is that fourth-class tickets are not taxed at all. Now, the fourth class is a North German institution, and a very large proportion of the short journeys are made in this class. Of course the corresponding class of passengers in South Germany travel third class, and so will be taxed. Where the fourth class exists it is feared by some that there will be such a diversion to it from the third class as to make the stock of fourth-class cars insufficient, and that of third-class cars excessive. Trains running considerable distances do not have fourth-class cars, however. It will be interesting to see what the effect will be.

By the same law a stamp tax is imposed on freight way-bills; but it apparently will not add materially to the freight charges.

### American Car & Foundry Company.

The annual report for the year ended April 30, 1906, covers only two pages and shows no more in regard to the company's affairs than is included in the general balance sheet, a statement of net earnings and their disposition, and a statement of working capital. Some further information in regard to operation was given at the annual meeting by the President. The printed report makes no reference to gross earnings, but, according to this statement, gross earnings for the year were about $74,000,000. The sum of $5,648,553 mentioned in the report as earnings from all sources apparently represents net earnings after operating expenses. The record of net earnings after operating expenses for the past four years is significant of the fluctuation of the car building industry. The net earnings of $5,600,000 in 1906 compare with $3,800,000 in 1905, $5,600,000 in 1904, and $8,400,000 in 1903, the last the company's record figure. From the 1906 figure, there was deducted for renewals, replacements, repairs, new patterns, flasks, etc., $1,490,103, as well as $350,791 for new construction, leaving $3,807,660 as net earnings after these deductions for betterments. A dividend of 7 per cent. was paid on the preferred stock, and in addition an extra payment of 1⅛ per cent. was made on July 1, 1905, to bring dividend periods and quarterly reports in conformity with the fiscal year. The total dividend payments of $2,450,000 left the year's surplus at $1,357,660, or 4.52 per cent. on the $30,000,000 common stock. This sum was added to the previous profit and loss credit balance, raising the total surplus to $14,113,094.

The balance sheet shows an addition of $1,266,681 to the item Cost of properties, plants, etc., for new plants and extensions, bringing the item to $59,371,979. Materials on hand amounted to $19,150,000 against $11,930,000 in 1905, a large increase which is balanced by an increase slightly larger in audited vouchers. Stocks and bonds of other companies, carried at $1,280,888, earned on the average 12 per cent. during the year against 11 per cent. in the year previous. The statement of working capital shows a gain of $90,979 over the amount on April 30, 1905, making the working capital at the close of the year $14,741,115.

The President reported that during the year the company manufactured 73,540 cars—72,757 freight cars and 783 passenger cars. Of the freight cars, 38,239 were of wood and 34,518 of steel construction. Of the 783 passenger cars 564 were wood and 219 steel. The company also made 949,951 car wheels. The total car production—73,540—compares with 35,857 cars of all kinds built in the preceding fiscal year, which shows the great increase in business during the recent year. Orders on hand at the beginning of the new year amounted to 71,369 cars against 44,000 cars a year previous. On April 30 the company was employing 27,807 men at its various plants. It is no surprise to learn that the year was a prosperous one and from present indications it seems entirely probable that the current year will prove equally satisfactory to the company's business.

The Pennsylvania Railroad, answering the suit concerning its mileage ticket which has been brought, at the instance of the Philadelphia drummers, in the Dauphin County Court, says that there are constantly in use sixty thousand of those tickets (on the Pennsylvania and six other roads); and for this reason, one of the main demands of the drummers, that lost tickets be bulletined to conductors, cannot be met. The most of the drummers' complaints are based on the flimsiest arguments. Their real demand is to have the tickets sold at a flat rate, abolishing the ten-dollar rebate, and that the railroads shall make the tickets usable by any one instead of limiting each ticket strictly to the purchaser's own use. This is a proper desire, provided it is not based on a purpose to speculate in the tickets or cheat the railroad in their use; but it is a question of price, after all. Some of the drummers' points are so childish as to be laughable. One of them is that the ticket is inconvenient for a passenger who cannot read. On the point that if a passenger loses his ticket, the road will not reimburse him for his loss, the answer rightly remarks that the mileage ticket is subject to exactly the same dangers as any other ticket—or as the man's watch or pocketbook. But we did not begin this paragraph with a view to wearying the reader with trifling arguments—which the Pennsylvania Railroad has had to answer in a sober 15 page pamphlet, addressed to the court—but mainly to quote one of the company's statements concerning the management of these tickets:

"The company admits as averred that no provision is made for the name or address of the purchaser or individual on or upon any part of the mileage book, and that the book as received by the purchaser after the agent's stub is torn off, gives no identification of ownership. But it denies that in case of loss the book 'is irrecoverable, or is without means of identification.' Each ticket is numbered and the owner may upon the cover of the ticket, or upon the ticket itself, write his name or initials.

"It admits that some years ago it issued a thousand mileage ticket for the sum of $20, but it avers that such ticket was not an interchangeable one, and it denies that no restrictions were placed upon its use. It was to be used only by the person purchasing it, and the identity of that person was established by his signature to the ticket and coupons. Owners of these tickets desired to be relieved from the duty of placing their signatures upon the backs of coupons, and the signature feature was waived, although not formally expunged from the contract. The result was that in a short time it was discovered that, notwithstanding the laws against ticket scalping, these mileage tickets were purchased and sold in large numbers by ticket scalpers, and in many instances were rented by their owners to ordinary travelers. Experience having demonstrated the impossibility of enforcing the contract that such tickets should be used only by their owners, this defendant had almost reached the conclusion that proper consideration for its interest and that of the traveling public required it to abolish the use of mileage tickets of that character. At or about that time, urgent requests were presented to the defendant by the members of commercial organizations and by business men for the issuance of a ticket at a low mileage rate, which could be used not only on the lines of the railroad of the defendant, but on those of other railroad companies. In compliance with these requests, and to meet these demands, the present form of mileage was issued, and, in order to protect . . . . against scalping and misuse, a ticket in its present form was issued. . . . No attempt is made to protect a passenger against the loss of his ticket, simply because it is a tested impossibility to afford him such protection. A ticket that had been lost might be bulletined, but the chance that it would be discovered by a conductor and taken up is too remote to be of sensible advantage to its owner. For years this defendant sought to protect itself from the presentation for redemption of lost or stolen tickets, good only over its own lines of road, by the issuance of bulletins containing descriptions of such tickets. These bulletins were reissued at the end of each year. The results of those efforts was that about half the tickets lost by passengers and reported to the defendant were afterwards found by them and sent in for redemption. The other half of the tickets so bulletined were never heard from, and the lists of such tickets became so voluminous that it was impossible to carry them forward from year to year; so that the company would have no protection against the redemption of a ticket that may have been bulletined last year or the year before, and that is brought in for redemption during the current year. . . . . The method by which the owner of any used ticket, obtains the refund of $10 is an easy, quick and economical one. Every authorized ticket agent of any line named on the ticket is required to receive the cover and forward it immediately to the Trunk Line Mileage Ticket Bureau in New York City, without expense to its owner; or, the owner of such ticket may directly transmit the ticket cover, with application for refund, to the Trunk Line Mileage Ticket Bureau in New York City. The lapse of time between the arrival of the cover with blank for refund and the return of the money does not now usually exceed an average period of four days. Whatever if anything the defendant may have received as and for interest on the $10 subsequently refunded to purchasers of mileage tickets sold by the defendant is not sufficient to pay the defendant's proportionate part of the expenses of the Mileage Bureau, which must be maintained by the different railroad companies over whose lines such tickets can be used."

*For New Publications, see page 32.*

## CONTRIBUTIONS

### The Personnel of the Commission.

Chicago, Ill., July 5, 1906.

To the Editor of the Railroad Gazette:

A great majority of the decisions of the Interstate Commerce Commission during the past ten or a dozen years have proved unsound. As Mr. Walker D. Hines showed so conclusively in his magazine articles and in his testimony before the Elkins Committee, some 27 out of 29 cases—I do not remember the exact number—were reversed or thrown out by the Supreme Court or by some other court of last resort. In some of these cases the commission was wrong both in its apprehension of the facts and in its interpreta-

tion of the law. With this state of things before him, the unprejudiced observer has been almost forced to conclude that the commission was made up of weak or prejudiced or unprincipled men. As there has been no suggestion that any member of the commission is unprincipled, we are shut up to the alternative between the other two explanations.

These men, by act of Congress, have now been given a vote of confidence, and have had their salaries increased $2,500 a year each.

It surely must be evident to all that it is the personnel of the commission, rather than the specific provision of the law, which is going to have the most weight in railroad regulation. How, then, are we to expect any benefit to follow the reappointment of these men, who have before them a task requiring all skill and judgment, and are not big enough for their jobs? CYNIC.

## Where to Hold the June Conventions.

Grand Union, Saratoga Springs, N. Y.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I received a clipping from your paper which relates to the entertainment of the Master Car Builders' and American Railway Master Mechanics' Associations at Atlantic City last week. With the accommodations that it was possible to have at Atlantic City I have no concern, but with that part of your article which applies to the advantages of Saratoga, I am in entire accord. But I think you owe it to the Associations and certainly to the hotel keepers of Saratoga to explain what you mean in saying: "It is to be hoped that the attitude of the hotels of that village will be such as to make it advisable to again hold the convention there. We know that the two associations would gladly return to Saratoga next year if met in the proper spirit by those who should be most anxious to have them." I would be pleased to know as one who has considerable to do with this matter the exact nature of the complaint against the hotel keepers in Saratoga, or more particularly as they refer to the Grand Union Hotel—wherein they have not been met in a proper spirit by this house. We have surrendered year after year, against our inclination, our lawn for their exhibits until finally those exhibits have outgrown the area which it is possible for us to offer. We have annually made a reduced rate to the associations and have never failed to keep our hotel up to its standard in every respect. The last time they were here it was almost the middle of July before the heavy exhibits were removed from our grounds and the grounds could be put in presentable shape for the season. We have gone to the committees repeatedly and explained to them the impossibility of doing more in the way of entertainment than we have already done. Apparently you do not believe our sincerity, else why would you say that we have not exhibited the proper spirit. Do you think it is likely that we would go against our own interests and deny these associations anything that it is possible to offer them in order to bring them here? It is just such articles as this, in my judgment, that have brought about the conditions which have taken these conventions away from this town. If the members of the conventions would realize our anxiety to meet them in every way possible and at the same time recognize the limits of what we can do, we should be able to better understand each other. It is most unfair to accuse us of not exhibiting the "proper spirit" towards these conventions, when we have done our utmost to bring them here and to make them comfortable during their stay. If you accused the town of not providing the necessary accommodations for such meetings as this that would be another thing, and we would say to you then, as we have said to your committees, that they are not in a position to do anything of this kind, that they also have done as much as they can in the way of making their town attractive for visitors and for the entertainment of such meetings and they should not be held responsible for impossibilities.

In conclusion, let me say that if the railroad journals would show what we might consider a "proper spirit" of fairness towards us, we might be able to arrange matters so that differences might be made less apparent to all, and the meetings might be held as successfully here in the future as they have been in the past. I would be very glad to see the conventions come here, and if they desire to have their headquarters in the other hotels, I would still be glad to have them come. If they desire to come to the Grand Union again, we shall still be willing to do our utmost, as we have in the past, to make their stay a pleasant and profitable one.

W. E. WOOLLEY.

Mr. Joseph W. Taylor, secretary of the M. C. B. Association, comments as follows on Mr. Woolley's defense: It seems to me that if Mr. Woolley is as anxious as he indicates to have the convention go to Saratoga next year, he should be prepared to submit a definite plan for the location of the exhibits; also a better meeting place for the conventions. We have tried in every way to make the acoustic qualities of the ball room at the Grand Union such that we could hear the discussions which took place, but without very much satisfaction. Another thing, he should come to our meetings prepared to submit a definite proposition from the hotel people and the other interests at Saratoga just the same as was done at Atlantic City this year and Manhattan Beach last year.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I was pleased to read your article on Master Car Builders and Master Mechanics' Associations, page 656 of your June 22d issue, and hope this matter will be agitated until such places as Atlantic City and Manhattan Beach are excluded as possibilities for places in which to hold the conventions.

I don't think our experience at Saratoga with the hotel keepers was improved upon at Manhattan Beach or Atlantic City, and everyone with whom I talked said they came home from Atlantic City tired out and were able to meet but few, if any, of the people whom they expected at the convention.

If such places as Manhattan Beach and Atlantic City were selected for any number of years the social feature, which has been one of the strong points in cementing the friendship of the members would, in my opinion, be eliminated and railroad men in particular would say that there is more real knowledge distributed among the members outside the meeting rooms than inside.

In speaking of the convention to a friend while at Atlantic City he expressed my views to a letter in saying that it was as good as a tonic to any man to walk down the passageway in the dining room of the Grand Union at Saratoga and greet his friends on the right and left, something that we knew very little about at Atlantic City. GEORGE W. WEST.

## Neglect of the Elkins Law.

WASHINGTON, July 10.—From the beginning of the agitation which has resulted in the enactment of the Hepburn railroad rate law, Senator Foraker of Ohio has insisted that what was needed was more energy in the enforcement of the laws already on the statute books rather than the enactment of new laws, and that the Elkins law, if slightly amended, would afford an efficient and prompt remedy for every conceivable abuse in connection with transportation rates, regulations and practices. The same view was taken by some of the leading railroad attorneys who appeared before the Senate Committee on Interstate Commerce last year. It was pointed out that the Elkins law, if enforced, would enable the law officers of the government, with the assistance of the Interstate Commerce Commission, to put a stop to rebates of all kinds and to all kinds of illegal discriminations and preferences, and that it provided heavy penalties for all those who might be found guilty of its violation. Senator Foraker contended that all that was necessary or desirable in the way of further legislation was a simple amendment of this law so as to make it apply to unreasonable or exorbitant rates as well as to rebates and discriminations.

Since the adjournment of Congress there has been published as a Senate document a statement from the Attorney General in reply to a Senate resolution of inquiry that fully sustains this view as to the efficiency of the Elkins law. The Senate called on Attorney General Moody for a statement of all suits brought under the Sherman anti-trust law, under the original interstate commerce law and its amendments, and under the Elkins law. The reply, sent in on the eve of the adjournment, has escaped general attention. It is of interest chiefly as showing what has already been done under the Elkins law, and as indicating the broad scope of that enactment. The record is such as to suggest the idea that if the efficiency of this law had been fully tested and demonstrated at an earlier stage there would have been little or no agitation for the enactment of additional legislation. It shows that while the administration and the Interstate Commerce Commission were zealously co-operating in the agitation for a law to confer dictatorial powers over commerce upon the Commission they were allowing a most efficient law to become a dead letter, for one of the most remarkable things about the Attorney General's statement is the showing that it makes that almost nothing had been done toward really testing the efficiency of the Elkins act until after the hearings before the Senate Committee had directed public attention to the fact that practically no efforts were being made to use it. Counting as one case the proceedings against the C. & N.-W., the Illinois Central, the Michigan Central, the Pennsylvania Company, the P., C., C. & St. L., and the Lake Shore & Michigan Southern, to enjoin departure from published tariffs, there were but four cases instituted under the Elkins law from the date of its going into effect on February 19, 1903, until October 25, 1905—more than two years and ten months. From the latter date until June 29, 1906—the date of Attorney General Moody's statement—a few days more than seven months—there had been instituted no less than thirty-eight cases.

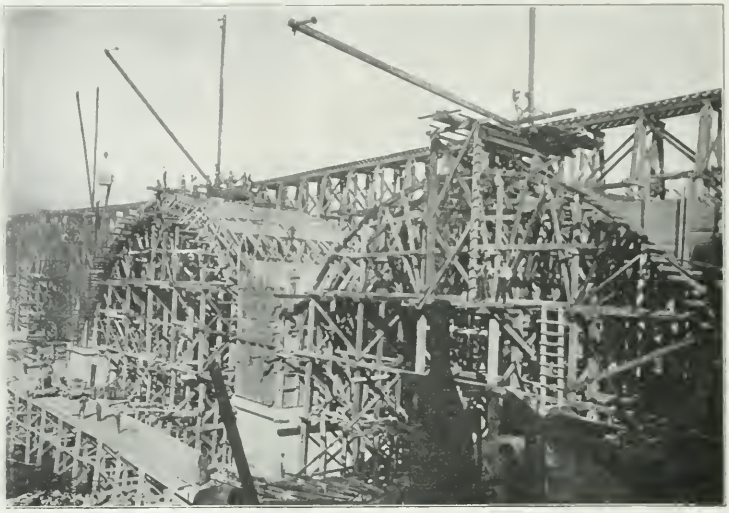
The detailed statement of cases and Mr. Moody's summary show that the law, when enforced, is summary and effective in its operation. Out of 11 indictments for receiving rebates there had been

five convictions, in one case the defendants having been fined $1,025 each and in four cases the defendant corporations having been fined $15,000 each. There had been one acquittal and five cases were still pending. Out of nineteen indictments for granting rebates there had been one conviction, the defendant corporation being fined $40,000 and two individual defendants being fined $10,000 each. Two cases had been nol-prossed and sixteen cases were still pending. Out of five indictments for conspiracy to obtain rebates there had been three convictions, in one case the defendant having been fined $1,025, in another case one defendant having been fined $6,000 and sentenced to jail for six months, and another defendant fined $4,000 and sentenced to jail for three months and in the third case the defendants having been fined in the aggregate $25,000. One case had been nol-prossed, there had been one acquittal, and one case was still pending. In addition to these cases the courts had issued six injunctions to restrain departures from published rates, had dismissed one petition to enforce an order of the Interstate Commerce Commission, and had issued one injunction against giving preferences and rebates. One petition to compel the filing of annual reports had been discontinued, and two cases of procedure to require defendants to testify had been successful.

Mr. Moody explains that the 22 cases of various kinds still pending are cases in which indictments have been returned within the last month or two, and that they will shortly be brought to trial. Since his report has been submitted there have been developments in two of these pending cases. The Chicago & Alton Railroad, with J. N. Faithorn and F. A. Wann, formerly officials of the road, has been found guilty of having granted rebates to the Schwarzschild & Sulzberger Packing Company, and Judge Holt has sustained the indictments against the New York Central road and some of its officials for the alleged granting of rebates on sugar. On the whole the record is such that if it could have been presented a year ago it might have convinced Congress and the country that the existing laws for the regulation of railroads were sufficient, but such record could not have been presented at that time for the reason that neither the Interstate Commerce Commission nor the administration seems to have believed that the Elkins law could be used with success. J. C. W.

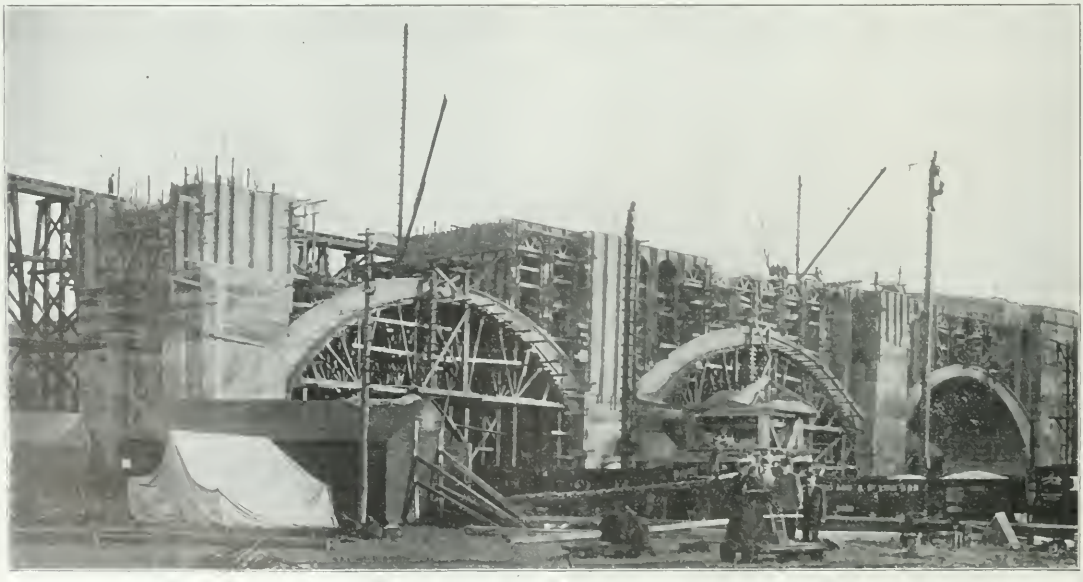
## Concrete Arch on the Big Four at Danville.

The rebuilding work on the Cairo division of the Big Four was described in these columns last fall (Oct. 27, 1905) and drawings were shown of the more interesting and important of the bridges, which were to be of concrete masonry throughout. The most notable of the structures is the reinforced concrete bridge over the Salt Fork of the Vermillion river just outside of Danville, Ill., the northern terminus of the line. Detail drawings of the design and a description were given in the previous article. This bridge has lately been finished and several photographic views, taken during the progress of the work and after completion, are shown herewith.

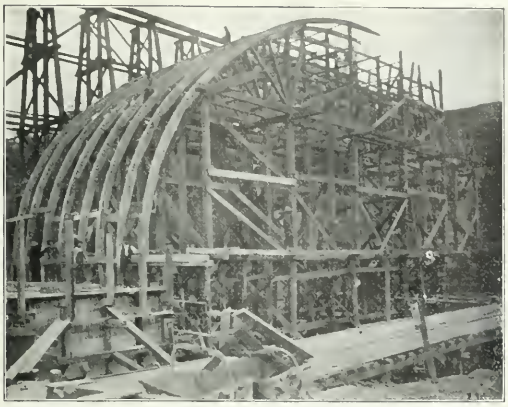


Falsework for Main Arches—Big Four Concrete Arch Bridge at Danville.

To repeat again briefly the principal characteristics of this bridge, it is a symmetrical three-arch double-track structure, 80-ft. arches flanking the 100-ft. central arch. The former are 30 ft. high above the springing line and the latter 40 ft., the thicknesses at crowns being 3 ft. 6 in. and 4 ft. respectively. The height to base



Progress View of Construction of Big Four Concrete Arch Bridge at Danville Showing Forms and Centering for Spandrel Arches, Forms for Near-End Abutment and Centering for Two Main Arches—Concrete Mixing Plant and Cement Storage House in Foreground.



Main Arch Falsework and Centering in Course of Erection.

Concrete Arch Bridge at Danville, Ill.—Big Four Route.

Detail View at Pier—Big Four Concrete Arch Bridge at Danville.

of rail above bed of river is about 90 ft. The spandrel arches are 8-ft. span and the intervening walls 2 ft. thick.

As mentioned in the previous article, the entrance of the line into Danville by the building of a cut-off 2½ miles long (it formerly used the Wabash tracks from Tilton, just south of Danville) involved some heavy cutting. The material from this was used in the big approach fill at the south end of the bridge and was conveyed thereto across, and dumped from a 90-ft. high timber trestle, which appears in the views on the downstream or east side of the bridge.

Material was delivered to the work over a spur track about a mile long laid up the valley of the stream from the Peoria & Eastern division of the Big Four. The provision of this track was made necessary by the character of the country adjacent to the bridge site, which made the latter practically inaccessible by teams and wagons. The concrete mixing plant was located between this track and the river bank, taking its sand, stone and gravel supplies from cars on the track or from storage piles alongside by means of a derrick and clam-shell bucket. Cement was stored in a small house on the opposite side of the track from the mixer, having capacity for 10 cars. It was delivered to the mixer, a ¾-yd. Smith, on small flat cars which were hauled up the incline to the platform by the derrick hoisting engine. The mixer discharged into ¾-yd. buckets on push cars on a service track beneath the platform. The normal capacity of the plant was 200 cu. yds. in 10 hours. The space for storage of materials was quite restricted, however, and impeded the continuous working of the plant to full capacity.

For delivery of the concrete to place, a double service track was built across the stream on a trestle and received the cars from the track running under the mixing plant through a turntable. Derricks lifted the buckets from the cars on the trestle and deposited their contents.

The three classes of concrete used, their location in the structure and the order in which the voussoirs were put into the arch rings were given in the previous article. The concrete was laid quite wet and was spaded well back from the forms on all exposed faces, this being the only treatment accorded to give finish to the surfaces. The resulting good effect is plainly apparent in the engravings.

Although concrete work was begun early in August, delays in securing materials prevented commencing work on the main arches until the first of October. The bridge was completed December 17 last. It contains 12,000 cu. yds. of concrete and 130 tons of Johnson corrugated steel reinforcing bars. The centering, falsework and forms required 500,000 ft. b. m. of lumber. The design was prepared under the supervision of Mr. W. M. Duane, then Superintendent of Construction, now Chief Engineer, of the Big Four. The Bates & Rogers Construction Company, Chicago, had the contract, and to them we are indebted for the views shown herewith.

## Railroad Decisions in June.

The following decisions in railroad cases were handed down by the federal courts in June:

*Collection of schedule rate in place of lower quoted rate.*—A carrier may require of a shipper the payment of the regular rate for an interstate shipment as shown by the schedule on file with the Interstate Commerce Commission and posted in the station of the carrier notwithstanding a lower rate was quoted and accepted by the shipper and the goods were shipped under the lower rate. Texas Pacific Railway Co. vs. Mugg & Dryden, 26 Sup. Ct. Rep. 628.

*Michigan tax law an impairment of a contract.*—The provision of the charter of a predecessor of the Detroit, Grand Haven & Milwaukee Railway Company that the company shall pay an annual tax of 1 per cent. on the capital stock paid in, which tax shall be in lieu of all other taxes except penalties and shall be estimated upon the last annual report, is a contract binding on the state and hence would be impaired by the enforcement of the tax law of that state enacted in 1901. Powers vs. Detroit, Grand Haven & Milwaukee Ry. Co., 26 Sup. Ct. Rep. 556.

*Discrimination as to cars furnished.*—A shipper is not deprived of his right to compel a railroad company to set off to him his equitable proportion of cars for the shipment of his product under the interstate commerce act by the fact that he is a party to an agreement between the carrier and numerous shippers fixing a basis for an equitable distribution of the cars which agreement the carrier has violated by discriminating in favor of other shippers. United

States vs. Norfolk & Western Railway Co., 143 Fed. Rep. 266.

*Safety appliance act.*—The Federal statute requiring the equipment of cars with safety appliances is violated by the act of a railroad company in hauling a car employed in interstate commerce not so equipped from one of its yards to another for the purpose of being put in a train and forwarded to its destination in another state (United States vs Pittsburg, Cincinnati, Chicago & St. Louis Railway Co., 143 Fed. Rep. 360), and generally where a railroad company hauls over its line within a state a car of another company employed in moving interstate traffic consigned to a point in another state and not so equipped. United States vs. Chicago, Pittsburg & St. Louis Railway Co., 143 Fed. Rep. 353.

*Injury to persons on railroad premises.*—The Pennsylvania enactment giving a person injured while working about the premises of a railroad company and not an employee the same right of recovery that he would have if he was an employee, is not applicable in a case where the injured person is a stevedore's employee who was injured while standing with others on or near the track of a railroad company after the close of his day's work waiting merely to give in his time to his employer, as it is clear that he was not employed about the railroad company's premises at the time of receiving his injuries. Hobbs vs. Pennsylvania Railroad Co., 143 Fed. Rep. 180.

*When action for penalty for discrimination may be brought.*—A state statute fixing the time within which actions for the recovery of a penalty may be brought at one year does not apply to actions for penalties for discrimination in violation of the interstate commerce law. Such actions, under the Federal laws, may be brought any time within five years after the cause of action has accrued. Carert vs. New Orleans & Northeastern Railroad Co., 143 Fed. Rep. 99.

*Bridges over navigable waters.*—A railroad bridge over a navigable stream in accordance with an act of Congress and maintained in accordance with the act cannot be enjoined as a nuisance on the ground that it is an unlawful obstruction to navigation. Such a bridge authorized by a statute without reservation can only be required to be removed by an act of Congress authorizing the same and providing for just compensation. United States vs. Parkersburg Branch Railroad Co., 143 Fed. Rep. 224.

*Ohio fellow servant act.*—The Ohio statute enacted to restrict the fellow servant doctrine in its application to railroads provides that every person in the employ of a railroad company "having charge or control of employees in any separate branch or department shall be held to be the superior and not fellow servant of employees in any other branch or department who have no power to direct or control in the branch or department in which they are employed." This act in effect divides all of the employees of a railroad company, with respect to those working in separate branches or departments constructively into superiors and subordinates; the superiors being all those having authority over any co-employee whatever and subordinates those having none. Thus understood and bearing in mind that the courts of that state consider that separate trains are separate "branches or departments" the conclusion follows that a railroad company is liable for the injury or death of a fireman through the negligence of the engineer of another train having authority over his own fireman, although he is himself subject to the control of the conductor of his train. Kane vs. Erie Railroad Co., 142 Fed. Rep. 682.

*Removal of trespassers from trains.*—The principle is well established that a carrier owes no duty to a trespasser on its train in ejecting him therefrom except to abstain from wantonly and recklessly injuring him, and whether or not this is done depends on all the facts and circumstances involved. In no event will the carrier be liable in exemplary damages for injuries though wilfully inflicted on the trespasser unless the company authorized or ratified the act, and the fact that the conductor removing the trespasser was not discharged before the trial of the case will not amount to a ratification. Toledo, St. Louis & Western Railroad Co. vs. Gordon, 143 Fed. Rep. 95.

*Inspection of equipment.*—A railroad company cannot shift to a trainman its duty to make a proper inspection of its cars and thus escape liability to an employee for injuries occasioned by a defect that was not obvious to the employee but which would have been disclosed by the means at the command of an inspector charged with that duty only. Martin vs. Wabash Railroad Co., 142 Fed. Rep. 650.

*Construction of bills of lading.*—Under the rule of law that a common carrier can limit its common law liability only by conditions clearly and distinctly called to the attention of the shipper, there is no presumption that the shipper had knowledge of these conditions are printed in small type along with other inconsequential conditions. To charge him with this knowledge the condition should be rendered conspicuous by its position or the color or style of the type in which it is printed. As a general rule any reasonable doubt as to the proper construction of the printed portion of a bill of lading should be resolved against the carrier which prepared it. Baltimore & Ohio Railroad Co. vs. Doyle, 142 Fed. Rep. 669.

## NEW PUBLICATIONS.

*Railway Signal Association; Digest of Proceedings for Eleven Years, 1895-1905.* Vol. I., 346 pages, 6 x 9 ins. New York: H. S. Balliet, Secretary, Grand Central Station. $4.

This is a valuable work, for the signalling art has grown fast during the past ten years and the history of these years has not been adequately recorded. The second volume is yet to be issued but the first one is justified, by itself alone, for the matter is largely made up of articles not depending on other articles for their value. The work can scarcely be called a digest, in the true sense of the term, for much of the matter is still undigested—and, indeed, was open to the charge of indigestibility when it was originally issued. Discussions were reported with tiresome redundancy and the association was even so amiable in one case as to listen to a paper one year that told only what had been presented by another member about one year before. Moreover, in consequence of the rapid growth before mentioned, some things that were said a few years ago are now out of date. Notwithstanding these defects—which are inevitable, unless the executive committee were to go to the expense of having much matter entirely rewritten—the book preserves important history and will answer many of the questions which are now asked every day by the younger signalmen, provided they will dig for the facts. The compiler has endeavored to arrange the matter by subjects and has in large measure succeeded; but there is much interesting matter in the discussions which is not germane to the topic under which it is given and yet is too valuable to be lost. To get the full value of the work the reader should himself amplify the index by adding names of speakers and dates of utterance, for a great many of the most useful things in the book depend for their value on a knowledge of these elements.

Among the important subjects touched upon with more or less fulness in Volume 1 are: the rules adopted for operation of interlocking plants in 1897; definitions accompanying the same; standard specifications for construction of mechanical interlocking, adopted in October, 1905; a paper on inspection, written by Mr. Elliott in 1899; economy of signaling crossings (Vernon and Peabody); time locks; facing points and slip switches; night color-indications; mechanical distant signals (several papers); batteries, primary and storage—cost of installation and maintenance, care and inspection; disturbance of automatic signals by lightning; management of track circuits; design, maintenance and care of signal lamps, and maintenance and inspection of automatic block signals (Balliet). Many of the papers are accompanied by reports of the discussion which followed their reading, with names of the principal speakers.

*Car Builders' Dictionary.* 1906 edition. Compiled under the direction of the Master Car Builders' Association by Rodney Hitt. New York: *The Railroad Gazette.* Leather, 9 x 12 in. 738 pages and 6,341 illustrations. Price, $6.00.

The early and more or less imperfect editions of this important book need no introduction to railroad mechanical officers. It has been a standard for reference and for practice since its first publication in 1880 and few technical books have exceeded it in the number of copies sold. The fifth revision just made surpasses even the high standard set by previous editions in completeness and accuracy. The number of pages has been increased to 738, nearly 200 pages of illustrations having been added and the number of illustrations increased to 6,344. Most of the pages have been entirely recast and the latest designs of cars and car details substituted for those shown in the 1903 edition. The same arrangement of illustrations into general groups has been followed and one new subject added, that of British cars and details, both passenger and goods. The illustrations under this heading will be found useful by those who may be in the position of having to adapt devices in use on American railroads to equipment on British or colonial railroads. The plan first adopted in the 1903 edition of putting the names of makers under devices shown has proved so helpful to those who use the book constantly as an ordering guide that it has been retained in the present edition. The definitions have been carefully revised and brought up to date. In view of the early publication of a Locomotive Dictionary along similar lines to this book all reference to parts belonging strictly to locomotives or tenders has been omitted.

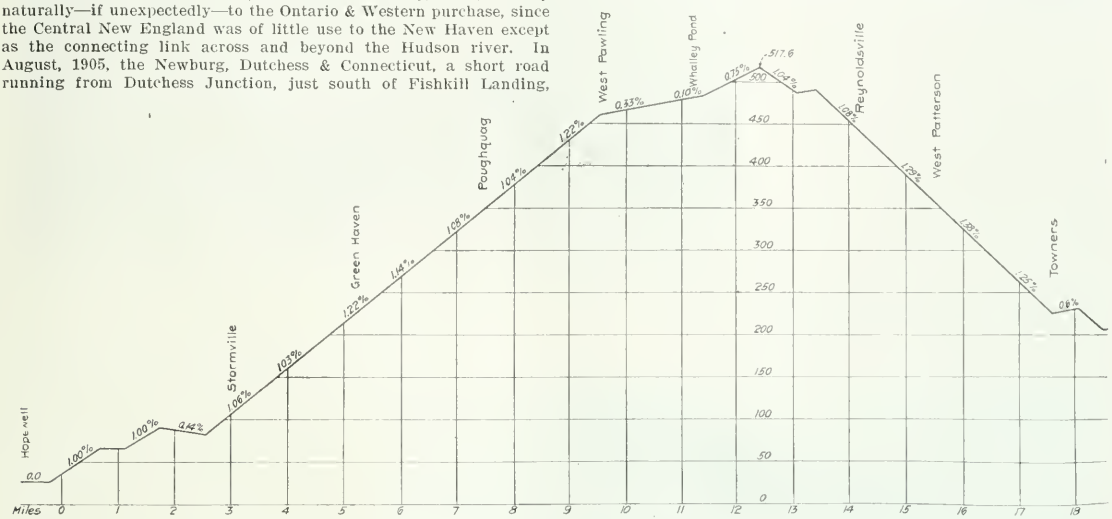
The two electric locomotives which were borrowed from the Valtellina Railroad, which has been worked by such engines for several years, to haul trains through the Simplon Tunnel, have proved inadequate for the work, and have been sent to the shops. Each of these engines had two motors of 450 h.p., which could be urged up to 1,100 h.p. for the engine. There is some difference of opinion as to the cause of the failure. One theory is that as the engines have a section equal to two-thirds that of the tunnel itself, they act as pistons in a cylinder, and waste a large part of their power in compressing the atmosphere in the tunnel. This atmosphere is saturated with moisture from the hot springs which discharge 2,000 gallons per second at a temperature of 111 deg., while the temperature of the tunnel walls is 93 deg. This compressed saturated air is believed to penetrate the insulation of the motors and cause an important leakage of the current and consequent short-circuiting.

## Rebuilding the Highland Division of the New York, New Haven & Hartford.

When, in October, 1904, Charles S. Mellen, then lately returned as President to the New York, New Haven & Hartford, suddenly bought control of the New York, Ontario & Western as a New Haven connection with the anthracite coal fields and, potentially, as an influence in the trunk line situation, the Central New England, "the Poughkeepsie bridge route," was already in the hands of the New Haven management. Its acquisition in February, 1904, led up naturally—if unexpectedly—to the Ontario & Western purchase, since the Central New England was of little use to the New Haven except as the connecting link across and beyond the Hudson river. In August, 1905, the Newburg, Dutchess & Connecticut, a short road running from Dutchess Junction, just south of Fishkill Landing, north to a connection with the Central New England near the northwest corner of Connecticut, was also acquired. The New York, New Haven & Hartford had been paying for 11 miles of trackage over this line, bringing its westernmost (Highland) division into Fishkill Landing on the Hudson river. With all these roads safely in hand, the New Haven management turned its attention to working out a satisfactory route for east and west traffic through this territory into New England.

The western terminus of the Central New England is at Campbell Hall, N. Y., 30 miles west of Poughkeepsie. Besides being on the main line of the New York, Ontario & Western, Campbell Hall is reached by the Erie over a five-mile branch from its main line at Goshen, is the southern terminus of the Walkill Valley (New York Central) and the northern terminus of the Lehigh & New England. Maybrook, on the Central New England three miles east of Campbell Hall, is the northern terminus of the Lehigh & Hudson River, which, like the Lehigh & New England, gives connection with the Delaware river region, and the various anthracite roads in that territory.

The Central New England forms the connecting link over the 30 miles to and across the Hudson river at Poughkeepsie; thence




Condensed Profile, Hopewell to Towners; Highland Division, N. Y., N. H. & H.

east, instead of northward over its main line which has exceptionally bad grades and alinement, traffic is turned southward over a 13-mile branch to Hopewell Junction, the western terminus of the New Haven's Highland division over which there is connection with all New Haven territory to the eastward. Thus the Highland division becomes part of a new through route between New England and the anthracite coal fields and the West. As before, freight is also received at Fishkill Landing and reaches the Highland division over the Newburg, Dutchess & Connecticut to Hopewell Junction.

With the establishment of the new through route it was necessary that the division should be put in shape to handle modern heavy traffic. What is now the Highland division, extending from Hopewell Junction, N. Y., east to Willimantic, Conn., was formerly the western end of the New England Railroad, which connected Boston and Fishkill and was leased to the New Haven on July 1, 1898, control having been acquired some three years earlier. The Hudson river extension of this road, from Waterbury to Fishkill, was opened

Poughquag Cut Before Being Widened for Double Track, Highland Division, N. Y., N. H. & H.

Highway Undercrossing near Brewster; Highland Division, N. Y., N. H. & H.

late in 1881. It is single track and never received any extensive improvements. Consequently its practical reconstruction to meet the demands of present and expected traffic has involved the substitution of present-day standards for those of 25 years ago.

The first section undertaken was from Hopewell Junction to Danbury, 34.6 miles. The accompanying photographs give an idea of the nature of the work. A condensed profile of the line from Hopewell east to Towners, 19 miles, is also given, showing the principal and maximum gradients both east and westbound over this section. About eight miles east of Hopewell is Poughquag cut, shown in the photograph, which was taken at the time the cutting for double track was begun. The cut is from 65 to 75 ft. high; the rock, shale. Excavation for the second track amounted to 38,000 cu. yds. The work was done without serious mishap, and with slight delay to trains, the only important accident being that of a foreman who fell off the top of the cut near the derrick shown in the photograph. However, in a week's time he was at work again. The 7-deg. curve through Poughquag cut is the maximum on this section, the sharpest curve between Hopewell and Danbury being, with this exception, 5 degrees. Just before reaching the summit the road skirts Whalley pond on the south side. There is a swamp on the north side of the track at this point. About 35,000 yds. of rock and 65,000 yds. of earth were dumped here before obtaining a firm bottom for the new track. The water along the track is about 5 ft. deep and the mud about 40 ft. deep below that.

Twenty-Foot Concrete Arch for Stream near Towners; Highland Division, N. Y., N. H. & H.

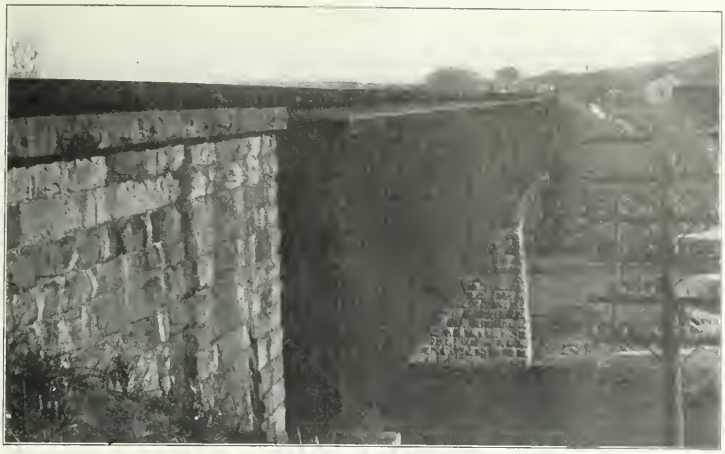
Old Bridge and Trestle Over Harlem Tracks at Towners; Highland Division, N. Y., N. H. & H.

Reynoldsville Summit is 750 ft. above sea level, the highest point on the old New England Railroad. Hopewell is 285 ft. above the sea. The eastbound grade, as shown by the diagram, rises to a maximum of 1.22 per cent. (64 ft. to the mile) between Hopewell and the summit, 12.6 miles east. Originally the pusher grade extended all the way to the summit, but in the reconstruction of the line the grade near the summit was cut down so that pushers can now cut off at West Pawling, the maximum grade on the remaining two miles to the summit being a short stretch of 0.75 per cent. (39 ft. to the mile). Great efforts were made to find some lower grade across this range of hills, which runs parallel to the river, but without success. New surveys were made for 15 or 20 miles both north and south of Reynoldsville, but no better location for a line than the original New England location was discovered. Fortunately the eastbound grade, which opposes the heavier traffic, is not as steep as the westbound, so that with the aid of one pusher fairly long trains can be operated eastbound over the summit. It is possible to haul from 30 to 40 loaded cars up the grade with one helper, though the ordinary train is somewhat lighter. This 10-mile grade with a maximum of 1.22 per cent. is a factor which must always be reckoned with in any consideration of the New Haven's through route via the Poughkeepsie bridge. Against the lighter traffic westbound the grade is heavier, reaching a maximum of 1.38 per cent., or 72 ft. to the mile. The foot of the grade is near Towners, five miles east of the summit.

In the vicinity of Towners a great deal of work has been done. The most important of this is the filling in of a long wooden trestle for about 1,500 ft. on each side of an overhead bridge over the main track and a siding of the Harlem division of the New York Central and the rebuilding of this bridge. The filling of this trestle requires about 125,000 yards, the material being all taken out of a cut east of Towners. A photograph shows the original situation at the crossing over the Harlem tracks. The new bridge, a photograph of which is also shown, is a double-track through truss steel bridge, 181 ft. long, on a skew of 26 deg. The New Haven tracks have been raised 4 ft. to give head room of 21 ft. over the Harlem tracks. The old wooden trusses shown in the earlier photograph have been in service over 25 years, and the timber when taken out was in as good condition as when built. The new masonry is built entirely in concrete resting on piles. About 1,000 yds. of concrete were required.

Just before reaching this overhead bridge there were formerly two bridges, near together, each over a highway. Here a new bridge, with a skew of 65 deg. and a 30 ft. 6 in. girder, replaces these two bridges, under which, by a slight shifting and joining of the highways, the two roads run. East of the overhead crossing is a 20-ft. concrete arch, a photograph of which is shown. This has been built to take a stream flowing under the Towners trestle, which is being filled in. The land here is swampy, and the stream ordinarily

New Bridge Over Harlem Tracks at Towners.



Old Single Track Bridge Over Croton River at Brewster; Highland Division, N. Y., N. H. & H.

has little or no flow, but at times is large enough so that this size arch is necessary. The four wings of the arch are each 24 ft. 4 in. long. It is built on piles, unlike the highway bridge, where piles were not necessary. This arch is all concrete except the ring, which is of cut stone. East of Towners there is a down grade of 1.12 per cent., with the bottom of the hill near Crotons, which is 438 ft. above sea level. Near Dykeman the eastbound grade has been cut down from about 60 to 36 ft. per mile.

At Brewster there is another heavy piece of bridge reconstruction. The bridge over the Croton river, as it originally existed, is shown in one of the photographs. The masonry was built for double-track, but allowed for only 11 ft. centers. As the new tracks will be 13 ft. centers, this necessitated practically rebuilding the entire masonry. Two views of the work as it is at present are shown. The new masonry has been built in concrete, 5,500 cu. yds. of which were used. The iron work consists of two deck spans each 134 ft. long. As it is at the bottom of a sag (1.25 per cent. on the west and 0.67 per cent on the east), the bridge is being raised 10 ft. above its present level, which will make the grade better and at the same time prevent the extreme shock with which a heavy train coming down the grade now hits the bridge. The base of rail on the new bridge will be 65 ft. above the bed of the stream. The total distance between parapets is 268 ft.

Another photograph shows the masonry built for a highway under-crossing near the village of Brewster. A long retaining wall was here necessary, on account of the skew on the highway. A short distance west of Brewster is the Connecticut State line. At Storm's Crossing, which marks the line, a new concrete overhead highway bridge has been built.

In Danbury a good deal of new work has been done. A new masonry bridge was built over West street. To replace a wooden trestle at one point where it was necessary to leave, in addition to a street opening, another opening underneath, in order to give access to one of the hat shops, and at the same time leave head room of 13 ft., five masonry piers were built supporting the tracks on a curve. A new concrete bridge was built east of the hat factory opening, where the channel of a stream has been changed. Here a new double-track trestle is to be built, replacing the present single-track trestle. On the south side of the right of way a long piece of retaining wall was built right up to the property line to hold up the new track. All bridges in Danbury have been made wide enough so that if grade crossings are abolished the bridges can be easily raised. Where they are on curves, copings have been inclined for the super-elevation of the outside track. The work from Hopewell to Danbury was divided into five sections. From Hopewell four miles east the work was done by the road's maintenance of way forces. From this point west to Stormville C. W. Blakslee & Son, of New Haven, had the contract. From Stormville to Reynoldsville Summit the contractor was J. W. Daly, of New Rochelle. From Reynoldsville to Brewster the Blakslee firm was the contractor, and from Brewster to Danbury, J. W. Daly & Co. The work from Stormville east to Towners was begun in December, 1904, and from Towners to Danbury in April and May, 1905. All of the double track between Hopewell and Danbury is now in operation, with the exception of about six miles from Towners to Brewster, and the last two miles into Danbury. Throughout the whole extent of the work numerous bridges over streams were replaced with arches, others rebuilt, girders substituted for wood on highway bridges, and culverts extended for second track. There were also 10 or 12 small bridges taken out and the openings filled in. It is noticeable that on this work there are a great many skew bridges. Where masonry was used, considerable difficulty was found at first in getting the stones for these skews cut to proper shapes. Finally, in some of the more difficult work, wooden blocks were made as a model for the stonecutters. Passing sidings on the line have been extended where necessary to make a 2,500-ft. clearance.

Reconstruction of Bridge Over Croton River at Brewster—Present State of Work.

Reconstruction of Bridge Over Croton River at Brewster—Present State of Work.

It may be interesting in connection with the rebuilding of the division to consider the sources of its through traffic. As already

explained, at Maybrook the Lehigh & Hudson River connects with the Central New England. Already this road turns over to the C. N. E. a considerable tonnage received by it, in particular from a connection completed late last year with the Delaware, Lackawanna & Western. The Lehigh & Hudson River is favored in making these interchange shipments from the Delaware river region rather than the Lehigh & New England, which is also under the control of the Lehigh Coal & Navigation Company. In order to increase the amount of through traffic from the West received over the Ontario & Western, the Ontario Central Dispatch line, which runs over the New York, New Haven & Hartford, New York, Ontario & Western, Michigan Central and Big Four railroads, was in February organized. Since the establishment of this fast freight line there has been a considerable increase in shipments by this route, and consequently in the use of the New Haven's Highland division. An idea, though not an accurate estimate, of the amount of traffic handled can be gained from the number of regular freight trains which are run over the Highland division east from the Hudson river. From Fishkill Landing there are three daily regular first class freight trains which run to Hopewell and thence east via Danbury. One of these is a Boston and another a Providence freight. In connection with these trains, the New York Central & Hudson River runs a daily train from East Buffalo to Fishkill Landing, carrying beef, perishable freight and high-class merchandise for points on the New York, New Haven & Hartford, connecting with the Boston train, and two solid trains from West Albany to N. Y., N. H. & H. points via Fishkill Landing for connection with the Providence train. In addition to the three first-class freight trains east from Fishkill Landing there are four regular second-class freight trains, two of them Boston freights, from Fishkill Landing, and three regular second-class freight trains, one of them a Boston freight, from Campbell Hall and Poughkeepsie. Thus the present regular traffic eastbound over the Highland division is made up of 11 regular freight trains, in addition to as many extras as may be run. That a large increase of traffic via Campbell Hall and Poughkeepsie is expected is shown also by the fact that a contract has been made with the American Bridge Co. for reconstruction, at a cost of about $1,000,000, of the Poughkeepsie bridge over the Hudson river.

Now that the double-tracking of the section from Hopewell to Danbury is nearly finished, rebuilding work has been pushed further to the eastward. Reconstruction of the section from Waterbury east to Bristol, 15 miles, was begun this spring. Much of this is very heavy work, involving considerable change of line, which will result in saving two miles of distance. About four miles from Terryville east to Bristol, and two miles from Hancock east to Tolles, is to be entirely new line. There is to be built a 3,500-ft. tunnel on the new location, and 1,200 deg. of curvature will be taken out. The 14 miles of new work will involve approximately 580,000 yds. of earth and 260,000 yds. of rock excavation. In comparison with the 30 miles of work between Hopewell and Danbury, which cost $1,200,000, this 14 miles will cost $1,700,000.

For the information in regard to this work we are indebted in particular to Mr. Edward Gagel, Chief Engineer, and to Mr. F. M. Smith, Assistant Engineer in charge.

Charles Paine.

Nemjeshajev, who succeeded Prince Hilkoff as Russian Minister of Transportation when Witte formed a cabinet, went out with Witte, and was succeeded by Maj.-Gen. von Schaffhausen-Schönberg-ek-Schaufuss, who is an engineer by training, has been a railroad manager and for some time has been attached to the department of which he is now the head.

## Charles Paine.

Charles Paine, who died at his farm near Tenafly, N. J., on July 4, was born in Haverhill, N. H., April 25, 1830. When he was 15 years old he was a rodman on the Vermont Central, where he stayed four years, becoming division engineer in charge of construction. He was a division engineer on the Vermont & Canada and Engineer and Manager for the contractor on the reconstruction and extension of the Champlain & St. Lawrence. Later he went West and served as Chief Engineer of different railroads in Wisconsin. He became a Division Superintendent on the Michigan Southern & Northern Indiana. He served successively as Engineer of the Western division, Chief Engineer and as General Superintendent of the Lake Shore & Michigan Southern. His services on that road and on the Michigan Southern & Northern Indiana covered 23 years. He left the Lake Shore to become General Manager of the New York, West Shore & Buffalo, where he stayed during the entire period of building. The unfortunate termination of the enterprise left him without employment, and he spent a year traveling in Europe for rest. In 1885 and 1886 he was General Superintendent of the New York, Pennsylvania & Ohio and Vice-President of the Erie; then for about five years he was Vice-President and General Manager of the Philadelphia Co. in Pittsburg, engaged in developing the principal natural gas interests of that region. From 1891 to 1899 he was in private practice as a consulting engineer and was employed in a confidential capacity on the Erie during the period of its reorganization, and as General Manager of the Union Steamship Co. for the Erie. In 1899 he became General Manager of the Panama Railroad and left it when the United States Government bought it. He was a Past President of the American Society of Civil Engineers, an Honorary Member of the Western Society of Engineers and of the Civil Engineers' Club of Cleveland, a member of the American Society of Mechanical Engineers and of the Century Club of New York.

Mr. Paine's character was of a type that is now infrequent. We read of such men in the Bible and in some other books, men who were invulnerable to every form of temptation that can come to a man of position and power. We have such men now; we hope for more of them among corporation officers in the future, for sturdy moral character in a severely tempted man is an accomplishment usually got under stress of public opinion. He was a learned man, with fine literary tastes and capacity for expression; a sound engineer of good judgment; and a safe railroad officer who enforced discipline and inspired loyalty. He never refused to see inventors or sellers of railroad devices, but he made his decisions rather quick and final. It was while he was engineer of the Lake Shore that he first met George Westinghouse, then little more than a lad, who called on him and got a sample order for an improved frog. It was a good frog, and from time to time Mr. Paine ordered more of them, and talked with and encouraged young Westinghouse in his studies for a practicable form of continuous train brake. The friendship then formed lasted through life.

Mr. Paine was for many years a not infrequent writer for the *Railroad Gazette*, not so often over his own name as in editorial discussion and expression of opinion. He was a suggestive and safe adviser for its editors; and his book, "The Elements of Railroading," consists wholly of reprints of some of these articles. It is a small volume which has had a wide reading, a model of accuracy, simplicity and condensed statement. Since retirement from the Panama railroad service Mr. Paine has led, up to the time of his painless death, an ideally happy quiet life at Tenafly, with his children and grandchildren often gathered together.

Mrs. Paine should not pass unnoticed in this memorandum, for she was so much a part of his life that in literary and artistic tastes and appreciations, in manner and form of expression, in ways of thinking, they so grew in each others lives as to be astonishingly alike. A casual observer would say that they looked alike. This is impressive now in the large photograph of Mr. and Mrs. Paine, made for the writer 15 years ago, and from which the engraving here shown is taken.

In estimating the sum of good work done for the world by Mr. Paine, we find no record of great achievement in engineering, finance, invention or any radical improvement in railroad methods. His monument is a correct and blameless life in positions of great responsibility, and the men he has encouraged, advised and trained in uprightness and thoroughness. One officer said a short time ago: "The country is full of Paine's men, and they are the best railroad officers we have." W. H. B.

## Organization of the Pennsylvania Railroad, 1906.

In the *Railroad Gazette* of April 27, 1900, there was printed a diagram of the organization of the Pennsylvania Railroad Company as it existed at that time. Since then some notable changes have been made, and the diagram accompanying this article illustrates these changes. In 1900 there were but three vice-presidents. At the present time there are five, and their respective duties and responsibilities have been much shifted about.

The first vice-president in 1904 had under his supervision three main divisions—that covered by the work of the third vice-president, that covered by the general passenger agent, and by the general freight agent. The third vice-president at that time was reported to by the chief engineer, chief of motive power, general manager, purchasing agent, superintendent of insurance department, and the real estate agent. The first vice-president was therefore directly responsible for traffic and indirectly responsible for transportation, the mechanical department, the engineering department, and several others as well. At the present time the first vice-president has collateral supervision over the work of the fifth vice-president, who is in charge of the treasurer's department only, and he has direct responsibility for the comptroller's department, including all the auditors. This work was done by the second vice-president under the former organization.

The second vice-president in 1906 is the operating man, reported to by the general manager, and also by the motive power and engineering departments. It has evidently seemed wise to consolidate the tremendous responsibilities attached to these widely separated functions under one roof for ultimate guidance, although it is scarcely necessary to point out the very able support which the vice-president receives from his general manager, his chief of motive power, his chief engineer, and his general superintendents.

The third vice-president in 1906 has several unusually diversified duties to perform, but it may be said that his chief work is that mentioned in the second grouping of duties under his title—the promotion of new lines and corporate work connected therewith, having particular reference at the present time to the New York tunnel extension.

The fourth vice-president is the traffic manager, and the fifth vice-president, as already mentioned, has charge of the treasurer's department.

On account of the tremendous concentration of all that is directly connected with operation in control of the second vice-president, it will be seen that the Pennsylvania furnishes the strongest possible example of a divisional organization. The diagram shown accompanies an interesting address on the incorporation and organization of the company, delivered before the Transportation Class of the Pennsylvania Railroad Department of the Young Men's Christian Association in Philadelphia by A. J. County, Assistant Secretary. In this address Mr. County goes into considerable detail with regard to the incorporation and past organization of the company, and also discusses somewhat fully the organization of the present time. The following table which he gives shows the growth of the principal departments in the management of the company, although it does not describe the breaking up of these departments into separate vice-presidencies in the manner we have discussed:

| | |
|---|---|
| 1846 | Charter officers—president, secretary, treasurer. |
| 1847 | Executive, secretary's, treasury and engineering departments. |
| 1852 | Transportation, freight, passenger and accounting departments. |
| 1856 | Legal department. |
| 1863 | Motive power department. |
| 1866 | Purchasing department. |
| 1869 | Maintenance of way department. |
| 1874 | Real estate department. |
| 1878 | Empire line. |
| 1879 | Insurance department. |
| 1886 | Voluntary relief department. |
| 1888 | Employees' saving fund. |
| 1893 | Telegraph department. |
| 1900 | Pension department. |

The following abstract is made from comments in Mr. County's paper on the division of responsibility throughout the system:

The entire supervision and direction of the affairs of the company are vested in the president. Assisting him in the performance of his duties the first vice-president exercises general supervision over the treasury, accounting and saving fund departments. This is a weighty responsibility, and therefore, so far as the affairs of the accounting department are concerned, the third vice-president assists him, and acts for him in his absence, and the fifth vice-president takes direct charge of the operations of the treasury department, and also acts as treasurer of the company. The principal duty of the treasurer is the custody of the money and securities of the company, and of all matters connected therewith. His staff of assistants are three assistant treasurers, an assistant to treasurer, a cashier and two registrars of the company's bonds.

The accounting department audits all the books and accounts of the company, and maintains and enforces the methods of keeping the same, and is in charge of the comptroller, whose official staff consists of an assistant comptroller, assistant to comptroller, auditor of merchandise freight receipts, auditor of coal freight receipts, auditor of passenger receipts, auditor of miscellaneous receipts and accounts, auditor of disbursements, auditor of the Empire Line, and an auditor of the Union Line.

The titles of auditors give a very fair indication of the scope of the accounting department, and these auditors have assistants.

The third branch, operation and transportation, is concerned with the prompt and economical movement of the traffic, and includes the building, as well as the maintenance, of the railroad and its facilities for that purpose. This comes under the jurisdiction of the second vice-president, who assists the president by exercising special supervision over the engineering and transportation departments, and has general supervision over the purchasing, real estate and insurance departments. Here again there is a concentration of responsibility requiring a large staff of officials. The assistant to the second vice-president is required to possess an intimate knowledge of the business of the various departments under the second vice-president to efficiently assist that officer. The chief of motive power exercises general supervision over the motive power department so far as it may be necessary to preserve the motive power standards and the systems of the company, and the plans for rolling stock. The condition and capacity of the shops and facilities for the maintenance of equipment are subjects upon which he must keep himself informed, and also as to the purchase of necessary tools and machinery. The record of patents and the organization of car trusts, and the records of equipment purchased through car trust, also come within his province.

The chief engineer has charge of all engineering and construction work, and the preparation of the plans, specifications and estimates for all of the railroads owned or operated by the company, as well as for new bridges and the improvement of buildings. He also keeps in his office a detailed record of the cost of all new work chargeable to construction account, and has charge of the distribution of steel rails for construction and renewals. His official staff consists of an assistant chief engineer, an assistant to the chief engineer, an engineer of bridges and buildings, and an engineering corps in the field. When the work of this officer is completed the structures are turned over to the transportation or operating department, of which the general manager is the active working head and responsible therefor to the second vice-president.

The general manager assists the second vice-president, and is given charge of the operations of the transportation department, being specially concerned in the safe and economical management of the entire system of railroad lines and facilities. An idea of his duties may be gathered from the titles of his large staff, namely, general superintendent of transportation, general superintendent of motive power, chief engineer of maintenance of way, superintendent of telegraph, four general superintendents and one terminal superintendent, three general agents, a purchasing agent and a real estate agent.

The general superintendent of transportation has general supervision of the movement of traffic and of the distribution of the car equipment. He is assisted by the superintendent of freight transportation and the superintendent of passenger transportation.

The general superintendent of motive power has direct supervision and control of the motive power department, so far as to insure the efficiency of all locomotives, cars, shop equipment and machinery. He keeps a record of the performance of all of the rolling stock and shop equipment, and makes recommendations for the efficient and economical operation of that part of the service which comes under his supervision.

The chief engineer of maintenance of way is in direct charge of the maintenance of way department, and the preservation of standards. These are vital points in the operation of a system as large as ours, in providing the most substantial roadbed for the economical and safe movement of heavy traffic, for which a uniform standard of maintenance and supplies and the methods of using them on every division is at the root of railroad progress. In addition, this

officer is obliged to keep in touch with all scientific and practical developments in the maintenance matter all over the world, so that the company may benefit therefrom. He is aided by an engineer of maintenance of way.

The superintendent of telegraph has general supervision of the construction and maintenance of telegraph and telephone lines, and the supplies therefor. This is one of the newest offices under the organization, which the progress of quick communication in modern railroading has made a necessity.

The railroads owned, leased and operated by the company are divided into four general divisions, each in charge of a general superintendent.

The general superintendents have charge of all right-of-way, buildings, property and equipment on their respective general divisions. They are responsible for the maintenance of the track and the discipline of employees, and the safe and economical movement of all trains and the maintenance of the service at the proper standard of efficiency. Each general superintendent is assisted by division superintendents, a principal assistant engineer and a superintendent of motive power.

The principal assistant engineer assists the general superintendent in maintenance of way matters. The superintendent of motive power has charge of the shops and of the maintenance of the equipment, tools and machinery, but the orders relative to shop discipline, increase or decrease of the working forces or changes in wages are issued by the respective division superintendents. He is assisted by a master mechanic, and at the car shops by a foreman of car repairs, who are responsible to him for the economical execution of the work of repairing and rebuilding locomotives and cars.

The division superintendents exercise on their respective divisions all the powers of the general superintendent necessary for its proper management. They are responsible to the general superintendent for the maintenance of the tracks, bridges and buildings, the movement of trains, the discipline of employees and the increase or decrease in the working forces and the rate of wages. The division superintendent is assisted by an assistant engineer, who takes special charge of the maintenance of the roadway, tracks and buildings, but the number of heads of sub-departments attached to the staff of each division superintendent to reach the bottom of the ladder is so great that the organization does not attempt to define their duties, and accordingly we must look to the book of rules, and there we find they consist of:

*Supervisors.*—Report to assistant engineer. They have charge of repairmen and other laborers on their respective sections, and are responsible for track and roadbed, bridges, culverts, telegraph lines, and everything pertaining to roadway. The employees subordinate to them are track foremen, laborers, road and bridge watchmen, signalmen and switchmen.

*Supervisors of Signals.*—Report to assistant engineer and have general charge of the maintenance and repair of switches and signals operated in connection with telegraph towers.

*Master Carpenters.*—Report to assistant engineer. They have charge of repairs of bridges and other structures, and employ workmen necessary therefor under approval of assistant engineer.

*Train Masters.*—Report to superintendent, and have charge of the movement of traffic and supervision of trainmen.

*Yard Masters.*—Report to train masters.

*Passenger Conductors.*—Report to train masters, and must obey orders of station masters, and conform to instructions issued by accounting, passenger and treasury departments.

*Passenger Brakemen.*—Report to train master. While on duty they are under the direction of conductors, and at stations must obey the orders of station masters.

*Baggageman.*—Report to train master.

*Freight Conductors.*—Report to train master, and must obey orders of yard masters.

*Freight Brakemen.*—Report to train master and must obey orders of yard masters, and when on trains those of conductors.

*Train Despatchers.*—Report to superintendent and issue telegraphic orders for the movement of trains in the name of superintendent. In the absence of the division operator they have charge of operators.

*Division Operator.*—Reports to superintendent.

*Telegraph Operators.*—Report to division operator, and in his absence to the train despatchers. At stations they obey the orders of the station masters or station agents.

*Telegraph Repairmen.*—Report to division operator.

*Levermen.*—Report to division operator.

*Station Masters.*—Report to division superintendent, and must obey orders of the train master.

*Station Agents.*—Report to the superintendent. They must conform to the instructions issued by the passenger, freight, accounting and treasury departments.

*Baggage Agents.*—Report to superintendent. Must obey orders of station masters or station agents, and conform to instructions issued by passenger and accounting departments.

*Road Foreman of Engines.*—Reports to superintendent.

*Enginemen.*—Report to road foreman of engines, and must obey orders of the train masters, and of station masters and yard masters as to shifting and making up trains; and when running are under general control of conductors as to the care and prompt movement of trains. When at the round houses they are under the direction of engine house foremen.

*Firemen.*—Report to road foreman of engines. Must obey orders of train masters, and when at the engine house are under direction of engine house foremen; when on duty they must obey the order of enginemen.

*Master Mechanics and General Foremen of Car Shops.*—Report to superintendent, and must obey orders of superintendent of motive power.

*Engine House Foremen.*—Report to master mechanics.

*Shop Clerks.*—Report to superintendent, and must obey orders of the master mechanics or general foremen and make reports as directed by accounting and motive power departments.

*Foremen of Car Inspectors.*—Report to superintendent, and must obey orders of superintendent of motive power, or station or yard masters.

There is one division superintendent who reports directly to the general manager, namely, the superintendent of the Philadelphia Terminal division, who has the same general responsibilities as the other superintendents. He has supervision of the freight and passenger stations, the movement of trains and the maintenance of the tracks in the Philadelphia Terminal district and other business and commercial interests affecting that district. His duties partake of a double nature, viz., that of the division superintendents and the general agents.

General agents are appointed for the cities of New York, Pittsburg and Erie, and assist the general manager by taking charge of the freight soliciting agencies, and the large freight and passenger stations and employees connected therewith in those cities.

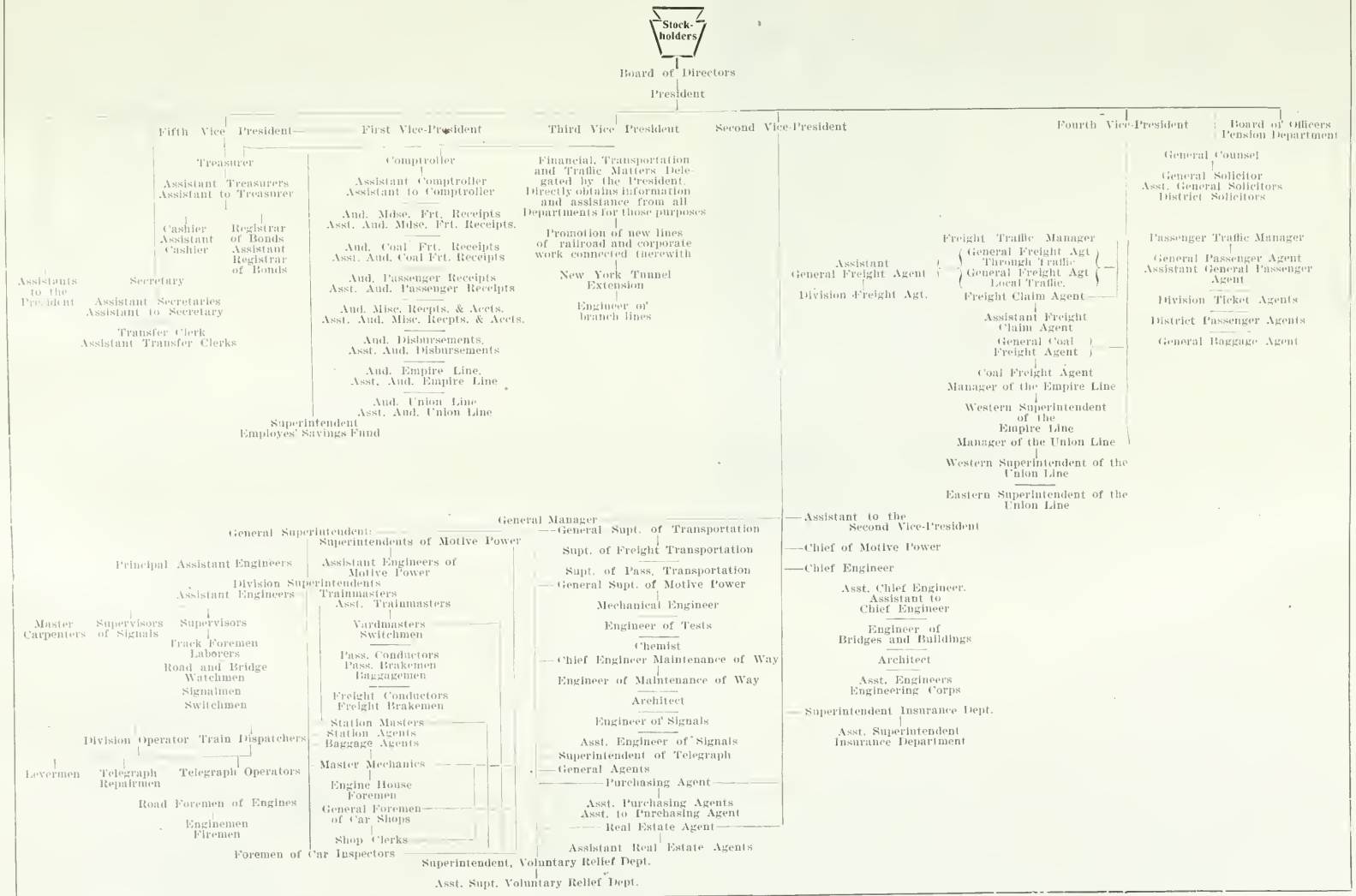
The second vice-president exercises general supervision over the purchasing agent and real estate agent, and yet these officers are also on the staff of the general manager. This is because their duties necessarily bring them into very close and constant touch with the general manager in the operation of the railroad.

The purchasing agent has charge of the department which purchases all supplies required for the company's use, and must keep in communication with the heads of all departments so that the stock of materials and supplies may be ample not only for the present but also for the future needs of the company. This necessitates a knowledge of general outside market conditions, so that supplies may be purchased at the most economical prices, and that there shall not be too much of the company's money invested in a large stock of materials for which the company has no immediate use.

The traffic department is in charge of the fourth vice-president, who assists the president by supervising the procurement and development of traffic for and upon the lines of the company, and exercises special supervision of the freight and passenger departments, and takes special charge of traffic relations with competing and connecting lines. The staff of the vice-president in charge of the traffic department consists of a freight traffic manager, a general coal freight agent, a manager of Empire Line, manager of Union Line, and a passenger traffic manager.

The managers of the Empire and Union lines are in charge of two fast freight service lines owned by the company, and take general control of their operating officers and agents, and their arrangements with other railroad companies, so as to develop the through traffic. Both of these fast freight lines are valuable to the company on account of their traffic agreements and relations with other roads. Years ago such independent agencies were a common feature, because at that time it was almost impossible to secure a fast movement of through freight on account of the conflicts which existed between competitive railroads, who very often declined to haul the cars of their competitors; and these through freight lines not only furnished the rolling stock, but also avoided the transferring of freight from the cars of one road to that of another at terminal points. Both these officers are assisted by superintendents and agents in charge of districts.

The aim of the organization thus far has been to assign several departments to each vice-president, but with the growth of the company, especially during the past ten years, the burden caused by the increased duties pertaining to these departments became so great that it was decided that there should be one vice-president in a position to consider and deal with matters pertaining to any of the principal branches of the organization, namely, finance, transportation and traffic, as the president should deem expedient, and to enable such vice-president to effectively act in that capacity he was given authority to directly obtain such information and assistance from any officer or department as might be deemed necessary in the discharge of such duties. This arrangement was for the purpose of increasing the flexibility of the organization, in addition to affording much needed relief to the vice-presidents and the president. This officer is designated the third vice-president, who in addition to this wide scope of duties has general charge of the promotion of new lines of railroad in which the company is interested, and the corporate work in connection therewith. He also assists in matters




Organization of the Pennsylvania Railroad Company, 1906.

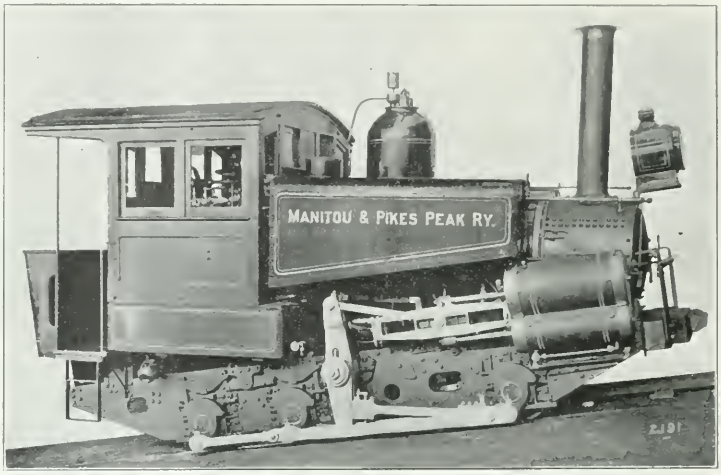
connected with the accounting department. To the third vice-president has been committed the charge of the construction work of the New York tunnel extension and the many questions incident thereto. The engineer of branch lines assists him in the discharge of his duties relating to the construction of branch lines of railroad and corporate work connected therewith. In the New York tunnel work he has a corps of chief engineers and assistants to aid him.

The legal department and secretary's department are primarily under the supervision of the president, and yet receive instructions from, and perform duties for, the executive heads of all of the other departments, and this is offered as one explanation why they are not entirely placed under the supervision of any single vice-president. For the relief of the president the nominations of all officers in the secretary's department must receive the approval of the first vice-president, and with the approval of the latter officer the secretary appoints all necessary employees in his department. The primary duties of the secretary are as an officer of the board, being responsible for a true record of the proceedings of the board and the standing committees. The office of the secretary is included within the executive department because the secretary is the channel through which the various officers are notified of the actions of the board pertaining to their departments, and of the execution of all contracts and other papers involving the interests of the company. The issue and transfer of the capital stock, and the books showing its ownership, are under his charge. He also is the custodian of the originals of the agreements and patents and other valuable documents, and takes charge of that portion of the machinery which gives notices of stockholders' meetings and elections, so that he is the agency through which the corporate work of the company begins in each year. He also takes charge of the general office building, of the necessary repairs thereto and the heating and lighting thereof. He is assisted by three assistant secretaries, an assistant to the secretary, and a stock transfer clerk. Another officer embraced in the executive department is the general counsel, who is the head of the legal department and has charge of all of the company's litigation. In this responsible work he is brought into touch with every department, and the heads of nearly every department find it essential to consult with him from time to time. The general counsel supervises the preparation of all contracts and bonds and furnishes opinions upon any subject referred to him by the president or board. His duties are far-reaching, and the wisdom of a competent legal advisor is an important element in the successful conduct of the company's business. He is aided by a general solicitor, two assistant general solicitors, located in the general office, and by district solicitors, residing in various cities along the company's lines.

In this organization sketch I have not considered the companies allied to the Pennsylvania Railroad, but do not forget that the duties of every officer is materially increased by the large number of corporations which are embraced in our system—the number of the companies east of Pittsburg being over 120—and in addition they act in an advisory capacity in other roads in which the company has an interest.

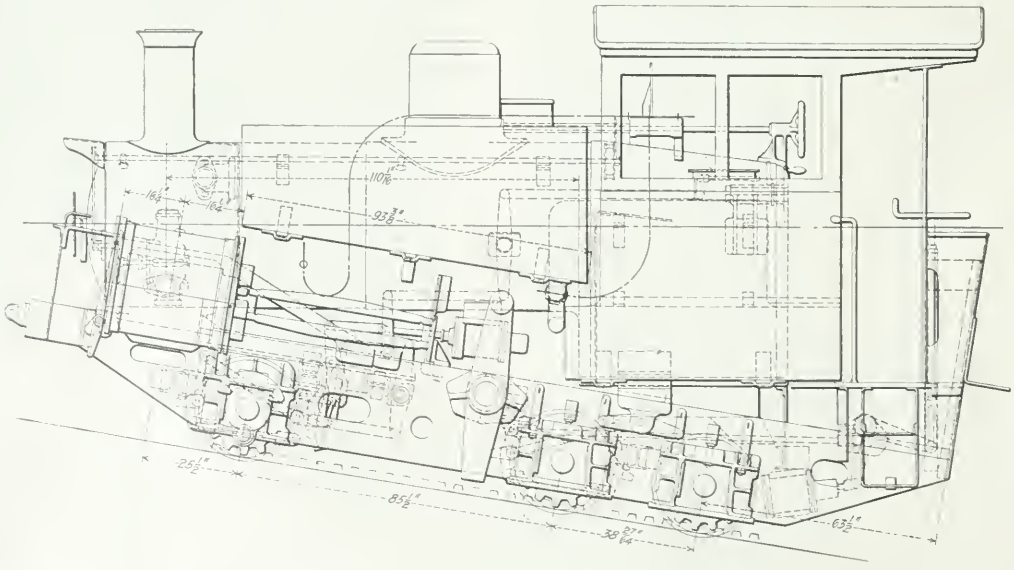
## Rack Locomotive for Manitou and Pike's Peak Railway.

Early in 1891, the first locomotives were delivered to the Manitou & Pike's Peak Railway. They were not entirely satisfactory on account of the disagreeable vibrations set up. Accordingly, in the following year, engines of a slightly different design and of the Vauclain compound type were built. They were illustrated in the *Railroad Gazette*, Aug. 12, 1892. These engines had cylinders 9 in. and 15 in. in diameter, with a stroke of 22 in. There were two geared driving wheels, with the rear end carried on a trailing truck. The engine was built with an oscillating arm to which the connecting rod, reaching to the main crank pin, was attached. The braking arrangements consisted of a band steam brake applying to the main axle, a band brake applying to the same and a water brake applying to the cylinders.

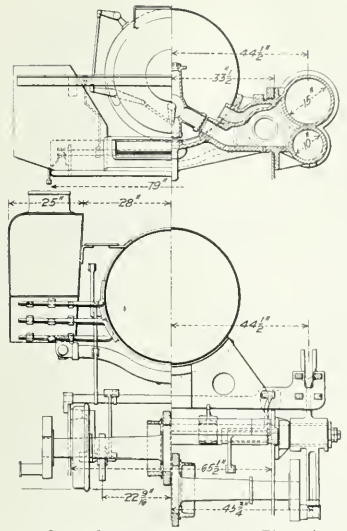



Rack Locomotive Built by the Baldwin Locomotive Works for the Manitou & Pike's Peak Railway.

The Baldwin Locomotive Works, by whom the earlier engine



Side Elevation of Rack Locomotive for Manitou and Pike's Peak Locomotive.




Cross-Sections and Rear Elevation of Manitou & Pike's Peak Locomotive.

was built, has recently completed another that possesses a number of interesting features, as shown in the accompanying illustrations.

The road is operated on the Abt rack-rail system, with a maximum grade of 25 per cent. The new engines resemble the earlier ones in the general features of the use of side tanks, three pairs of wheels and the Vanclain system of compounding, but differ in that each of the three axles is fitted with a driving gear and in the use of oil for fuel instead of coal, while the high-pressure cylinders are of 1 in. greater diameter and 2 in. longer stroke.

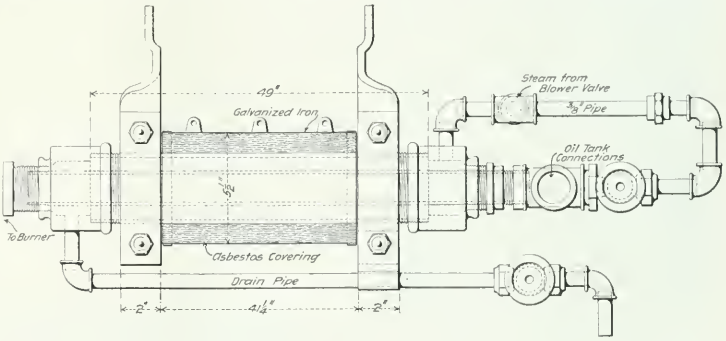
The frames are of the plate type, ¾ in. thick, and are outside the wheels. They are braced in front by top rails which are bolted to the cylinder castings as shown in the side elevation. The boiler is set so that the tubes, which are of steel, will be horizontal when the engine is upon a 16 per cent. grade, the cylinders being placed on an inclination of four in twenty-five.

The valve motion is of the Good type, with eccentric on the main or leading axle. The motion is indirect, the rock shaft being behind the links and between the frames. A screw mechanism is used for reversing.

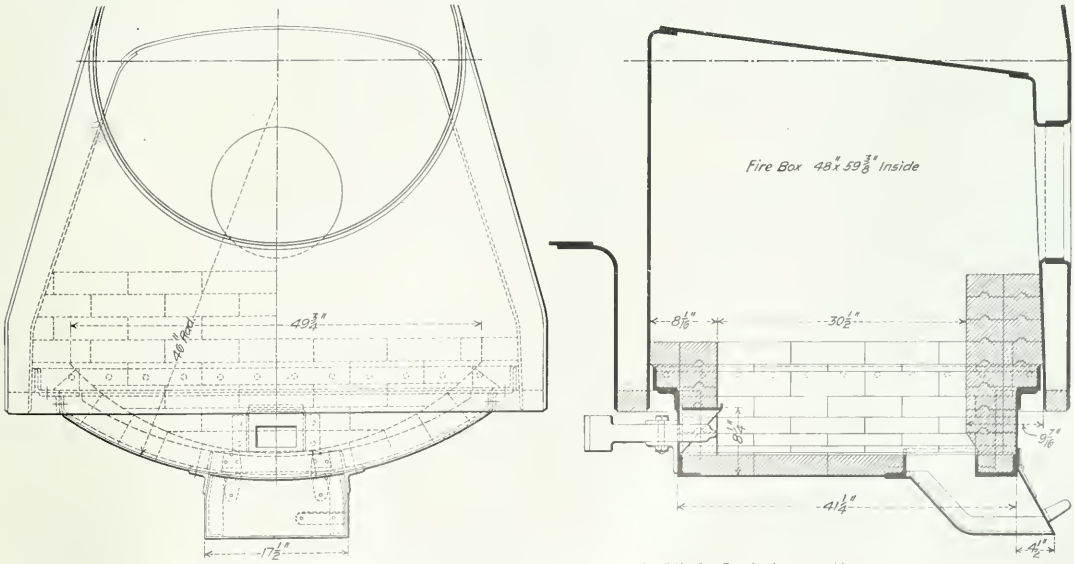
The second and third pairs of driving wheels are equalized together, semi-elliptic springs being placed over the boxes. On the front wheels the weight is carried by rubber springs in the same position.

The oil tanks are on either side beneath the cab floor, and the oil is fed through a heater placed on the left hand side of the engine beneath the ash pan. This heater is formed by a 1¼-in. oil pipe inside a 3-in. pipe 4 ft. long. The space between these pipes is filled with steam, and the outer one is lagged with asbestos covering. The burner is of the same type as that used by the Southern Pacific Co. As shown in the engraving, it is placed under the mud ring, at the front end of the firebox, and is directed back against the fire brick lining at the rear, which is $9\frac{7}{16}$ in. thick over the back sheet. A damper with an opening of $9\frac{1}{8}$ in. admits air to the back. The floor of the firebox is protected by fire brick $2\frac{1}{2}$ in. thick and, contrary to the practice on coal-burning locomotives, has its greatest dimension across the engine.

The arrangement of the oil piping and the method of its regulation will be readily understood from an examination of the engravings by which it is illustrated. The oil cock handle and the valve admitting steam to the heater are on the left hand side, conveniently located for the fireman. The oil feed cocks are near the floor on either side and control the flow from the tanks near which they are respectively located, and from which the oil flows by gravity to the heater. The control of




Oil Heater for Manitou & Pike's Peak Locomotive.




Arrangement of Oil Burning Furnace on Manitou & Pike's Peak Locomotive.

the actual injection of the oil into the firebox is effected by means of a valve operated by a connection running the breadth of the firebox from the back end, which is shown in the side elevation of the piping arrangement.

The engine is equipped with steam, hand and water brake. The steam and hand brake are of the band type, and operate upon the first and second driving axles respectively. The hand brake is also provided with an auxiliary steam cylinder by which it can be operated if so desired. The cylinder for the steam brake is set just ahead of the throat of the firebox and works through a lever shown in dotted lines in the side elevation. The auxiliary cylinder for the operation of the hand brake is set back of the rear driving axle and beneath the back end of the firebox. This works on the vertical arm of a bell crank, to the horizontal arm of which the hand application is made. The Le Chatelier water brake is operated by a valve placed on a level with the lowest gage cock.

As shown in the cross section at the cylinders, the exhaust nozzle is fitted with a shut-off valve that is operated from the cab, so that air can be prevented from being drawn into the cylinders from the smokebox when the engine is reversed. The following are some of the principal dimensions of this engine:

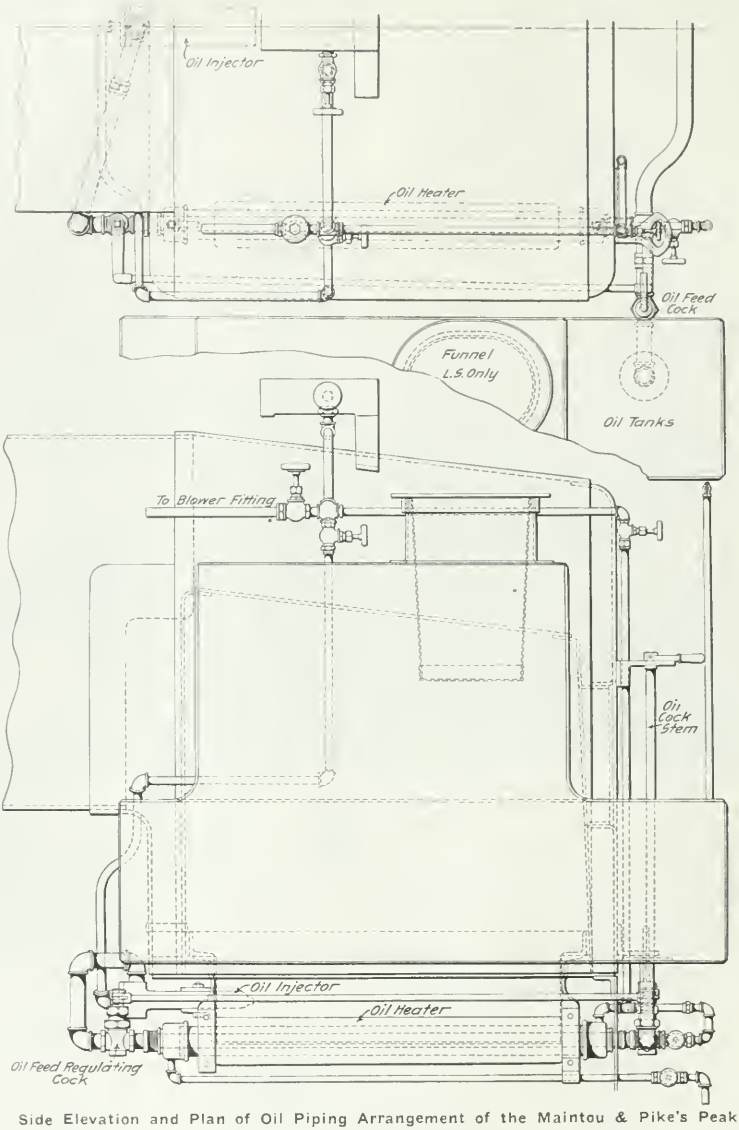
| | |
|---|---|
| Tractive power | 25,284 lbs. |
| Cylinder diameter, H. P. | 10 in. |
| Cylinder diameter, L. P. | 15 " |
| Piston stroke | 24 " |
| Steam pressure | 210 lbs. |
| Fuel | Oil |
| Firebox, length | 48 in. |
| " width | 59¾ " |
| " thickness sides & back sheets | 5-16 " |
| " thickness crown sheets | ⅜ " |
| " thickness tube sheets | 7-16 " |
| Water space, front | 3½ " |
| Water space, sides and back | 2½ " |
| Tubes, material | Steel |
| " number | 176 |
| " diameter | 1¾ in. |
| " length | 7 ft. 11 15-16 " |
| Heating surface, firebox | 58.3 sq. ft. |
| Heating surface, tubes | 546.7 " |
| Heating surface, total | 605.0 " |
| Grate area | 19.7 " |
| Driving gear, pitch, diameter | 22.465 in. |
| Driving journals, length | 6 " |
| Driving, journals, diameter | 6 " |
| Wheel base | 10 ft. 3 59-64 " |
| Weight | 60,000 lbs. |
| Tank capacity, water | 600 gals. |
| Tank capacity, oil | 325 gals. |

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 2.37.$$

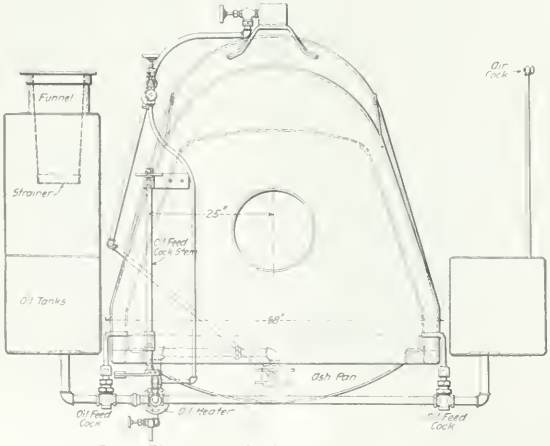
$$\frac{\text{Tractive effort} \times \text{diam. drivers}}{\text{Heating surface}} = 938.85$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 30.71$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 0.96$$




Side Elevation and Plan of Oil Piping Arrangement of the Maintou & Pike's Peak Locomotive.




Rear Elevation of Oil Piping Arrangement.

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 99.17$$

$$\frac{\text{Volume of 2 H. P. cylinders}}{\text{Heating surface}} = 2.18 \text{ cu. ft}$$

$$\frac{\text{Heating surface}}{\text{Vol. 2 H. P. cylinders}} = 277.52$$

$$\frac{\text{Grate area}}{\text{Vol. 2 H. P. cylinders}} = 9.03$$

## Welding Locomotive Frames.*

The first successful attempts to weld broken frames in place, that were given much publicity, were made on the Southern Pacific in California, following which the writer took up the idea and made many successful welds, using kerosene oil as fuel; gas can also be used. Each fracture requires its own detailed treatment; there cannot be any text-book examples laid down for others to follow. A break in a pedestal leg at the bottom, at the middle, near the top; in the upper or lower bar of the frame; over the driving-box; through a bolt hole; at the splice; horizontally, vertically, on a slant—each and every case requires its special treatment.

*Extracts from a paper by R. P. C. Sanderson, S. M. P., Seaboard Air Line, read before the M. M. Assoc., Atlantic City, June 18.

There are, however, governing conditions that rule in every case that should be understood.

To get a welding heat quickly with the least possible wasting away or burning of the metal, the oil or gas flame must be regulated so that there is not quite enough air to give absolutely perfect combustion, to the end that there will be little or no free oxygen in the flame to oxidize the metal.

For the same reason the little furnace that must be built up and around the fracture to be welded should have just space enough for the flame to whirl around the frame, give off its heat to the fire bricks and fire clay, which soak it up like a sponge soaks up water, without this flame being driven too hard against the metal, as this will cause wasting away. The inlet for the flame and its first contact with the metal should be at the back or unimportant part of the frame and not against a finished surface, that has been or must be machined, as the wasting away is greatest at first impact of the flame. There should be as little space between the metal to be heated and the furnace wall as will suffice, as the heating is done principally by the heat that has been soaked up by the bricks and is radiated back against the metal. Radiation loses force rapidly with increasing distance.

The outlet for the waste flame should be located where the man doing the job can watch the heat through it and see the weld, as a minute's extra heating is very wasteful.

No more of the frame should be heated than must be to get a good weld, seldom over 4 or 5 in. each side of the break.

The furnace must be so built that a couple of quick blows of a sledge will knock it all down, clear out of the way, so that the smiths can sledge up the weld on the sides while yet at the serviceable heat. The pit can be partly full of water into which the red hot bricks fall.

A 4 by 5-in. frame can be brought to a welding heat in not to exceed 20 minutes, if the points just mentioned are observed.

When a weld is made in this manner the frame will, of course, be a trifle shorter and somewhat wasted away, which is objectionable. To avoid this it is best to jack the fractured part and place in the fracture ⅜ in. of good high-grade soft-hammered iron. The irregularity of the fracture will usually keep the surface more or less apart, which has the advantage of allowing the heat to penetrate between the broken surfaces. The soft iron between the broken parts heats first and acts as a cement, welding more easily on the broken surfaces than they will to one another.

To get a perfect weld, a 30-ton hydraulic jack should be in place before the heat is started, so that when the metal is at welding heat it can be pumped up and force the broken surfaces together at its full power. To prevent the frame bending under this pressure it must be counterbraced, which is usually easy to do. By jacking the fracture together in welding the surface around the weld is bulged out a little all around, and after the furnace is knocked down while the pressure of the jack is still on, the two smiths can hammer away at the surfaces of the weld, leaving enough to chip or file down to a fair bearing for shoes or wedges, etc.

It is best to make some centerpunch marks in the frame well away from the weld on either side; have a tram made to fit these punch marks, allowing just a little for shrinkage for the final cooling off. These punch marks must be well outside of the furnace and the tram made to straddle it. Then the tram can be held to place where the jacking is done and the foreman can see when the weld has been sufficiently crushed together.

With skill many a broken frame can be welded in place in this manner and give satisfactory service afterward, but if the frame is too weak in design at the broken place it needs strengthening or it will break again. We cannot add metal by welding as described, but must resort to some other method.

The recently developed process of Thermit welding permits repairs to be made and reinforcement to be made on broken frames in cases that could not be handled in any other known way.

The Thermit process is not a welding process in any sense of the word, but is a casting process. The blacksmith has little or nothing to do with it; as a general proposition he should be kept out of it, as his prejudices and his interests must naturally be in an entirely different direction.

Perhaps a history of the writer's experiences in learning to use Thermit successfully will serve as a guide for others who have not tried it, or show those who have had ill success with it how they can reach success.

Profiting by the experience of a disappointed neighbor, we did not make any attempt to weld engine frames at first. The first thing done was to make a few small casts of Thermit; study its temperature and action on small sections of iron and steel. Following this we took some short broken sections of old frames and laid them in a mold on the foundry floor and attempted to mend the fractures by Thermit.

Following the usual prescription given us at that time by the manufacturers, the first cast was made and the result appeared to be a first-class job; however, bearing in mind the trouble our neighbors had had, the piece of metal was put in a planer and sliced from end to end, exposing the core or center of the weld. One-half of this was polished on the emery wheel on the guide grinder, and this showed—while bright—that the molten steel from the Thermit had welded itself to the partly fused stub ends of the old frame, but in cooling off had shrunk by natural contraction, leaving a number of cavities, like blow-holes, in the center, which materially weakened the section at that point.

It was found that this metal was exceedingly hard and brittle, while the rest of the frame was of the usual soft-hammered wrought iron, consequently we had a hard, brittle, spongy knot in the middle of the bar of soft iron.

The other half of this sample was heated in the furnace and drawn out under the steam hammer. It drew down to about one-half of the original section and then broke in two, through the old fracture and through the center of the Thermit. The fracture showed that the break had occurred through these shrinkage cavities or blow-holes.

Study of the proposition indicated clearly that some method of forcing the broken fracture together, after the cast had been made, and during the process of cooling off, and while the metal was still at welding temperature, was necessary, to close up the spongy holes—in other words, the shrinkage must be followed up in order to get solid metal. Another advantage of this would be that instead of the particles of the molten steel cooling off in the form they assume in a steel casting—in other words, in a crystallized condition—that this crushing together would in a measure produce a similar result to a subsequent forging process, in that it would knead or squeeze the congealing metal and make it more ductile.

To prove the correctness of this reasoning, a fresh sample was preapred and fresh cast was made with it in precisely similar manner to the first cast, but after pouring the cast the two ends of the frame were forced together with jacks a distance of a little over one-eighth of an inch.

The result justified our belief. The cavities were very much fewer and much smaller, and crushed together, so that they represented flaws or lines rather than holes. It was evident that the crushing process had not been undertaken soon enough, or with sufficient pressure to properly weld up these shrinkage cavities. It was also noticeable on the fractures, after polishing, that there was rather a definite line of demarcation at the junction where the cast steel had burned on to the wrought iron, and in cutting it it was noticed that when the tool went through the soft iron and came against the hard Thermit there was a distinctly different resistance, indicating still a hard knot in the middle of the soft frame.

The other half of this section, after being sliced, was drawn out under the steam hammer at a higher temperature than the first cast, and drew down to less than one-third of the original section before fracture took place, and this again showed breakage through the shrinkage cracks or cavities.

It was evident that our processes were not right yet, and since Thermit steel by its own nature must necessarily be a more dense and harder metal than any wrought-iron or cast-steel frame could usually be, it becomes necessary to figure out some way in which the line of demarcation between the Thermit, which is manganese steel, and the wrought iron, forged or cast-steel frame could be obliterated and be made more gradual, otherwise cracks would be sure to finally come in these frames at the point where this sudden change of quality in the material existed.

After much thought we decided to drill the frames on both sides of the fractures, choosing the size of the drills used to suit the size of the section; thus, as it were, making a series of dovetails in the two ends of the fractured frame, into which the liquid Thermit could be poured and interlock even though the welding might not be perfect. It would also do away with the sharp distinction between the Thermit steel and the soft metal of the original frame.

A third sample was prepared along these lines, and in view of the necessity of forcing it together more than was previously done, the original fractures were separated by small pieces of soft iron about ⅜ in. The cast was made, and as quickly after the heat and flame and burning slag would permit the sections were jacked together until they resumed the original length between previously located center marks, which meant that the Thermit metal had been compressed three-eighths of an inch after pouring.

This weld showed a very distinct advance over the others. The cuff around the weld was swelled out, due to the jacking process.

When this sample was examined it showed at the section that the junction between the Thermit steel and the original metal was less clearly defined; there were only a few small spots or specks which would indicate shrinkage cavities.

The other half of this section drew down to about one-fourth size without any fracture, except a few small ragged surface cracks at the corners, and we felt that we had succeeded in developing a process which we could rely on to give satisfactory results.

One thing which was noticeable at once in the last experiment, which we had not thought of before, was shown by the polished fracture: the Thermit had melted off the ends of the dovetails. The conclusion to be drawn from this was obvious, that with such an arrangement as high a temperature as we had been experimenting with, with pure Thermit, was not necessary, and if anything objec-

tionable, so that we added to the following test a proportion of boiler punchings in the Thermit, thus cheapening the process, and as the intense temperature of the melted Thermit was partly used in melting this additional quantity of steel punchings the result was the temperature of the molten metal was reduced; the character of the Thermit metal after cooling off was different, in that it had not been so suddenly chilled and was less brittle, which was an additional advantage gained by this new method.

We then proceeded to weld broken frames, following the lines of the last experiments, and have been, with two exceptions, universally successful.

To help toward certainty in the weld we arranged the Thermit mold around the fracture with an opening in the bottom for a gas or oil flame and, just as if we were going to make a flame weld in place, the frame and inside of the mold were heated until brought up to a bright cherry red, after which the hole in the bottom of the mold was quickly closed and made secure with a dry sand plug luted in and back with sand and the Thermit touched off.

By doing this the Thermit was not chilled by a mass of cold frame; it did not require to be robbed of so much of its heat to fuse the heavy frame ends and a larger proportion of punchings could be used successfully, thus greatly cheapening the work. This preheating of the mold is of great importance.

To reinforce a weak place the usual cuff that is cast around the weld can be extended or thickened, making the weak place stronger than before the break.

There are, of course, plenty of places about locomotive frames where fractures may occur where Thermit cannot be used, on account of the cuff interfering with attachments, but in many such cases we have chipped off such portion of the cuff as interfered and left the balance of it, in other cases the presence of the boiler mud-ring or other parts up against the frame prevented the use of Thermit. Of course, Thermit cannot be successfully used at the frame splices and in a few other places, and where it is just as easy to make an ordinary weld by means of a small furnace built around the frame as it is to use Thermit the ordinary weld is preferable and cheaper.

## Rapid Transit in Chicago.

The following report was submitted by Mr. Bion J. Arnold to the Committee on Local Transportation of the Chicago City Council, July 2, 1906. Mr. Arnold, in his letter of transmittal, refers to the council's request that he discuss the traction situation as it exists at the present time, bearing in mind the changes in the legal situation between the companies and the municipality that have taken place since his 1902 report, and that he outline a general plan to follow. He points out that the principal objects to be accomplished at present, in addition to the changing of the river tunnels, are the through-routing of cars and the adoption of a universal transfer system. The accomplishment of these objects necessitates decisions upon the following points:

First—Type of construction (whether trolley or underground conduit system) to be adopted in the downtown business district.

Second—The disposition of the river tunnels, that is, whether they shall be abandoned or reconstructed at a lower depth to facilitate navigation, and utilized in the future as parts of a surface transportation system, or be so reconstructed that they will at once, or ultimately, become parts of a permanent subway system.

Third—Whether any subway shall now be built, and, if any, how much.

*I.—Underground Conduit versus Overhead Construction.*

In my report of 1902 one of the questions submited to me was as to the feasibility and practicability of underground conduit construction for the city of Chicago. I reported that it was feasible both to construct and operate.

The running of electric cars, however, over certain streets or portions of streets by means of the overhead trolley and then changing to the underground conduit system necessarily means delay and annoyance at the point of transfer, and makes the use of the underground conduit system under such conditions more difficult than it would be could the cars operate throughout their entire course with the underground conduit system. To use the underground conduit system for the entire surface railways of Chicago would make the cost so much as to make the reconstruction of the present systems practically prohibitive, therefore, if any underground conduit system is adopted in the city at the present time it would be necessary to change from the overhead trolley to underground construction at certain points. As shown by my original report and by my specifications for the Adams street line, I have always insisted that these transfer points should be removed as far from the center of the city as possible, bearing in mind the largely increased cost of underground construction as compared with overhead. The principal object of having these transfer points removed from the center of the city is that the change may be made after the car has passed out of or before it has reached the zone of congested traffic. I have also recommended that this transfer should take place in a building or other locality that could be equipped with apparatus especially adapted for prompt service. The subject, therefore, resolves itself largely into a question as to how much underground conduit the city is prepared to insist upon at the present time. If it is now proposed to insist upon only a limited amount of underground conduit construction, and that in the strictly central district, it is my opinion that the benefis from this will not be sufficient to justify the additional cost, considering the fact that the change from underground to overhead will be attended with annoyance which will substantially equal that which will arise from the use of the overhead trolley in the business district. There are other objections to the immediate construction of the underground system in the business district arising from the necessity of a certain amount of sewer reconstruction in that district, and the possible installation of a high-pressure water system. The subway question is also involved and is of great importance. The construction of a certain amount of subway for taking care of the cars which now pass through the river tunnels must be borne in mind as one of the strong probablities if not reasonable certainties of the near future. To construct underground conduit on streets which are likely to be used for subways within any reasonable time would be obviously uneconomic as these conduits would have to be taken out in the event of a high-level subway being constructed in any street where conduit construction had previously been built. For instance, State street is now one of the streets, if not the principal street, upon which underground conduit is desired from the public point of view. In the plans which I have heretofore recommended for subway construction I have advised a high-level subway on State street. If there is any probability of the construction of such a subway in the early future it would be unwise to install an underground conduit on this street at the present time.

Owing to the fact that the plan of financing the street railway reconstruction has radically changed since my original report, and that it is now proposed to reserve to the city, or its licensee, the right to purchase the entire railway system for the value of the present property and the additional investment for improvements, it would appear to me wise to omit the construction of any underground conduit at the present time, but to specifically reserve, in any ordinances or permits that may be granted, the right that the city may require the construction of underground conduit as soon as the subway and sewer questions have been disposed of and the city has then determined upon a sufficient amount of conduit construction to carry the transfer points well out of the business center.

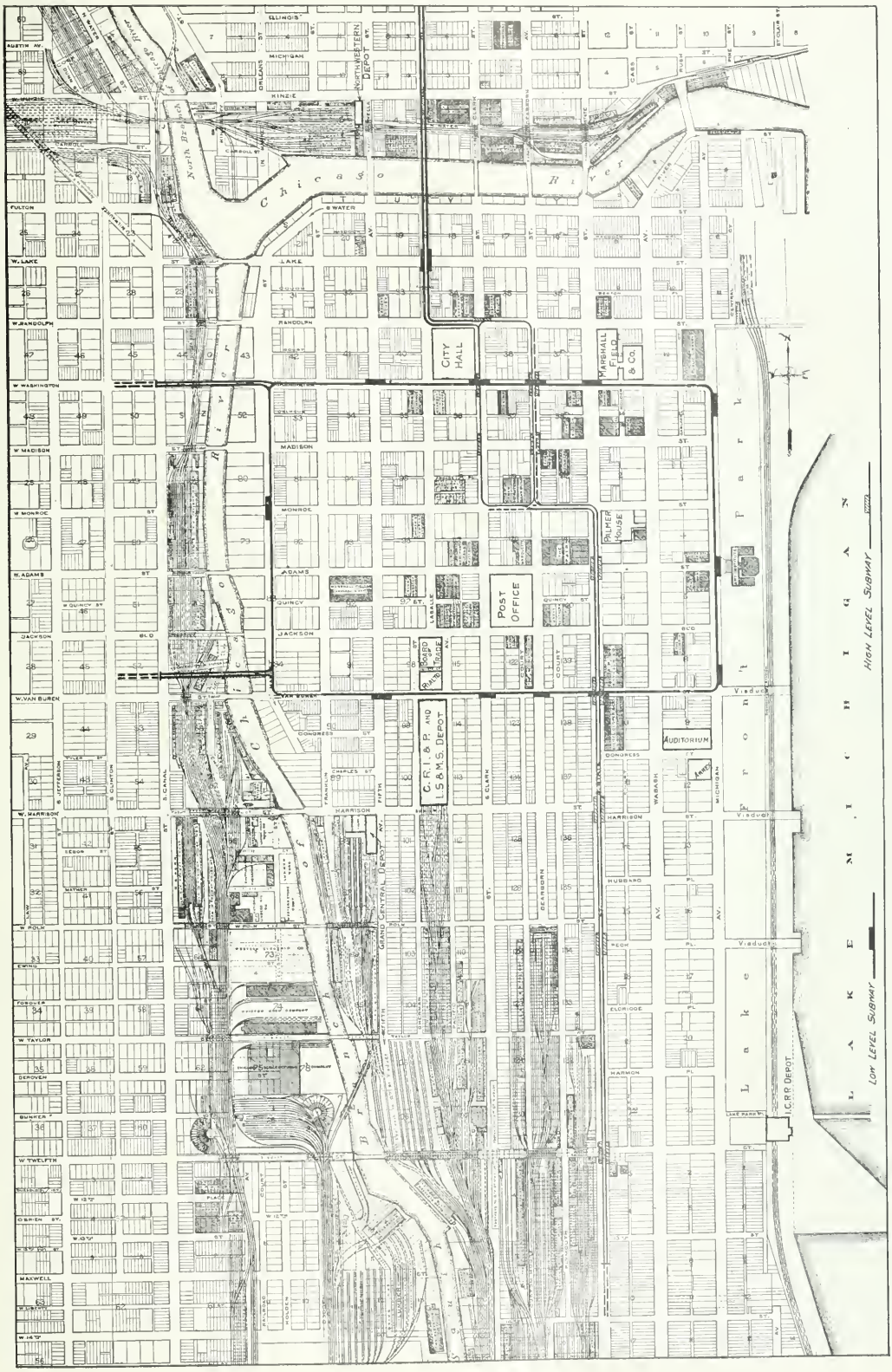
When it has become sufficiently clear that the city should and can provide for the construction of underground conduit in any one street, such as State street, for a sufficient distance to enable the cars to be operated solely by underground conduit throughout their entire course, or at least until they have reached the point where the traffic has clearly ceased to be congested I should recommend the adoption of the underground conduit, and not until then.

All feeder and transmission wires, however, should be placed underground within a district at least as large as that prescribed by the ordinances recommended by your committee on December 4, 1905.

*II.—Subways.*

With regard to subway construction, it is my opinion that all cars which pass through the tunnels under the Chicago river should be kept underground and off the surface of the streets in the downtown business district. It seems sufficiently clear that in any future development of the transportation system in this city we shall have to use some tunnels under the Chicago river between the business district and the north side and west side in order to give the citizens of these divisions the same reliability of access to the business center that the citizens of the south side now enjoy. As it will be, in my judgment, impracticable to permanently take care of the traffic by the use of bridges alone, owing to the interference from navigation on the river, and from the fact that we must at once modify the river tunnels, I can see no reason why a beginning should not be made at once in the direction of the development of a subway system. I understand that it is now contemplated to lower the existing tunnels as soon as a permanent solution of the traction question can be reached, either with the present companies or otherwise. That being so we should provide for taking care of the traffic through these tunnels by the necessary amount of subway in the central part of the city, and so plan that this subway shall be available as part of the complete system in the future. Any subway which is now constructed should be available for any reasonable development of subway construction at any time hereafter.

Your committee is already familiar with my recommendations as to subway construction, as given in my report of 1902, wherein I submitted two different subway systems, viz.: Subway Plan No. 1, as shown upon Map No. 11, and Subway Plan No. 2, shown upon Map No. 5. Plan No. 1 was submitted as an alternative plan in case Plan No. 2 could not be built. Plan No. 2 contemplated the construction of some low-level subways which would conflict with the large bore tunnels of the Illinois Telephone & Telegraph Com-




Chicago Subway System as Suggested by Bion J. Arnold.

pany (now the Illinois Tunnel Company), which that company at the time of the 1902 report was endeavoring to secure the right to build. Since the publication of that report the tunnel company has abandoned the plan of constructing these large bore tunnels, and is bound by the terms of its ordinance to keep its tunnels a certain distance below city datum which places them a sufficient depth below the surfaces of the streets to allow the construction of the low-level street-car subways. Thus the principal objection to Subway Plan No. 2 is removed, and I again recommend this plan, in general, as the best solution of the subway question for the reasons given in my report of 1902. Briefly these are as follows:

First—Grade crosings in subway construction are avoided.

Second—This subway system ultimately provides for a comprehensive downtown distributing system, and permits the universal use of transfers without injustice to any one, so that all of the objections to the exchange of transfers in the center of the city, which have been urged with such force by the railway companies in connection with the surface system, will disappear if such transfers take place only in the subways.

Third—The construction of portions of this subway system would permit the immediate adoption of through routes in subways between the north and south sides, and loops in subways for the north and west and south side systems.

I appreciate fully the necessity of confining any subway construction in the immediate future to the smallest possible amount that will take care of the traffic which is intended to pass through the river tunnels when lowered and reconstructed. This traffic can be accommodated and kept off the surface of the streets in the downtown district, and the advantages of the transfer system secured up to the capacity of the subway herein recommended for immediate construction, by a low-level single-track subway loop passing through the Van Buren street tunnel, south on Market street to Van Buren street; thence proceeding eastward in Van Buren street to Michigan avenue; thence north in Michigan avenue to Washington street; thence west in Washington street through the Washington street tunnel. This single loop tunnel to be connected on Market street by a single-track low-level tunnel between Washington and Van Buren streets. The complete loop thus constructed would take care of the west side traffic passing through the river tunnels until such time as it became necessary to construct a third river tunnel in Adams street and additional loops as shown in the completed Subway Plan No. 2.

By retaining the present eastern outlet to the Van Buren street tunnel, which could easily be done since it is on private property and does not interfere with the surface of any street, the subway loop cars could be brought to the surface and distributed over surface loops at any time when, through accident or otherwise, congestion occurred on the west side subway loop.

To take care of the north side traffic which would pass through the reconstructed La Salle street tunnel there should be a low-level double-track subway extending from the La Salle street tunnel south on La Salle street, gradually rising to Randolph street, where it becomes a high-level subway; thence east on Randolph street to Clark street, where the tracks would divide, one extending eastward on Randolph street through a single-track high-level subway to Dearborn street. The other track would swing south on Clark street through a single high-level subway and extend south on Clark street to Monroe street. A double track high-level subway should extend on Dearborn street from Randolph street to Monroe street, and on Monroe streeet from Clark street to State street, thence southward on State street to Fourteenth street, or whatever point your committee may determine upon as the present temporary southern entrance to this subway. A single track only would be laid, at present, in Monroe street from Clark street to Dearborn street, and in Dearborn street from Monroe street to Randolph street, and a double track in Monroe street from Dearborn street to State street. This arrangement (as shown on the map accompanying this report), will permit a double-track subway route between the north and south sides of the city, as well as provide for subway loops for all traffic coming through the river tunnels from the north and west sides.

If it is desired to provide for through-routing of cars through subways from the west side to the north side, and from the west side to the south side this can be taken care of by the construction of a double-track low-level subway on Randolph street, beginning at La Salle street, where it would connect with the La Salle street tunnel subway, thence west to Market street, thence south on Market street to Washington street, but I do not consider the construction of this piece of subway necessary at the present time, as it is not required in the permanent subway system, and if put in would introduce grade crossings in the subway which I have carefully eliminated in the completed system recommended, and would be built solely for the purpose of through-routing from the west division to the north and south divisions, which routing can be effectually accomplished with the surface systems.

Should your committee think it best not to do any subway construction on Clark, Dearborn or Monroe streets at the present time most of the above mentioned objects can be accomplished, though not so satisfactorily, and with some less expense, by continuing the double-track subway north on State street from Monroe street to Randolph street, thence west on Randolph street to Clark street.

To construct the low-level subway loop and north and south subways, as above described and recommended will cost approximately.....$4,800,000

If the double-track connection on Randolph and Market streets, for the purpose of through-routing is desired, it will cost an additional..... 40,000

If no subways are built on Clark, Monroe and Dearborn streets, and the double-track subway is extended on State, Randolph and Market streets, the cost would be approximately..... 4,500,000

The above figures do not include the cost of changing the river tunnels, or damages to property.

*III.—Summary.*

Summarized, then, my recommendations as to what to do at present are as follows:

First—Trolleyize the cable systems and the terminals in the business district to such an extent that the through-routes recommended in Exhibit C, and shown on Maps 18 and 19 in Supplement No. 2 of my Report No. 3, dated November 16, 1905, and adopted by you November 27, 1905, can be put into effect, with the understanding that when the completed subway system is built that the tracks in the business district will be modified to conform to the arrangement shown on Map No. 17 of that report. All feeder and transmission wires to be placed underground within the business district and such other territory as your committee may determine.

Second—Take immediate steps for rehabilitating the present surface systems, and for constructing the subways herein outlined.

Third—Reconstruct the river tunnels, when they are reconstructed, at such level and in such a manner that they can be used as part of a permanent and comprehensive subway system.

Respectfully submitted,

(Signed) Bion J. Arnold,
Consulting Electrical Engineer.

I concur in the recommendations as to general policy outlined in the above report.

(Signed) Walter L. Fisher,
Special Traction Counsel.

## Hill's Canadian Invasion as Seen by Eastern Canada.

BY J. A. MACDONALD, C.E.

Mr. J. J. Hill's invasion of Canada is now an assured fact. Western Canada, from Manitoba to the coast, hails his advent with the greatest enthusiasm. The West wants all the railroad competition possible, and cares not whence it comes. It knows what it is to suffer grinding monopoly. What further accentuates Mr. Hill's welcome in the West is the large number of his old neighbors from Dakota, Montana and Minnesota, who are now settled and settling there. But if the West hails the invasion of Mr. Hill with such evident delight, Old Canada does not nor do the Canadian railroads. Their cry is, "Canada for the Canadians."

Had Canada and the United States been under one flag since 1776, it is safe to say the main lines of Canadian railroads would have been built from north to south rather than from east to west. Starting at British Columbia, we should have had roads running, not diagonally across the mountains, but down the valleys into Washington, Oregon, California, Idaho and Montana. The wheat of the Northwest would have been carried to Minneapolis and Duluth and the north shore of Lake Superior given a wide berth. It would not have been necessary to bring the Intercolonial to Levis or Montreal. Montreal and Quebec would have been the summer ports, but in winter the provinces of Quebec and Ontario would have used Portland, Boston and New York, nearer to them than St. John or Halifax. This would in all probability have been the state of things now existing had we been American subjects. As we are not American but British subjects, ambitious to build up a British nation on this continent, our policy has hitherto been to confine Canadian traffic as far as possible within Canadian channels, just as, since 1879, we have endeavored to do our own manufacturing. There was no other way by which we could hope to solidify the country.

The Intercolonial, which has cost $80,000,000, was the first railroad built from east to west to serve this great political object. The Grand Trunk united Upper and Lower Canada, but in a commercial rather than a political sense. Then came the Canadian Pacific, built primarily to connect the Northwest and British Columbia with Old Canada. Though its eastern division traverses Maine, it does so in the interests of St. John and Halifax. As a Canadian line, it was obliged to build along the north shore of Lake Superior, a more or less hopeless wilderness 600 miles wide, and to face the enormously expensive work involved in crossing at right angles the mountain ranges of British Columbia. The Canadian

Northern, a commercial and, as yet, local railroad, has been built from east to west within Canadian territory in order that its traffic may be handled by Canadian lake and ocean ports. The Grand Trunk Pacific is to run in the same direction and on Canadian soil all the way from Moncton to the Pacific, for the same purpose. The cost of these four roads, counting public and private expenditure, will approach $500,000,000.

With the same determination to make herself independent of the United States, Canada has built canals between Montreal and the Soo at a cost of $100,000,000. There were some who argued that, instead of going to so much expense, she should use the Erie, Oswego and Champlain canals to reach New York with her products, but they were promptly overruled. In addition Canada has spent many millions of public and private capital in dredging channels, improving harbors and building elevators, docks and ocean steamships in the belief that Canadian traffic, including that of the West, would be preserved for Canadian ports. When Mr. Blake and Sir David MacPherson suggested that the Canadian Pacific should commence opposite Pembina, N. Dak., on the United States boundary south of Winnipeg, and going up to Winnipeg and Selkirk, cross the prairies and mountains to the Pacific ocean, its eastbound freight being turned over to the American lines at Pembina, they found few sympathizers. Liberals as well as Conservatives in Old Canada asked, "Why should we tax ourselves for so great an enterprise if the Americans are to be the principal beneficiaries—if Montreal and Quebec, Halifax and St. John are to be cut out of the export and import traffic?"

Canada's policy in these vital matters is apparently about to be reversed. Some time ago, with Mr. J. P. Morgan's assistance, Mr. Hill consolidated the Northern Pacific with his own road, the Great Northern. They are still separate corporations in name but are both under his immediate control. At present he taps Canadian territory between the Red river and New Westminster at a dozen different points, nine or ten other branches run to within a few miles of the boundary, and he is building a main line through British Columbia, which is to be extended eastward, he says, to Winnipeg. All these roads are or will be feeders of the Northern Pacific and Great Northern, and all the Canadian traffic they bring down will be carried to American ports. When Mr. Hill has fully executed his plans, the Northwest and British Columbia will be much more closely attached to the United States than to Old Canada, so far as railroad communication is concerned.

Mr. Hill is a veteran campaigner. He knows how to appeal to human nature. His promise to spend $30,000,000 on his road from Fernie to Winnipeg, $25,000,000 on the Vancouver, Victoria & Eastern, and an indefinite sum on his new spurs in Manitoba, has, of course, aroused much enthusiasm in Manitoba and British Columbia. His announcement that Canadian hard wheat is about to be admitted free into the United States is another happy stroke of the same kind. If Mr. Hill is to be believed, one purpose of his in thus entering Canadian territory is to feed the Canadian Pacific and Grand Trunk Pacific. However, by carrying their traffic for shipment to American lake and ocean ports, he will seriously impoverish the Canadian roads, besides doing great damage to Fort William, Midland, Depot Harbor, Owen Sound, Montreal, Quebec, St. John and Halifax.

Taking the Northern Pacific and Great Northern together Mr. Hill now has lines reaching the Canadian boundary, or to within a short distance of it, at the following points:

(1.) From the Great Northern main line to Greenbush, near Warroad, on the Canadian Northern, at the south end of Lake of the Woods.

(2.) From the Northern Pacific to Pembina; two spurs from the Great Northern to Emerson and Gretna, further west.

(3.) From the Great Northern to Wallhalla, Hannah, Hansboro, Thorne, Sarles, St. John, Bottineau and Sherwood, all separate spurs.

(4.) From the Great Northern to the boundary of Sweet Grass (Coutts) and thence to Lethbridge.

(5.) From the Great Northern, separate spurs to Fernie, Kootenay Landing by way of Creston, Nelson, Kaslo and Sandon, Rossland, Grand Forks and Midland.

(6.) A Northern Pacific line from Mission Junction, B. C., to Seattle and Portland, together with a Great Northern line from New Westminster and Vancouver to the terminus of the main line at Seattle.

In other words, Mr. Hill has already tapped Canadian territory at 12 or 13 different points and is within striking distance of the boundary at nine more.

His entrance into Canada is of vital moment not only to the Canadian transcontinental railroads but to Canadian lake and ocean ports as well. Canada has sunk a vast amount of public money in all three, and private capital has sunk more. Canadian ocean ports, Montreal and Quebec, St. John and Halifax, have been handicapped in various ways from the beginning.

(1.) The navigation laws, whereby none but British bottoms were allowed to participate in the colonial trade, were the cause of excessively high outward ocean rates from Quebec down to their repeal 60 years ago, with the result that a great deal of the produce of upper Canada destined for Europe was sent by way of the Erie canal to New York.

(2.) Nature is somewhat unkind. For five months of the year the St. Lawrence is icebound and business has to be transferred to St. John and Halifax. Such a break in the continuity of trade is, of course, a very serious matter for Montreal and Quebec.

(3.) Halifax and St. John are excellent winter ports, but geography is against them, since the Ontario exporter and importer finds it cheaper to use Portland, Boston and New York, which are considerably nearer.

(4.) Marine insurance favors American and discriminates against Canadian ports, more especially in the fall, when export grain is going out.

(5.) The Welland and St. Lawrence canals, on which $100,000,000 has been spent, are not deep enough to accommodate the modern type of steam vessel employed on the upper lakes, the result being that a considerable percentage of wheat grown in the Canadian Northwest, and the great bulk of that grown in the northwestern states, reaches the Atlantic by way of Buffalo and New York or by other American routes and is lost to Montreal.

(6.) Ocean traffic at Montreal is crippled to some extent by inadequate harbor accommodation as well as by the danger involved in taking the larger vessels up the St. Lawrence. This will be improved with the deepening and widening of the channel; meanwhile the port of Montreal is suffering from those drawbacks and must for some time yet continue to suffer.

(7.) Great sums are and have been spent by the United States Government in improving the harbors of New York, Boston, Portland, Baltimore, Newport News, Philadelphia, etc. As the efficiency of those seaports increases, they become more and more formidable competitors of Canadian summer and winter ports.

In giving Mr. J. J. Hill the free run of the Northwest and British Columbia, thereby enabling him to carry their traffic south, Canadian ports will be dealt a hard blow. When the Government chartered the Grand Trunk Pacific it did what it could to prevent the diversion of traffic to Portland. But what will that avail if traffic is to be switched south to the American seaboard at the points of origin? The question is one of momentous importance to eastern Canada and its ports. They believe they have a better right to handle Canadian traffic than Mr. Hill's railroads; than Duluth and Buffalo, New York and Boston. In taking this ground eastern Canada cannot be accused by Americans of narrowness of spirit. It's wish is simply to retain Canadian business in Canadian channels, on which a vast amount of money, public and private, has been spent; just as Americans keep their home market to themselves by means of a high tariff wall, and their coasting trade to themselves by prohibiting Canadian vessels from trafficking between one American port and another.

## Comparative Test of Large Locomotive Air Pumps.

In the course of the development of the present-day railroad practice it has come about that the demand for compressed air by the air-brake and the auxiliary apparatus, such as bell-ringers, sanders, water scoops and the pressures used on Pullman cars, has become far in excess of the capacity for which the air pump was originally designed. In response to the demand for an increased air supply the New York Air-Brake Co. brought out a duplex pump; this has been more recently followed by the Westinghouse Air-Brake Co., with a compound pump illustrated in the *Railroad Gazette* of June 30, 1905. These pumps have been designed to take the place of the 11-in. Westinghouse pump that was thought at the time it was brought out to have a capacity sufficient to supply air for all conditions of train service.

As the locomotive air pump in its original form was not an economical machine from the standpoint of steam economy, and as the great demands made upon it of late have resulted in a serious drain upon the coal pile, an attempt was made in each of the pumps referred to to secure a better steam distribution and consequently to do more work per pound consumed. With a view of determining in a practical way the capabilities of the two types of compressors, the officials of the mechanical department of the Lake Shore & Michigan Southern have recently completed a series of comparative tests between the New York No. 5 duplex pump and the Westinghouse compound.

The tests were divided into three classes as follows:

1st. Efficiency and capacity tests with pumps working against constant pressure.

2d. Efficiency and capacity tests with the pumps working against increasing pressure as in charging reservoirs.

3d. Efficiency and capacity tests with the pumps working against approximately constant pressure, an orifice in a diaphragm being used to approximate the amount of air delivered.

The steam was furnished by a locomotive boiler and was first passed through a jacketed receiver that served not only as a separater but as a means of controlling the pressure. The exhaust steam from the pumps was condensed in a surface condenser and then

weighed. The delivery pipes of the pumps were connected to the constant pressure reservoir No. 3, the overflow from it being alternately measured in the measuring reservoirs Nos. 1 and 2. In arranging the pumps and reservoirs, an effort was made to have the pipe volume of each pump the same. The difference was slight, the Westinghouse pump having the larger volume. Thermometers were inserted in the delivery pipes near the discharge valves of the two pumps, and in reservoir No. 3. Pressure gages were attached to reservoirs Nos. 1, 2 and 3, and to the steam receiver. The strokes of the pumps were taken with an ordinary reciprocating counter. The whole apparatus was arranged so that the conditions were almost identical for both pumps, thus avoiding the necessity of making corrections for observations.

In the first series of tests the pumps were worked with steam pressures of 150 lbs., 175 lbs. and 200 lbs. per sq. in., and the pressures against which they worked varied from 70 lbs. to 130 lbs. With 200 lbs. steam pressure the constant air pressures against which the pumps worked were 70 lbs., 100 lbs., 130 lbs. and 140 lbs., with the following results: The total amount of free air pumped by each pump was the same, but the work was done in a shorter interval of time by the Westinghouse than it was by the Duplex; while there was a marked decrease in the quantity of steam used,

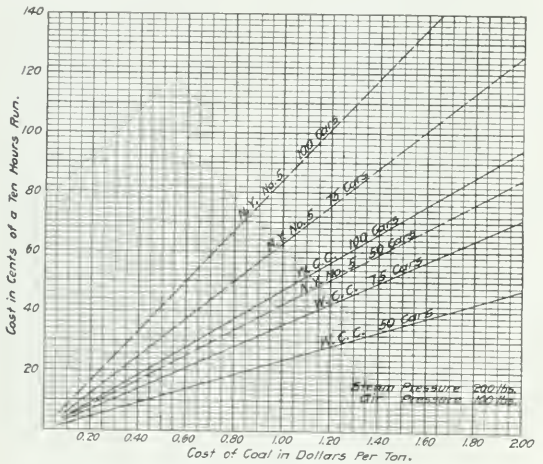

Cost in Cents of a Ten Hours Run.
Cost of Coal in Dollars Per Ton.
W. H. No. 3. 100 Cents
N. Y. No. 3. 75 Cents
W. C. C. 100 Cents
N. Y. No. 2. 50 Cents
N. Y. No. 2. 75 Cents
W. C. C. 75 Cents
W. C. C. 50 Cents
Steam Pressure 200 lbs. Air Pressure 100 lbs.

**Diagram Showing Cost of Coal for Operating Air Brakes.**

and this was coupled with lower initial and final temperatures. The first items are shown in detail in the following tables:

*Comparison with Steam Pressure at 200 Lbs.*

| | Westinghouse | | | | Duplex | | | |
|---|---|---|---|---|---|---|---|---|
| Constant air pressure, lbs. | 140.0 | 130.0 | 100.0 | 70.0 | 140.0 | 130.0 | 100.0 | 70.0 |
| Free air per min., cu. ft. | 115.5 | 131.0 | 151.6 | 168.0 | 75.2 | 93.6 | 115.7 | 138.2 |
| Weight of steam used, lbs. | 143.5 | 121.3 | 116.0 | 94.8 | 317.6 | 249.0 | 207.8 | 164.5 |

This gives the percentage in favor of the compound pump.

| | Constant air pressure | | | |
|---|---|---|---|---|
| | 140. | 130. | 100. | 70. |
| Free air delivered, lbs. | 53.6 | 40.1 | 31.0 | 21.6 |
| Free steam used | 121.3 | 105.4 | 79.1 | 71.0 |

*Comparison with Steam Pressure at 175 Lbs.*

| | Westinghouse | | | Duplex. | | |
|---|---|---|---|---|---|---|
| Constant air pressure, lbs. | 130.0 | 100.0 | 70.0 | 130.0 | 100.0 | 70.0 |
| Cu. ft. of air per min. | 107.9 | 132.4 | 151.6 | 72.3 | 100.3 | 122.4 |
| Weight of steam used, lbs. | 124.5 | 110.8 | 85.8 | 251.0 | 206.3 | 155.5 |

The percentage in favor of the compound pump is:

| | Constant air pressure. | | |
|---|---|---|---|
| | 130. | 100. | 70. |
| Free air delivered, lbs. | 49.2 | 32.1 | 23.5 |
| Weight of steam used, lbs. | 101.6 | 86.2 | 81.4 |

*Comparison with Steam Pressure at 150 Lbs.*

| | Westinghouse | | | Duplex. | | |
|---|---|---|---|---|---|---|
| Constant air pressure, lbs. | 120.0 | 100.0 | 70.0 | 120.0 | 100.0 | 70.0 |
| Cu. ft. of free air per min. | 85.8 | 110.9 | 132.5 | 60.0 | 79.6 | 106.1 |
| Weight of steam used, lbs. | 105.5 | 102.8 | 81.5 | 220.8 | 208.5 | 148.5 |

The percentage in favor of the compound pump is:

| | Constant air pressure. | | |
|---|---|---|---|
| | 120. | 100. | 70. |
| Free air delivered, lbs. | 43.0 | 39.3 | 24.9 |
| Weight of steam used, lbs. | 109.3 | 102.9 | 82.2 |

From this it appears that the compound pump was not only by far the most economical in the use of steam but had the greater capacity of the two by from 21.6 to 53.6 per cent., according to the conditions under which the pumps were worked.

In the second series where the test was for capacity with the pumps working against an increasing pressure, the time and weight of steam consumed in the work was taken. The initial air pressure was 30 lbs. in every instance, and the work was done under nearly identical atmospheric temperatures, though in some cases that obtaining at the time of the Duplex pump tests was 3 deg. the higher. The results are given in the following tables for the several steam pressures used.

*Comparison of Time and Steam Required to Compress 100 cu. ft. of Free Air from Initial to Final Pressure.*

Steam Pressure, 200 Lbs.

| | Westinghouse | | | | Duplex | | | |
|---|---|---|---|---|---|---|---|---|
| Final air pressure, lbs. | 70.0 | 100.0 | 130.0 | 140.0 | 70.0 | 100.0 | 130.0 | 140.0 |
| Time req. to compress, sec. | 40.2 | 41.8 | 43.5 | 43.8 | 43.7 | 47.6 | 52.7 | 55.0 |
| Steam used, lbs. | 21.2 | 20.9 | 20.9 | 21.1 | 32.1 | 33.1 | 37.2 | 37.6 |

Steam Pressure, 175 Lbs.

| | Westinghouse | | | Duplex. | | |
|---|---|---|---|---|---|---|
| Final air pressure, lbs. | 70.0 | 100.0 | 130.0 | 70.0 | 100.0 | 130.0 |
| Time required to compress, sec | 42.3 | 44.3 | 46.9 | 49.2 | 53.7 | 61.5 |
| Steam used, lbs | 18.7 | 18.5 | 16.5 | 23.0 | 32.4 | 34.8 |

Steam Pressure, 150 Lbs.

| | Westinghouse | | | Duplex. | | |
|---|---|---|---|---|---|---|
| Final air pressure, lbs. | 70.0 | 100.0 | 130.0 | 70.0 | 100.0 | 130.0 |
| Time required to compress, sec | 46.5 | 49.9 | 57.0 | 55.6 | 61.9 | 76.1 |
| Steam used, lbs. | 15.2 | 17.0 | 17.8 | 29.3 | 30.5 | 34.5 |

Taking the percentages of the gains thus shown by the Westinghouse compound pump we have:

*Table of Gain in Time, Per Sec.*

| Final pressure. | Steam pressure 200. | 175. | 150. |
|---|---|---|---|
| 140 | 25.6 | .... | .... |
| 130 | 21.1 | 31.1 | 33.4 |
| 100 | 13.9 | 21.4 | 24.0 |
| 70 | 8.6 | 16.4 | 19.7 |

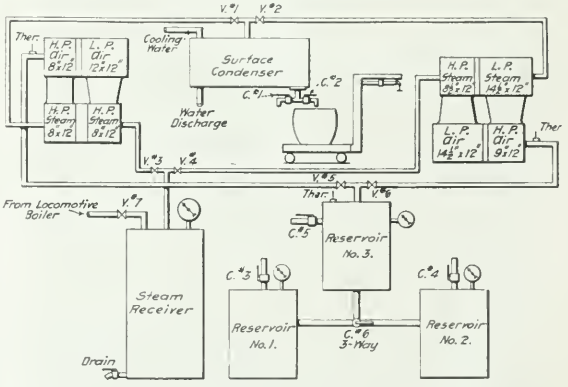
*Table of Saving of Steam, Per Cent.*

| Final pressure. | Steam pressure 200. | 175. | 150. |
|---|---|---|---|
| 140 | 78.0 | .... | .... |
| 130 | 78.0 | 111.2 | 93.9 |
| 100 | 58.1 | 75.1 | 79.0 |
| 70 | 51.4 | 23.1 | 93.5 |

In the last series with the pumps working against an approximately constant pressure and discharging through an orifice in a diaphragm the results showed an average saving of steam of nearly 38 per cent.

As already stated, there was a slight difference of reservoir capacity for the two pumps, due to a variation in the piping and in calculating the units of comparison, time and steam per 100 cu. ft. of free air, this reservoir difference was considered but was too small to be noticed. It will be observed that the initial pressure in these tests was 30 lbs. in each case, increasing to 70 lbs., 100 lbs., 130 lbs. and 140 lbs., this minimum pressure being selected owing to the excessive pounding of the heads of the New York Duplex, a condition which largely prevailed when the pump was working against low air pressures.

In this connection it may be said that the Westinghouse Compound worked very quietly, regardless of either high or low air or steam pressures, the tendency to pound being absent even when the




**General Arrangement of Apparatus Used for Comparative Test of Westinghouse and New York Locomotive Air Pumps.**

throttle was thrown wide open with a high boiler pressure and with little or no air pressure in the charging reservoirs. This is of special importance owing to the "racing" of pumps against low pressure being responsible for a large portion of the failures of pumps of the simple and duplex types.

Aside from the important question of being able to supply the air needed for all the various auxiliaries upon a modern train, that of cost of coal for the operation of the pumps must be considered. In order to show this relation as derived from this series of tests the accompanying diagram has been drawn up in which the cost of coal for operating the air-brakes on trains of different lengths is shown for the two types of pumps under consideration. In this the effect of the percentage of saving is brought out very clearly where it appears that the cost of operating a 75-car train with the Westinghouse compound pump is about 17 per cent. less than that of operating a 50-car train with the New York Duplex pump, or a comparison of 50-car trains shows a saving in coal of about 45 per cent.

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 3. FRIDAY, JULY 20, 1906.


The field of electric traction on steam railroads is evidently soon to be widely extended in this country if the reported announcement of Mr. James J. Hill on his visit this week to the Pacific Coast is to be shortly carried out. This is to the effect that the Portland & Seattle, a Hill subsidiary, which is now building a line for the Great Northern and Northern Pacific down the Columbia river into Portland, is to build, true to its name, a new Hill link between Portland and Seattle, supplementing the present Northern Pacific line between those two cities, and that the new road or part of it is to be operated by electricity instead of by steam. This is the first instance in which one of the large railroad systems in the West has undertaken to install electric operation and the results of the experiment will be watched with a great deal of interest by railroad managers in that part of the country. The state of Washington appears to be a region unusually well suited to use of electricity as a motive power, because of its numerous water powers, many of them as yet undeveloped, which are easily available. As the new road has yet to be built, it will, of course, be some time before the final decision as to motive power need be made. By that time the experience gained by actual operation on some of the Eastern roads will be available. Nevertheless, the announcement of intention to electrify the new line is good proof that the success already obtained experimentally in electric operation by the New York Central, the New Haven and the Pennsylvania has made Mr. Hill, at least, reasonably certain of the success of the new system.

In its present somewhat inchoate stage the "Lincoln Republican" organization of New Hampshire, with which Winston Churchill is identified, apparently represents at least a sincere movement toward state reforms which may or may not hereafter be harvested in results on the variegated field of politics. The organization has lately struck a position on three points of railroad policy, namely, (1) opposition to free railroad transportation, (2) in favor of "true" valuation of railroad property for purposes of taxation, and (3) approval of the election of railroad commissions by the people. The first of these propositions we pass here until the limits of free transportation by the railroads—of course, inside the state—as contemplated by the new organization are more explicitly set forth, while as to "full" taxation of railroads, it may be suggested to the Lincoln Republicans of New Hampshire that taxation of a debt at par value and of stock at market value comes about as near fullness of valuation as can practically be attained in a country where there are about as many systems of railroad taxation as there are states in the Union. The third proposition, the election of railroad commissions by the people, is not only specific but pretty suggestive as coming from a New England State, and a commonwealth that has had a commission for many years, albeit with somewhat restricted powers; nor has it less meaning as an expression of a "reform" idea at a period when state commission activity in the land is reviving and, in too many cases, perniciously. But the plan is of very doubtful merit. Some states in the Union have now elective commissions, others appointive; but results show very obscure balances of virtue in favor of either system. As a very broad and general truism with many exceptions, it may be said that appointive commissions have shown themselves too lax, elective commissions too radical and both kinds ignorant and untrained, with liberal infusions of "politics," personal or partisan. The appointive state commission falls into the limbo of "pull" and favoritism, the elective commission into that of caucus and convention. Of the two, in the practical outworkings, the appointive plan is probably less bad, as it thrusts on the appointing power—whether governor, legislative or both—a certain personal responsibility. What the commissions need, of course, is what they now lack, men of character, courage and training. If men of intelligence, energy and civic righteousness, such as appear to be behind the new movement in New Hampshire, would only brace up the appointive system by bringing organized and intense pressure on the appointing power not only would the commissions be a good deal better than they are now, but almost as good as even idealists, under existing general conditions, have any right to expect. In the

absence of such civic energy the state commissions are as they are, with ability and equity alike predicated only upon the happy chance which now and then brings in an able and honest man as chairman.

## THE OUTWORKINGS OF RAILROAD MONOPOLY.

In a railroad sense all New England, like the Gaul of Cæsar's Commentaries, divides itself into three parts. In the north is the Boston & Maine system, in the south, the New York, New Haven & Hartford system, and between the two the Boston & Albany line. The New Haven system in the south, ever since it acquired the New England some 10 years ago, may be described as an almost unqualified territorial monopoly more complete, probably, than can be found in any other similar region—of great wealth and industrial energy—in the world, except in those countries where the railroads are under State control. In the north the Boston & Maine may also be described as a monopoly, but a modified one. It has not the reach in territorial control of the New Haven nor the marine protection of a fleet of boats, nor the regulation, not to say check, of competition derived from large ownership of street railway systems. The fact that the Grand Trunk cuts both the northern and southern systems with outlets to Portland and New London respectively, is a coincidence which, while somewhat affecting western business, does not bear seriously on the dominance of the two great New England roads. The midway line, the Boston & Albany, is in no sense whatever a monopoly and, as a policy, has not acquired subsidiary or electric lines. To round up the description, it should be said that the New Haven had last year, including the Ontario & Western and Central New England lines, 2,833 miles of main track, and $49,981,948 gross earnings, not including earnings of the boat lines and street railways; the Boston & Maine, 2,286 miles of main track and $36,213,246 gross earnings from operation; and the Boston & Albany, 392 main track miles and $10,748,469 gross earnings from operation. The three corporations together operate over 96 per cent. of the railroad mileage and conduct about 98 per cent. of all the passenger and freight business covered by the reports of the Massachusetts railroad commissioners—ratios that would not be greatly reduced for all New England.

The three roads may therefore be said to represent the three principles of full monopoly, qualified monopoly and non-monopoly in a connected group of six States with a total population by the last census of 5,591,952, and with very high industrial development. What are the respective outworkings and by what can the results be tested? Primarily by the variations downward in freight and passenger rates during a period of years sufficient to index tendencies clearly. For this purpose we take the last 10 years, which is not merely a rounded span of time, but is sufficient to illustrate the principles stated—a period during which, in the history of the three roads, monopoly, qualified monopoly and non-monopoly have had their fullest play.

In the tables annexed, compiled from the annual returns of the Massachusetts Railroad Commission, are given the variations in rates per ton mile and passenger mile, the rates for the merged New England and Fitchburg lines being introduced for reasons to appear later.

| | *Average Freight Rate per ton-mile (cts.).* | | | | | *Average Passenger Fare per mile (cts.).* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year. | New Haven. | Boston & Maine. | Boston & Albany. | New England. | Fitchburg. | New Haven. | Boston & Maine. | Boston & Albany. | New England. | Fitchburg. |
| 1896.. | 1.57 | 1.53 | 0.94 | 1 11 | 0.86 | 1.77 | 1.79 | 1.75 | 1.94 | 1 77 |
| 1897.. | 1.54 | 1.45 | .92 | 1.07 | .87 | 1.80 | 1.76 | 1.75 | 1.97 | 1.81 |
| 1898.. | 1.51 | 1.48 | .83 | 1.10 | .82 | 1.77 | 1.74 | 1.75 | 1.93 | 1.83 |
| 1899.. | 1.41 | 1.43 | .78 | ... | .77 | 1.80 | 1.71 | 1.74 | ... | 1.80 |
| 1900.. | 1.45 | 1.44 | .82 | ... | .80 | 1.78 | 1.73 | 1.75 | ... | 1 81 |
| 1901.. | 1.48 | 1.13 | .83 | ... | ... | 1.76 | 1.76 | 1.74 | ... | ... |
| 1902.. | 1.46 | 1.12 | .97 | ... | ... | 1.74 | 1.76 | 1.72 | ... | ... |
| 1903.. | 1.41 | 1.13 | .97 | ... | ... | 1.73 | 1.77 | 1.73 | ... | ... |
| 1904.. | 1.42 | 1.18 | .99 | ... | ... | 1.73 | 1.78 | 1.68 | ... | ... |
| 1905 . | 1.41 | 1.15 | .93 | ... | ... | 1.70 | 1.76 | 1.64 | ... | ... |

Taking up first for analysis the freight rate table, there will be noticed the absolute low rate through the decade of the Boston & Albany, due to its large through western business on low-class freight, and also the slight variation, if we compare the beginning with the end of the decade—the reduction being but a trifle more than 1 per cent. In comparing the New Haven with the Boston & Maine, certain qualifications must be stated. The sudden fall in the Boston & Maine rate from 1.44 cents to 1.13 cents in the year 1901 is explained by the absorption of the Fitchburg with its large low-class through freight traffic. If the difference be allowed for in the same terms, it raises the rate at the end of the decade to 1.46 cents while similar correction for the New Haven rate after taking in the low-class freight New England line raises the New Haven figure, for purposes of comparison, to 1.51 cents last year. In the final computation the reduction of the New Haven during the 10 years becomes, in percentages, a little more than 3.8 per cent.; of the Boston & Maine a little less than 4.6 per cent.; and of the Boston & Albany a little more than 1 per cent. as stated. Had the comparison been made for 11 years, the reduction on the New Haven would have been more than 9 per cent., as it had a rate of 1.66 cents in 1895. In the actual figures of the table since the merger of the returns of the New England and the Fitchburg, it will be noticed that the New Haven rate, as compared with the year 1901, has decreased 7 points, while the Boston & Maine has increased 2 points and the Boston & Albany 10 points.

In analyzing the passenger rate variations, as shown by the table, one is relatively free from the disturbance of the rates by the two absorbed roads. But the New Haven has just made a reduction to 2 cents a mile on its regular passenger fare which will be in force on its whole system by next November. On the basis of official information, founded on last year's passenger traffic, this will reduce the passenger fare average about 6 points to 1.64 cents. Crediting this reduction to the New Haven—and there is no evidence at hand that the Boston & Maine will meet it—the final computation shows a decrease for the New Haven of somewhat more than 7.3 per cent.; for the Boston & Albany of a little less than 6.3 per cent.; and for the Boston & Maine of nearly 1.7 per cent. Both the New Haven and the Boston & Maine seem to have "digested" the higher passenger rate on the New England and Fitchburg respectively without much change, each rising three points. In the reductions of the Boston & Albany a downward variation, due to meeting, in the large local business of its Boston suburban "loop," the competition of electric street railways must, presumptively, be allowed for; and reference may also be made to the fact that, on all three lines, there must be some difference from year to year in the volume of various classes of freight. But the latter are so averaged in a ten-year period that they are not likely to affect much the final conclusion.

In that conclusion we find—and the logic of the returns seems irresistible—that, as proved in practice by the New England experience, comprehending a large and populous territory and very extensive railroad operation, full monopoly, limited monopoly and non-monopoly stand in merit first, second and third respectively upon the scale of public benefit in so far as that public benefit is measured by public service and public concession. Reduced freight rates and reduced passenger fares are surely fundamental elements in what we may call the public function of railroads; and the New England case shows clearly that they are both on the side of monopoly. We might add, also, the more familiar fact that consolidation precedes monopoly and that, with consolidation, goes usually both better and cheaper operation of subsidiary and local lines. We cannot contend, however, that bettered public service exhausts the monopoly question. On the negative side will be cited an array of moral consideration. These will be urged with force and backed by example, the temptation to local abuses, to discriminations, to rebates and the sinister effects when monopoly focuses its powers on State legislatures. But even here may be raised, as partial offset, the question whether a State legislature—that of Connecticut for example, with its putrid reminiscences of the great parallel fight of 1889—is more corrupted by one railroad corporation than by the contention of two. And, finally, with the New England case still in the foreground, rises the telling fact that monopolies grow sensitive and responsive to the "monopoly" cry so insistent and so easily raised from the grievance, great or small, real or fictitious. By proverbial philosophy the monopoly, as a corporation, may not have a soul; but it owns a body and the body has nerves—and generally brains.

## EXTRA-FARE TRAINS.

Our correspondent "Guelph," in another column, complains of the extra-fare trains on the New Haven road. In this particular case he will probably find a considerable number of travelers who will agree with him, and point out that on the approximately equal run from New York to Washington, where the service is competitive, there are no trains at all that charge more than the regular parlor car fare, while only one day train on each road—the Congressional Limited on the Pennsylvania and the Royal Limited on the Reading-Baltimore & Ohio route—fails to provide coaches as well as Pullman equipment. Yet the cost of a single-trip ticket from New York to Washington is $6.50, as against $5 from New York to Boston, and

the cost of a single-trip ride on the Congressional Limited, including the regular parlor car fare, is $7.75, as against $7 on the special fare trains of the New Haven.

Without stopping for further consideration of these two cases, except to mention that the New Haven road has been unable to maintain really fast schedules on account of the extensive rebuilding of its bridges, now nearly completed, it seems worth while to discuss the extra cost to a railroad of running fast trains as compared with slow ones. It is fair to say at the outset that this extra cost depends very greatly on whether the run is a long one or a short one. Great numbers of through trains between the twenty or thirty largest cities of the country run every day for short distances at the highest speeds, and the railroads evidently are glad to build the most powerful engines and use them to the utmost limit of their capacity in such services, but the congestion of general traffic caused by running a specially fast train may be said to increase almost in proportion to the distance. The delays to freight trains, clearing the track as they must twenty or thirty minutes before the limited is due, involves specific losses as well as other losses not easily defined. Besides this, the limited train must be made up of fewer cars than the ordinary train and must omit some of the intermediate stops in order to accomplish the journey in the shorter time allowed.

Without attempting the impossible feat of saying what the basis is upon which passenger as well as freight tariffs are made, it may be observed that one great difference between the two is that in the passenger service frequency of trains is an important element. Freight can be carried in train loads and the shipper is satisfied; passengers must be carried in half train loads or quarter train loads, or even smaller units, according to circumstances, thus doubling or quadrupling most of the items of expense, as compared with freight costs. The traffic officer who sets out to charge for passengers "what the traffic will bear" always finds many more reasons for reducing the rates and increasing the cost (increasing it by running more trains for the same number of passengers) than for increasing the rates. Low passenger rates do not pay anywhere except where people can be carried in large train loads. The western manager who said that he would like to abolish all his passenger trains and devote the facilities of the road to freight spoke soberly, honestly and intelligently.

Railroads strive for additional passenger business even when the rates are not yielding their equitable shares of the profit necessary to recompense the stock and bondholders, because, as the passenger trains must be run to serve the people, whether the business is profitable or not, the income from additional passengers is almost all profit. That is to say, the second thousand of passengers produces a much larger proportion of profit than the first thousand. All these considerations apply in making rates for ordinary passenger service. Any fair investigator will admit that the great bulk of the passenger rates of the country are low enough now, if not too low, as compared with freight rates under the actual cost of service. Every instance of a rate which is kept up where it ought to be reduced the railroads could match with an instance of additional trains put on in advance of marked increases of traffic. When it comes to the justification of extra-fare trains, each such train, so far as we can recall, has been put on after it has been made clear from the parlor car traffic on ordinary trains that there would be a demand for the higher cost train from passengers whose time would be worth the additional money (one dollar an hour on the New York-Chicago and the Boston-New York trains). It must be clear from what has been said that the faster trains cost more to run than the slower ones. It might be said that all railroads run their passenger services as fast as they can conveniently and feel justified in charging an extra fare for a service so fast that it is inconvenient and expensive to them. For example, it would be hard for a fair-minded critic to decide off hand that the time between New York and Chicago should be made quicker than 28 hours, unless the hours saved could be shown to have a definite value. Running on the 28-hour basis (34½ miles an hour by the New York Central) the modern engine can haul enough cars to carry a paying load; and, allowing for the necessary stops and delays, the speed while in motion—say, 45 to 50 miles an hour—is certainly fast enough to obviate any annoyance from the feeling that time is being wasted. In these days there is no real difference in the accommodations of extra-fare trains and ordinary trains on through services. The extra sum charged is simply a bonus—and a very small one—paid by the passengers to induce the road to run a service that it could not otherwise afford to run. Looking at it in another way; owing to the limited capacity of a busy road to handle extra fast trains, it may be said that the additional fare tends to keep the travel on these trains low enough so that they can maintain their schedules, which they would doubtless have difficulty in doing if they were compelled to add car after car to handle the traffic which would otherwise go to the fastest train. Therefore, the extra fare not only protects the railroad to a greater or less extent from loss of money, but it protects the passenger on urgent business from loss of time.

## Annual Report of the Suez Canal Company.

Although traffic through the Suez Canal was exceptionally active during the first part of 1905, for the whole year it showed a slight decrease from 1904, which was the climax of a series of years during which receipts had almost uniformly increased. The total receipts in 1905 were $53,461,640, a decrease of $373,640. Total expenses were $8,196,837, including $800,000 for sinking fund, and $50,000 for insurance. The net earnings were $15,264,802, a decrease of $362,783 from the previous year. During the year 4,116 vessels, with a total tonnage of 13,134,105 tons, passed through the canal, an increase of 121 ships and 267,730 tons, as compared with 1904, the decrease being all in merchant shipping. The average tonnage per ship showed no increase in 1904, but rose from 3,163 to 3,191 tons in 1905. Twenty years ago, in 1885, the average tonnage per ship was 1,748 tons, so that there has been an increase of about 80 per cent. in that period. Nevertheless, in spite of the increase in size of vessels, navigation has been made safer. In 1885 there were 43 groundings per 1,000 vessels using the canal, against only 17 groundings per 1,000 vessels in 1905.

Traffic on the canal was interrupted last year by an exceptional happening. On September 5 a fire broke out on the steamer "Chatham," which carried 80 tons of dynamite and 250 lbs. of detonators. The hold in which the fire was burning was flooded, but the bulkheads gave way and the ship sunk in a short time. Navigation was carefully carried on alongside the wreck by day, but it was finally decided that the only means of removing so formidable an obstacle was by blowing it up. After adopting all possible measures to lessen the damage the wreck was exploded on September 28. Work was immediately begun to repair the effects of the explosion, but was greatly impeded by pieces of iron which had to be removed in the dredging. On the four days between October 8 and October 11 109 ships, 53 from the north and 56 from the south had been delayed since the explosion passed through the canal.

The traffic of the year was increased by a further expansion of trade between the West and the East, and also in the early part of the year by shipments of coal for the fleets engaged in the Russian-Japanese war. The wheat traffic from India to Europe, an important element of the record travel of 1904, continued in the early part of 1905 to such a degree that the available tonnage was insufficient and ships had to be sent to India in ballast. This traffic decreased in the second half of the year and during the last quarter fell below the usual average.

## Railroad Gross Earnings in May.

The gross earnings during the month of May show, as a whole, quite satisfactory increases over the figures for the same period of last year, the average increase of 49 roads being about 10 per cent. The two most important factors affecting earnings were the coal strikes and the large grain movement. The general business situation remained at the high level at which it has been during the last 12 months. Of the trunk line roads, nine report gross earnings of $38,783,300, an increase of $2,265,200, 6 per cent. This percentage is small in comparison with most of the other groups and is entirely due to the fact that three of the roads, the Pennsylvania, the New York Central and the Erie were badly hit by the strikes in Pennsylvania, which were not settled until late in the month. The coal and coke originating on the Pennsylvania Lines East amounted to 3,975,328 short tons, as compared with 4,207,011 last year. The other two companies under consideration doubtless suffered nearly as much as this. All other kinds of trunk line traffic were carried in large volume. The eastbound shipments of provisions from Chicago amounted to 156,126 tons, as compared with 129,285 tons during May, 1905. Shipments of packing house products from Chicago were almost double the amounts of last year and the eastbound trunk line movement of grain amounted to 11,675,000 bushels, an increase of nearly 6,000,000. Owing to this heavy grain movement the granger lines made an exceptionally good showing. The earnings of eight of them aggregated $17,533,307, an increase of $1,933,955, 12 per cent. Only one, the Chicago & Alton, shows a decrease, and this was due to the coal strike in the middle West. The effect of these labor troubles is clearly shown in the figures for the receipts of Illinois coal at Chicago; these amounted to but 109,379 tons, as compared with 280,257 tons the previous year. The other Chicago lines also suffered from this loss, but, having a greater diversity of traffic than the C. & A., their total earnings do not show it so plainly. Aggregate grain receipts at 15 interior markets were 47,370,293 bushels, an increase of over 13,000,000 bushels. Of the coal

roads, 11 earned $21,943,669, an increase of $267,290, 1 per cent. The only four companies which report increases are the Baltimore & Ohio, the Chesapeake & Ohio, the Norfolk & Western, and the Pittsburg & Lake Erie. The first three of these derive the greater part of their coal traffic from the West Virginia coal fields and their shipments of coal and coke show satisfactory increases, there having been no strikes in this region. The fourth road, the Pittsburg & Lake Erie, carried enough ore to offset its loss in coal traffic. As indicating the conditions affecting the other roads of this group, the anthracite coal shipments from eastern producing regions aggregated only 3,254,230 tons, as compared with 6,005,158 tons in May, 1905. The earnings of six roads in the southwestern group were $18,011,699, an increase of $1,829,948, 11 per cent. These roads profited largely by the big grain movement and by the increased live-stock shipments. In the southern group, nine roads report gross earnings of $18,775,361, an increase of $2,340,182, 14 per cent. The great industrial development of the south, which has been so noticeable during the whole past year, is responsible for this particularly satisfactory showing. The cotton movement was smaller than during May, 1905, when unusually heavy shipments were made. Some roads gained an increase in traffic from grain, the foreign shipments from New Orleans being 1,699,673 bushels, while in May, 1905, only 239,441 bushels were shipped. The transcontinental roads, as usual, show the greatest increase of any group. The earnings of three of them were $15,080,681, an increase of $2,972,997, 25 per cent. Much of this increase can be explained by the fact that each of these three companies operated during May of this year from 150 to 200 miles more track than they did in May, 1905. It is to be regretted that, owing to the loss of records in the San Francisco fire, neither the Union Pacific nor the Southern Pacific are yet able to make public their earnings for this month.

The accompanying table shows the gross earnings of 49 roads for May, 1906, and the increases over the figures for May, 1905:

| | | |
|---|---|---|
| Atchison, Topeka & Santa Fe | $6,782,266 | $936,985 |
| Atlantic Coast Line | 2,250,905 | 228,802 |
| Baltimore & Ohio | 6,817,083 | 976,907 |
| Buffalo, Rochester & Pittsburg | 387,553 | *381,895 |
| Canadian Pacific | 5,579,003 | 1,358,872 |
| Central of Georgia | 875,088 | 111,535 |
| Central of New Jersey | 1,736,264 | *327,027 |
| Chesapeake & Ohio | 2,196,342 | 393,862 |
| Chicago & Alton | 822,121 | *30,161 |
| Chicago & North-Western | 5,098,480 | 494,623 |
| Chicago Great Western | 688,057 | 108,572 |
| Chicago, Milwaukee & St. Paul | 4,340,243 | 439,689 |
| Chicago, Rock Island & Pacific | 3,926,801 | 428,427 |
| Chic., St. Paul, Minneapolis & Omaha | 954,687 | 65,714 |
| Chn., New Orleans & Texas Pacific | 736,022 | 114,472 |
| Cleve., Cln., Chicago & St. Louis | 1,989,663 | 230,888 |
| Colorado & Southern | 954,548 | 132,649 |
| Denver & Rio Grande | 1,702,482 | 255,122 |
| Erie | 4,102,435 | *32,673 |
| Grand Trunk | 3,403,675 | 322,508 |
| Great Northern | 4,158,354 | 697,981 |
| Hocking Valley | 468,455 | *58,981 |
| Illinois Central | 4,258,972 | 437,894 |
| Interoceanic of Mexico | 646,962 | 119,819 |
| Kansas City Southern | 765,652 | 162,792 |
| Lake Shore & Michigan Southern | 3,652,111 | 516,338 |
| Lehigh Valley | 2,418,335 | *363,396 |
| Louisville & Nashville | 3,698,960 | 491,786 |
| Mexican International | 725,701 | 173,115 |
| Michigan Central | 2,099,887 | 229,236 |
| Minn., St. Paul & Sault Ste. Marie | 937,266 | 264,299 |
| Missouri, Kansas & Texas | 1,687,740 | 20,015 |
| Missouri Pacific | 3,703,000 | 326,000 |
| Nashville, Chattanooga & St. Louis | 995,199 | 139,772 |
| National Railroad of Mexico | 1,272,109 | 198,613 |
| New York Central & Hudson River | 7,250,241 | 112,739 |
| New York, Ontario & Western | 554,410 | *115,224 |
| New York, Susquehanna & Western | 204,427 | *41,236 |
| Norfolk & Western | 2,557,207 | 334,204 |
| Northern Pacific | 5,343,324 | 916,144 |
| Pennsylvania Railroad Company | 11,859,033 | 436,900 |
| Philadelphia & Reading | 3,289,052 | *261,425 |
| Pittsburg & Lake Erie | 1,314,532 | 160,551 |
| Pitts., Cin., Chic. & St. Louis | 2,408,189 | 290,600 |
| St. Louis & San Francisco | 3,181,663 | 159,177 |
| St. Louis Southwestern | 767,831 | 94,868 |
| Southern | 4,434,651 | 583,679 |
| Wabash | 2,018,866 | 158,664 |
| Yazoo & Mississippi Valley | 736,633 | 137,174 |
| Total | $132,772,780 | $12,101,319 |

*Decrease.

## NEW PUBLICATIONS.

*American Street Railway Investments.*—Issued monthly in connection with the *Street Railway Journal*. Edition of 1906. The McGraw Publishing Company, 114 Liberty Street, New York. 432 pages, and 49 maps. Price, $5.00.

The 13th annual edition of the "Red" Book is slightly larger than that of previous years, due partly to the addition of reports from new roads, partly to more complete statements from roads which were reported in the 1905 edition, and partly to the publication of a considerably greater number of maps of operating properties than have appeared in previous editions of the annual. The book starts with a compilation of street railway gross earnings arranged in groups of companies having gross receipts for 1905 of over $1,000,000; of between $1,000,000 and $500,000; of between $500,000 and $100,000; of between $100,000 and $50,000, and of between $50,000 and $25,000. There are now 51 companies in the first group, 39 in the second, 170 in the third, 100 in the fourth and 77 in the fifth. The five companies which had more than $10,000,000 gross earnings in 1905 are the New York City Railway Company, the Manhattan Railway Company, the Brooklyn Rapid Transit Company, the Philadelphia Rapid Transit Company, and the Boston Elevated, in the order named. It is interesting to note that the earnings of the New York City Railway Company were over $4,000,000 less in 1905 than in 1904 on account of the competition of the Subway. All the other companies show increases, although the increases in the case of the Philadelphia Rapid Transit Company and of the Boston Elevated were quite small. The Red Book is a very convenient street railway reference publication and the large maps constitute a valuable addition to it.

# CONTRIBUTIONS

### Failure of Electric Locomotives in the Simplon.

New York, July 13, 1906.

To the Editor of the Railroad Gazette:

On page 32 of your issue of July 13, 1906, you print a notice stating that the two electric locomotives which were borrowed from the Valtellina Railroad to haul trains through the Simplon tunnel have proved inadequate for the work and have been sent to the shops. This statement is distinctly misleading and, inasmuch as we represent in this country the "Ganz electric railway system," which has been successfully employed on the Valtellina road for many years, and which may be hurt through statements of this kind, we think it will be well to acquaint you with the actual facts.

You are probably aware that, when the Swiss Government decided to use electricity as motive power for the Simplon tunnel, it provided for five electric locomotives. Three of these were loaned by the Italian State Railways. These three were built by Ganz & Co., and have been in operation on the Valtellina Railroad. The other two locomotives were built by Brown, Boveri & Co. on an order received originally from the Adriatic Railroad for operation on the Valtellina Railroad. This order was, however, canceled later on, due principally to late delivery, and the locomotives were placed at the disposal of Brown, Boveri & Co., who then proposed to use them for the working of the Simplon tunnel. The electric operation in the Simplon tunnel was to commence on June 1, 1906. From that day on, the three electric locomotives built by Ganz & Co. have been continuously in service without any trouble and they are conveying eight trains per day through the tunnel. The two locomotives supplied by Brown, Boveri & Co., however, became unfit for the service on the first day of operation, as the motors broke down and the locomotives had to be sent to the repair shops. For that reason there are not sufficient locomotives available now to work the traffic exclusively by electricity, and some of the trains will be conveyed by steam locomotives until the two locomotives built by Brown, Boveri & Co. can be repaired and made fit for service again.

We trust that you will be good enough to publish this explanation, and in view of the great difference in behavior of the two types of locomotives it might be interesting to your readers to know that the motors of the Ganz system have their electrical windings hermetically sealed in metal tubes, protecting them not alone against dust and similar substances, but also against moisture and even directly against water. That this protection is most effective seems to be clearly shown by the experience of these locomotives under the trying conditions of the Simplon tunnel. As a matter of fact, the Ganz three-phase electric locomotives are probably the most robust electric locomotives ever built.

G. Leve,
Second Vice-President, Railway Electric Power Co.

### Recent Development of American Passenger Locomotives.

New York, June 16, 1906

To the Editor of the Railroad Gazette:

In the interest of historical accuracy, as well as in justice to a locomotive builder now no longer with us, but who did much good work in the early days, I call attention to an error of statement in the article on "Recent Development of American Passenger Locomotives," appearing on page 641 of your issue of June 15th. It is there stated that:

"When designs had apparently reached their limits, a *revolution was created* by the introduction of the class K locomotive upon the Pennsylvania Railroad by Mr. Theodore N. Ely, who was at that time superintendent of motive power. *He simply raised the boiler and placed the mud ring on top of the frames, above the driving axles*, by which he was enabled to add about 7 in. to the width of the grates, while the length was limited only by the ability of the fireman to properly distribute the coal." (Italics mine.)

To the same effect, it is also stated that "As in 1881, Mr. Ely solved the problem of the narrow firebox by putting a wide one on top of the frames," etc.

Dr. Thomas P. Jones, who, many years ago, was Superintendent

of the United States Patent Office, said, among other good things, in criticizing alleged new inventions, that the Patent Office records showed us the reprehensible practice of our ancestors in pirating our inventions. As a matter of fact, Mr. Ely's "revolution" and solution of "the problem of the narrow firebox" were pirated, about 24 years before he made them, by James Milholland, Master Mechanic of the Philadelphia & Reading Railroad, who, in 1857, "simply raised the boiler and placed the mud ring on top of the frames, above the "driving axles," in the engine "Vera Cruz," and continued that practice, in both passenger and freight locomotives, for many years thereafter.

The "Vera Cruz" had 24.5 sq. ft. of grate area, which was very large at that date, and, in a 15-in. cylinder engine, is more than proportional to the 35 sq. ft. of Mr. Ely's engine. An illustration and description of a Milholland engine of the "Vera Cruz" type, showing sections of the boiler and firebox, was published in the London *Engineer* in 1860, and the same matter will be found in other publications. Whatever credit is due to placing the firebox above the frames, in the manner stated in your article, should be awarded to James Milholland. J. SNOWDEN BELL.

It is quite true that Mr. Milholland put the mud ring of his firebox on the top of the frame many years before the appearance of the Pennsylvania class K. But the credit for the innovation, as it certainly was, in 1881, lies in the fact that the designer had the courage of his convictions and dared to raise the center of gravity of his boiler to a height that Mr. Milholland did not dream of but which the growth of the engine during the preceding years necessitated if the design were to be used. As a matter of fact, the predictions that the engine (class K) would upset were so emphatic that though the calculations had been carefully made and these showed complete stability at 60 miles an hour on the track between Altoona and Harrisburg, the speed on the first run down was limited to 40 miles an hour. On this trial the engine was so steady that on the return trip all scruples were cast aside, and 60 miles an hour maintained, thus demonstrating the stability of the machine and showing that the method of widening the firebox was practicable for existing conditions. By this, as I stated in the article referred to, the introduction of the widening of the firebox was brought about, and not that the mud ring had never been placed on the top of the frame before. GEO. L. FOWLER.

## Extra-Fare Trains on the New Haven.

New York, July 16, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is the claim of the advocates of railroad territorial monopoly —notably, President Mellen, of the New York, New Haven & Hartford—that complete occupation of a given region by one railroad company results in better service for less money than would be possible with competing roads bidding against each other for the business. Concretely, it is urged, and not without considerable justice, that the southern part of New England is better served by the New Haven road than it would be by two or more competing lines. Many things go to prove this true in the New Haven's case, but there is one feature of its passenger service in which it is safe to say that, for the average traveler, competition would result in a great improvement in service. The New Haven has a monopoly of passenger travel between the cities of New York and Boston, which are 232 miles apart by the usual (Shore Line) route. The travel between them is regularly very heavy; so much so that with the adoption of this year's summer time-table a new five-hour train (the Mayflower Limited) has been put on, running from each terminal daily over this route. This makes the fourth five-hour train in regular service in each direction. On all of these trains an extra fare of $2 is charged between any two points, raising the fare between New York and Boston from $5 to $7, or between New York and New Haven from $1.50 to $3.50. There are nine through trains over the Shore Line between New York and Boston, and the fastest time made by any one of the other five is, with one exception of five hours and a half, six hours less one or two minutes for the 232 miles. As a result of the system of excess fares, the only way in which one can make a trip between the two cities in five hours, which is at the rate of 46.4 miles an hour—not remarkably fast time—or in correspondingly fast time to New Haven, New London or Providence, is to pay what amounts to an increase of 40 per cent. over the regular fare for the through run and of 133⅓ per cent. between New York and New Haven. For the average traveler this is a hardship. He is not surprised that an extra fare is charged on one particularly fast train of a road, like the 18-hour New York-Chicago specials of the Pennsylvania and New York Central, connecting long distance points, but when on every train which makes a 230-mile run in five hours an extra fare is charged, it seems a discrimination. It may be objected to this view that the $2 extra charge is only double the regular parlor car fare, and that, therefore, it really only slightly increases the regular rate. In practice, however, to all those who for a five-hour trip would not use a parlor car it raises the railroad fare by the full amount, since no coaches are run on these trains. If the two cities were far enough apart so that the trip involved a night on the road there would be some argument for such a system, for then most travelers would pay for extra accommodations in any case, but here the extra charge is in many cases simply a tribute to the absolute monopoly of the railroad company. Modern competition for passenger traffic shows itself mainly in an attempt to attract travel by satisfactory service, and there is no doubt but that if there were competition between New York and Providence or Boston it would be possible to travel on most, if not all, of the faster trains by payment of the regular fare. Viewed from the railroad's standpoint, and particularly in the case of a road like the New Haven which runs its own parlor cars, the financial results of the present system are, of course, highly satisfactory; but from the standpoint of the general public, to have an excess fare charged on all the fast trains between New York and Boston is not calculated to make clear the advantages of a pure territorial monopoly. GUELPH.

## New Electric Lines of the Great Western Railway and the Hammersmith & City.

The most recent instance of railroad electrification in England is that now being completed on the Hammersmith & City line and the Great Western additional lines between Bishop's road and Westbourne Park, together with a branch from Latimer road to Uxbridge road. From Uxbridge road to Addison road trains run over the West London line, and in consequence a part of this has had to be electrified together with the two bays at Addison Road station.

Electrical energy is obtained from the Great Western's new generating station at Park Royal. This station generates a three-phase current at 6,300 to 6,600 volts, which is transmitted over underground feeders to Old Oak Common, where the first substation is, at the junction between the High Wycombe line and the Great Western main line. From this point the feeders are carried by the side of the main line to Westbourne Park, where they branch, four going to a substation on the south side of the main line at Royal Oak and three to a substation on the west side of the Hammersmith & City line near Shepherd's Bush. From Park Royal to Old Oak Common is about 1 mile, to Royal Oak 4½ miles, and to Shepherd's Bush 5 miles. The current is stepped down to 630 volts direct current for distribution to the conductor rails of the Hammersmith & City and for lighting purposes in the locomotive sheds, carriage sheds, freight yards and offices, and part of Paddington station. Alternating current at either 220 or 110 volts is used for arc and incandescent lighting and for small motor work throughout the Great Western stations, freight yards, offices and hotel, at or near Paddington. The present power station is of 6,000 k.w. capacity in 750 k.w. sets, but this is one-sixth of its planned ultimate capacity.

As the Hammersmith & City trains run over the Metropolitan Company's lines from Bishop's road by the Inner Circle to Aldgate, the system adopted had to be the same as that already in use on the Metropolitan and Metropolitan & District Railroads. There are two insulated conductor rails, the positions of which correspond exactly with those on the Metropolitan & District Railway, the positive conductor being 3 in. above the rail level and 16 in. outside the running rail, and the negative 1½ in. above rail level, and in the center of the track. The two conductor rails are of an inverted channel section resting on iron-capped porcelain insulators. The insulator is fixed to the sleeper by small clamps and coach screws. This design leaves the conductor rail and insulator free to move up and down relatively to each other, as occurs when a train is passing, owing to the spring in the sleepers and roadbed. The rails are 102.8 lb. and have a cross-sectional area of approximately 10 sq. in. They are made of steel having a conductivity equal to 15 per cent. of that of copper. The rails are fished by a joint-plate on the under side and are connected by four laminated copper strip bonds, which are protected by the joint-plate. Long steel ramps made from a bent section of the ordinary conductor rail are used at all facing ends and short cast iron ramps at trailing ends. At points and crossings the different lengths of conductor rail are connected by rubber-insulated and lead-sheathed armored cables buried direct in the ground, each end of the cable being sealed in a specially designed porcelain terminal cap, from which a solid copper rod projects. To this projection two flexible copper bonds are clamped, the other ends of the bonds being expanded into the conductor rail. Any jumper cable can thus be at once disconnected by removal of two bolts in the clamp. The feeder cables are connected to the rails in the same way. The conductor rails are divided into sections corresponding approximately to the distance between stations. A sectional insulator is placed just beyond the cross-over at each station, so that in the event of a breakdown at any point it will always be possible to continue working the trains up to the next station by using the cross-over there for shunting the trains from one line to the other. Under normal conditions all sections will be connected,

the gap at the section insulators being bridged by switches which will be kept closed. The line is fed from the substations at Shepherd's Bush and Royal Oak, eight feeders being carried from the former and four from the latter.

At Hammersmith large new train sheds have been built to house 20 new electric trains. The ordinary conductor rails are stopped 15 feet away from the shed doors, so as to leave a clear gangway outside the sheds. Inside the sheds the trains will be supplied with current from overhead. A steel joist carrying a small trolley is supported from the roof above each line from end to end of the carriage shed. The trolley is fitted with two collectors, which take current from two insulated trolley wires placed one on each side of the steel joist. A flexible cable from the trolley can be plugged on a socket in the train

Each of the trains consists of two motor cars and four trailers with an aggregate seating capacity of 320 persons. They are similar to the Metropolitan cars with closed vestibules, and are being built by the Metropolitan Amalgamated Carriage Co. at Saltley. Each motor car has four 150 h.p. motors, two on each bogie; they are designed for a schedule speed of 16 miles an hour, including stops, and for a maximum speed of 30 miles an hour. The British Thomson-Houston Co. has supplied the whole of the electrical equipment. Multiple unit control is used. All connecting leads are run in metal pipes, and special fire prevention precautions have been adopted. The trains are fitted with the Westinghouse air brakes. The rolling stock was designed by Mr. G. J. Churchward, Locomotive Superintendent of the Great Western, and Mr. Alfred Ingram, Carriage and Wagon Superintendent of the Metropolitan.

## Testing and Inspection of Railroad Supplies.*

The main object of the Test Department is to determine the kind and quality of material most efficient and economical for any given purpose, and then by means of routine tests to hold shipments fully up to the desired standard. The plan usually followed is to get together all the information obtainable regarding the particular article to be investigated, decide through study of service tests just what properties are essential to the greatest efficiency, and then work out specifications which will enable the manufacturer to understand thoroughly just what kind of material is desired and what tests must be met to insure acceptance of shipments.

These proposed specifications are referred by the Purchasing Agent to the manufacturers for their criticism, the replies are sent to the chemist, and a final draft is then prepared with any changes necessary, submitted again if needful to the manufacturers and finally to the First Vice-President for approval.

Orders are then placed in accordance with the new standard, and on receipt of each shipment a sample is selected at random and forwarded for test. If the sample is not in accordance with the specifications the shipment is rejected, and the freight is paid by the shipper. In this manner inferior material is weeded out from the good and discarded.

Iron in one form or another is, of course, an important item of railroad supplies. Bar iron, and the better grades for bolts and for staybolts come under this head, and also rivets, steam pipes, boiler flues, chain, iron castings, wheels, etc.

The quality is determined in part with the so-called "test machine," by which the tenacity and ductility of the metal are measured; the cold bending test develops any cold-shortness, if present, and the hot bend any red-shortness or failure to bend when red-hot. If too much sulphur is present the iron will crack on bending hot, while excess of phosphorus will cause cold-shortness. More than a trace of copper will prevent proper welding—and too little working in the rolls, or finishing at too high a temperature will result in brittleness, and be indicated by the bright granular condition of the fractured surfaces, instead of the long, ropy fibrous apearance indicative of toughness and strength.

The pig iron used for making cylinders and other castings must be low in phosphorus or the metal will be weak and brittle —not too high in manganese and sulphur or it cannot be machined—and close-grained and compact to insure strength and impermeability. Analyses are made of samples from each carload of pig iron to hold it to the proper quality, and the foundry practice has been carefully studied, and treatment is applied to render the iron tough, strong and ductile.

Tests of cast-iron wheels for freight cars are made at the place of manufacture and involve measurements and weight and general inspection, and a "drop test" made by allowing a weight of 140 lbs. to fall upon the wheel from a height of 12 ft. a specified number of times, depending upon the weight and size of the wheel—12 blows for the usual 33-in. wheel.

Materials of steel are of great importance, since they include such products as boiler steel, axles, rails, splice plates, springs, piston rods, crank pins castings, general forgings, building material, etc. In fact, the very stability of the structures, the engines and equipment depends in large degree upon the quality of the steel and iron. In the case of boiler steel, a test piece is taken from every sheet and given a tensile test to insure the desired strength and ductility, freedom from flaws, etc.; a bending test is made after quenching, to avoid possibility of brittleness, and also chemical analysis to determine and bar out more than a certain proportion of phosphorus and sulphur.

Steel rails, splice plates, axles, piston rods, crank pins and springs are inspected at the manufacturing plant. Each spring is pressed down solid in a testing machine, and must also have a certain height under a given load, be of correct design, etc. Also an analysis is made of one spring of every 200 to determine whether the steel may be depended upon to give good service.

Axles in addition to the usual surface inspection and measurement are subjected to a drop test to insure freedom from brittleness, and they are also held to a definite composition to enable them to support the loads and give reliable service. Rails likewise have composition specified to secure proper hardness and toughness, and a drop test is made upon a rail-butt from each heat from the top of an ingot, allowing a 2,000-lb. weight to fall a distance of 20 ft., striking the rail midway between two supports 4 ft. apart. If the steel is brittle and unsafe for use, owing to defective manufacture, pipes, flaws, etc., this 40,000 foot-pound blow speedily renders the fact evident and breaks the rail, sometimes into splinters. In some cases, especially when steel has given poor service, it is necessary to make a microscopic investigation of the structure of the metal to find out the exact conditions of heat-treatment received in course of manufacture, for as is well known, good steel can be completely ruined by incorrect heat-treatment. If the steel was overheated or burned, and thus was rendered brittle and untrustworthy, the fact is clearly shown by the microscopic structure.

Passing now from iron and steel, we may mention protective coatings for metal or wood. Paints to-day are used in enormous quantity, and it is of great importance to obtain the utmost durability not merely in order to afford the necessary protection and appearance, but also to reduce labor costs and to avoid the need of frequent shopping of equipment and consequent withdrawal from urgent service. The paints are separated into their constituents and the purity or efficiency of each is determined. The linseed oil must not be of poor quality or adulterated with fish oil, mineral oil, corn oil, etc.; turpentine must be really turpentine and not benzine; and japan must be up to the specified strength and quality.

"Hot boxes" are generally due to difficulty with oil, wool-waste or bearings, and each of these materials are held to a definite standard. A week often passes without a single hot-box upon any of the passenger equipment of the Reading.

Wool-waste for freight service must contain at least 65 per cent. of pure wool and be of fair length of thread, or the waste after short service would lose its elasticity and fail to remain in contact with the journal, thus cutting off the feeding of the oil to the axle.

The oil must have correct flashing and burning points, be of proper viscosity and have enough fat oil to make the mixture adhere to the steel. Signal oil must be of standard composition and quality so that the wick in the lamp will hold the flame in a gale of wind; headlight oil must not explode even when hot and jolted.

Also each kind of machinery must be lubricated with oil adapted to its weight and speed—or loss of power, heating or rapid wear will result, with heavy bills for maintenance or repairs.

Air-brake hose must stand a pressure of 400 lbs. per sq. in., and the rubber must be tested to prove whether or not it is so adulterated with shoddy, mineral matter, paraffine, tar, etc., that its life will be gone and it will be useless within a few months. The battery materials to operate the electric track signals with which our tracks are protected must be found so free from impurities that the service rendered will be absolutely reliable.

Portland cement is very largely used in construction work, and gives excellent results when the quality is good. It may, however, be unsound and cause the work gradually to disintegrate, or it may be shipped out by the manufacturer while it is too fresh—not properly aërated—and if used then the concrete would not prove lasting but would crack and weaken; in these cases careful tests indicate the quality, and they often keep from service material which would have caused failure and perhaps accident.

The water supplies, both for steam and for drinking purposes, also require careful attention. The former must be of a character that will not corrode the boiler, nor on the other hand fill it with scale and necessitate frequent cleaning of the flues, and waste of fuel, since scale ⅛ in. thick means a loss of fuel of 22 per cent.; also, the character of the water must be so regulated when necessary by treatment, that foaming and liabilty of explosion will not be possible.

Every water supply upon the Reading is tested from time to time; bad waters have been abandoned, and other supplies substituted, or, if nothing better is available, treatment is applied to neutralize the injurious results which otherwise would follow.

Every water used as a drinking supply in stations or upon cars has also been carefully analyzed to be certain that it is as free as possible from contamination.

*Paper read before the Franklin Institute by Robert Job, Chemist of the Philadelphia & Reading Railway Company.

Whenever desirable, bacteriological examinations are made to determine whether a water supply in some locality may have become contaminated and caused typhoid fever or other disease which developed.

Tin plate and roofing tin sometimes have so thin a coating of tin or composition that rusting begins after exposure of a day or two upon a roof, and we have actually received shipments in which the thickness of the tin coating averaged less than 3/100,000 of an inch. Such material of course has little practical value other than that of the steel sheets of which it is composed, and the latter could be secured at far less cost than probably would be charged for the so-called "tin plate."

Insulated signal wire is tested to determine whether the copper is pure, and the rubber and other insulation of standard quality.

Soap must be free from excess of alkali, salt and other impurities, and must not, be adulterated with clay or other "fillers," and must not contain more than a definite proportion of water.

Enough instances have now been cited to convey some idea of the great variety of tests and inspections regularly made by the Test Department. In addition to such routine work, investigations are made upon materials which may have given unsatisfactory service, or which apparently have not been exactly adapted to the conditions under which they were used, in order to determine just why the failure occurred, or the service was defective, and the data thus obtained often results in revision of specifications with consequent improvement.

Investigations are also made to devise new methods for use or renewal of waste materials or to develop new processes, large savings having been effected through such work.

The preservation of wood is a subject of the greatest importance to every railroad, and a very careful investigation has been made of all processes used and results obtained both in this country and abroad; also tree-planting upon the land at our disposal has been looked into thoroughly and estimates obtained as to the cost and ultimate return from such investment under our conditions of place and climate.

From the foregoing brief account of work of the Test Department, the fact will, I think, be evident that a persistent and earnest effort is being made to secure the grades of material best adapted to the various purposes, and such effort naturally results in relatively great durability of material, and thus in great ultimate economy combined with a high degree of safety and of efficiency in the service.

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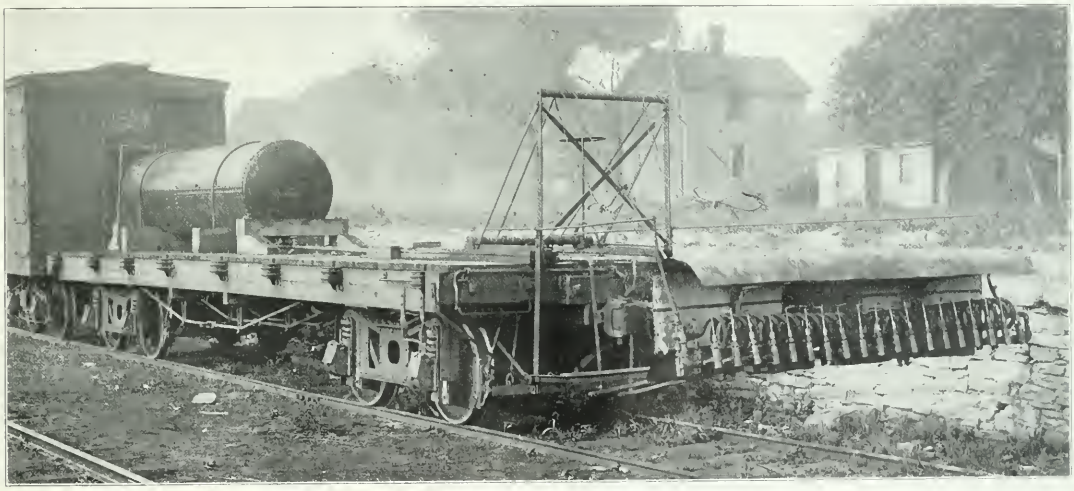
The authorities of the Congo Free State report to the King of Belgium that steamers are now running on all the navigable streams in the country, which must amount to several thousand miles, chiefly the Congo and its numerous tributaries. On the middle section of the main stream, between Stanley Pool and Stanley Falls, there is a regular service three times a month, and the boats make the round trip in 45 days. Six steamers are employed on this line, three of them of 150 tons burden and with accommodations for 30 passengers each. Work is in progress to open the upper river to navigation. Little steamers of five to 30 tons are now employed. A railroad is to connect the upper Congo with the interior lakes. About 80 miles of track is laid from Stanleyville up the Congo to Ponthierville, where the river again becomes navigable for a stretch of 275 miles to Sendwe. Above Sendwe there is another stretch of unnavigable river to Buli, which is to be covered by a railroad; above Buli steamers can go 400 miles further up to Kalengwe, 10 deg. south of the equator, and near the southern border of the Congo state, where there is said to be copper. This is perhaps 400 miles north by west of the present terminus of the Cape to Cairo Railroad. The numerous transfers which this route will require would make transportation too costly for ordinary freights; but the exported produce of the interior of the Congo state consists largely of rubber and ivory, which can bear enormous charges.

## The Lamb Gasolene Weed Burner.

The accompanying view is of a gasolene weed burner which has recently been on trial on the Illinois Central Railroad. Nine miles of track between Buckingham and Clark City were gone over with the burner and a subsequent inspection showed that all weeds had been killed outright, leaving nothing standing but burnt stalks and stubble. This latter can be completely consumed by a second trip of the burner, when desired, or left to be carried away by the wind and the drafts of passing trains. The actual cost of the work was said to be less than $50, while the same work done by section hands would, of course, be many times this.

The burner is simple in design and can be worked by one man. It consists of the series of generating coils plainly visible in the view, into which the gasolene is forced by air pressure from the 1,000-gal. tank at the opposite end of the car. To the front and rear of the coils are a row of Bunsen burners, which give a strong, continuous flame capable of being increased or decreased at will. The burners are set on a bar which works on pivots at each end and can therefore be quickly raised or lowered as desired.



The Lamb Gasolene Weed Burner.

The burner is the device of Mr. W. W. Lamb, Chicago, who has been engaged several years in perfecting it. He claims that under suitable operating conditions the cost of killing weeds with this machine need not exceed $3 to $4 a mile, and that the tracks can be cleaned by a second trip at an additional cost of $2 a mile. The speed on the recent trial was 3 m.p.h., but Mr. Lamb claims that by increasing the size of the generator, and the generating power correspondingly, almost any speed within reasonable limits is possible.

The burner is of equal, if not greater, interest to interurban roads; for apart from its weed burning possibilities, the patents on the machine apply to the melting of snow and ice on railroads and highways, and a machine is now being built which the patentee expects will alter present methods of cleaning snow off of city streets. Mr. Lamb's address is 1414 Manhattan Building, Chicago.

## Power Signaling in England and Scotland.

From a summary printed in *Engineering* (London), June 22, it appears that there are now in use on British railroads 115 plants, in which signals or switches, or both, are worked by electric or pneumatic power, and it is only a little over six years since the first power plant was installed in Great Britain (the electro-pneumatic at Bethnal Green on the Great Eastern). Power apparatus is now used at half a dozen large stations—Euston, Hull, St. Enoch's

(Glasgow), Crewe (freight), Bolton and Folkestone. Power plants are to be used at Clapham Junction and Newcastle-on-Tyne, and it has been decided to use power at Glasgow Central, Victoria (London, Brighton & South Coast) and elsewhere. The Westinghouse electro-pneumatic is in use at Bolton, on the Lancashire & Yorkshire, Tyne Dock and Hull on the North Eastern, and throughout the lines of the London District Railway. It is to be used at Newcastle. The low-pressure pneumatic is in use on the London & South Western at Grateley, Salisbury, Staines, Basingstoke and other points and 14 at cabins on the Great Central between Manchester and Newton. Webb & Thompson, all electric, has been in use at Crewe freight yards several years and for one year at four cabins at Euston, and near York on the North Eastern. The Siemens all-electric system is in use on the Midland at Derby and at Didcot on the Great Western. The Sykes system is in use at St. Enoch's, Glasgow; at Folkesstone, and on other places on the South Eastern & Chatham, and at Victoria Station, London. In the Sykes system electric power is used for the signals, but manual power for switches.

Automatic block signals are in use in England on the North Eastern between Aine and Thirsk, 11 miles; on the London & South Western between Grateley and Andover, six miles, and between Woking and Basingstoke, 23 miles; on the London District Railway throughout its lines and on the Great Northern & City. A few automatic signals are in use on the Lancashire & Yorkshire near Middleton Junction, and on the Great Central near Ashby Magna.

## The New Cunarders.*

The launch of the "Lusitania" at Clydebank recalls attention to the characteristic features of the two great Cunard steamships which are being built under special agreement with the British Government. The fundamental condition of that agreement is that these vessels shall be "capable of maintaining a minimum average ocean speed of from 24 to 25 knots in moderate weather." The fulfilment of this condition will restore to the British flag the supremacy in speed on the transatlantic service which was long maintained, but which passed to the Germans nine years ago. The "Campania" and "Lucania" (built in 1892-93) still remain the fastest British steamships; they are propelled by twin-screw engines of 30,000 h.p., and have attained 22 knots. The North German Lloyd steamship "Kaiser Wilhelm II" began her service in 1903 and has a speed of 23½ knots; horse-power 40,000. Increase in speed from 22 to 23½ knots involved about 30 per cent. increase in displacement and horse-power; the water-line length was increased by 86 ft. and the cost by 50 per cent.

To endow the new Cunarders with as great a superiority in speed over the German steamship as she possessed over the "Lucania" was a formidable undertaking. The laws of steamship propulsion are well understood, and to increase speed across the Atlantic from 23½ to 25 knots involved much greater proportionate increase in engine power, coal consumption and dimensions than that involved in passing from 22 to 23½ knots. Precedents had to be surpassed and many difficult problems solved.

It soon became obvious that the engine power required must be from 60 to 70 per cent. greater than that of the "Kaiser Wilhelm II," and the coal consumption proportionately increased. The installation of this immense power and of the corresponding coal supply was no easy matter. In round figures 1,000 tons of coal will have to be put into the furnaces in every 24 hours during the transatlantic passage.

The choice of the most suitable propelling apparatus involved considerations of alternative types of machinery. If reciprocating engines had been adopted, triple-screws and three sets of machinery would have been necessary. Each set of engines would have been of greater power than a set of engines in the "Kaiser Wilhelm II." It would have been necessary to place one set abaft the other two; consequently engines of enormous power and with great weights in the moving parts would have been installed far aft, and there would have been risks of objectional vibration, even when all possible precautions had been taken to balance moving parts of the engines. Furthermore, the manufacture of the screw shafting, and particularly that of the crank-shafts, would have involved great difficulties, as the sizes required would have been far beyond precedent. The directors of the Cunard company, therefore, appointed a special committee for the purpose of considering and reporting on the possible adoption of turbine machinery. Certain advantages of turbines had already been demonstrated, chiefly by experience with installations on land, but partly with turbines fitted in cross-channel steamers and torpedo craft. Freedom from vibration, reduced cost of maintenance and working expenses, greater economy in the use of steam at or near maximum power, capacity to run continuously for long periods without sensible deterioration in condition and power to take considerable overloads without injury were among the proved qualities of turbines; evidence was available also to show that turbines increased their economy with increase in size and power. All these features were substantiated by independent investigation.

At that time the cruiser "Amethyst" had not completed her trials, but she represented the greatest horse-power applied to marine turbines—her three turbines being estimated to develop from 12,000 to 14,000 horse-power. The Allan line had decided to use turbines in two new transatlantic steamers of large size, but the power was not greater than that of the "Amethyst," and the work of construction was in an early stage. An enormous advance, therefore, had to be made if turbines of nearly five times the power were to be installed in the new ships. Indeed, the step forward in power was practically as great as the total advance made gradually with reciprocating engines in from 40 to 50 years. This change in propelling apparatus has since been emphasized by the adoption of turbine machinery in all vessels recently ordered for the royal navy, from the great battleship "Dreadnought" down to the "coastal destroyers." The Cunard company decided also to fit turbines to the "Carmania" and compare her performances with those of the sister ship "Caronia," which is fitted with reciprocating engines. Instead of the triple-shaft arrangement of turbine machinery which had been adopted in most steamers, the "Lusitania" and "Mauritania" will have four propelling turbines, each working a separate shaft and propeller, and two reversing turbines will be fitted on the shafts nearest to the middle line of the vessels. In this way the sizes of the turbines will be kept down and the total power will be distributed; but even under these conditions the moderate rate of revolution adopted results in very large dimensions of the turbines and their castings.

Before the dimensions and forms of the vessels were definitely determined extensive experiments were made with models tested in the admiralty tank at Haslar, and great advantage resulted from this investigation. The dimensions finally adopted are as follows: Length over all, 790 ft.; length at water-line, 760 ft.; breadth, extreme, 88 ft.; depth, 60½ ft.; at 33½ ft. draught of water the displacement will approach 40,000 tons; the weight of the materials in each of the ships and her machinery will be about 30,000 tons. The proportion of length to breadth is not so great as in preceding transatlantic steamers of recent date. The water-line length in the "Lucania" is 9.2 times the beam; in the White Star "Oceanic," 10; in the "Kaiser Wilhelm II," 9.5, and in the new vessels, 8.6 times the beam. This change in proportion secures the association of extremely fine ends with greater proportionate beam, and favors economical propulsion at maximum speed. A notable increase in proportionate depth has also been made; the length at water-line in the "Lucania" and "Oceanic" is about 14 times the depth; in the "Kaiser Wilhelm II" it is 13 times, and in the new vessels about 12.6 times the depth. This increase in relative depth greatly favors longitudinal strength, and the greater length of the new ships will tend to diminish the longitudinal bending moments impressed on the structures when exposed to the action of Atlantic storm waves. The watertight subdivision is very thorough and is much improved by the introduction of the four turbines which are placed in three separate engine rooms. There are six complete decks, including promenade and boat decks. The passenger accommodation will be about 550 first-class, 500 second-class and 1,300 third-class passengers. The complement of officers and men will be about 800, so that when each ship is full about 3,200 persons will be embarked.

*From a paper by Sir William H. White, in the *London Times*.

## Working of the Simplon Tunnel.

The following notes on the working of the Simplon tunnel are given by a special representative in *The Engineer* for June 22:

The ventilation of the tunnel, although ordinary coal-burning locomotives are still in use, has proved a great success, even though mechanical forced ventilation has had to deal with the natural rock heat as well as the smokiness and closeness of the tunnel. This heat is the only inconvenience which passengers suffer. It is slight, lasting for a short part of the journey, and there is little chance that electric working will cause the least appreciable diminution of it. The popular opinion that the tunnel is badly ventilated is largely due to the action of the trainmen in closing the windows. Riding with windows open all the way makes it clear that the ventilation is very perfect indeed and leaves nothing to be desired other than suppression of the moist hothouse heat near the middle of the tunnel.

On the Italian side, the route from Milan to Domodossola is worked by steam locomotives and cars of the Italian State Railroads. North from Domodossola, at first over Italian territory, the line is operated by the Swiss Federal Railroads, with Swiss rolling stock throughout. A change of cars is therefore necessary except in the *trains de luxe*. The prevailing gradient on this section is 2.5 per cent. For this service a new and very fine type of consolidation locomotive built by the Swiss Locomotive Works at Winterthur is used, two of these powerful engines being required for a train. On the Swiss side, between the tunnel and Lausanne, the maximum grade is only 1 per cent., and on this section four-cylinder compound express locomotives are used. The tunnel was opened for regular trains daily in each direction, besides a tri-weekly *train de luxe*. There appear to be very few freight trains. The tunnel is a single-track line.

It is interesting to note the wide variation in smoke-box design shown in the practice of the same designers. In the case of the light engine with 19-in. cylinders and a smoke-box diameter of 58⅛ in., the stack has a diameter of 14½ in. at the choke, and the bottom of the petticoat pipe is 2 in. above the top of the exhaust nozzle. In the case of the heavy engine with 20-in. cylinders and a smoke-box diameter of 67 in. the same size of stack is used, but the distance between the top of the exhaust nozzle and the bottom of the petticoat pipe is 15 in. Certainly these dimensions are difficult to harmonize when it is considered that the two machines are to burn the same grades of coal, are to run over practically the same tracks, and to perform the same sort of service.

If we take the formula set forth by the committee on smoke-boxes and apply it to these engines we find that the distance of the top of the nozzle below the center of the boiler is 2½ in. in the case of the light locomotives, and 7½ in. in that of the heavy. If, then—

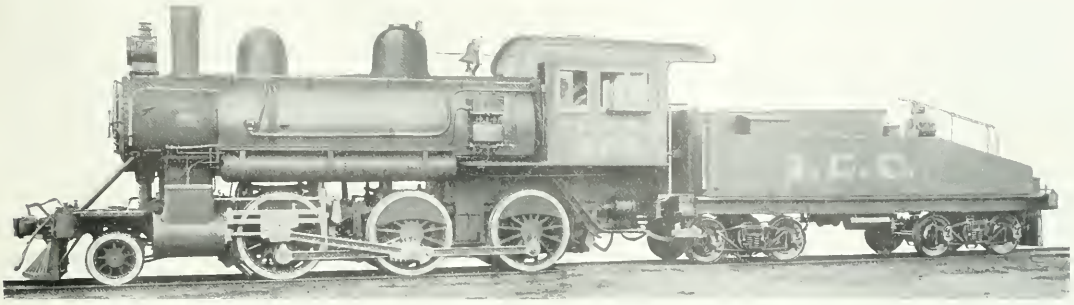
d = the diameter of the choke.
D = the diameter of the smoke-box.
h = the distance of the top of the exhaust nozzle below the center of the boiler,

the formula,

$$d = .21\ D + .16\ h,$$

becomes d = 12.8 in. for the small engine and 15.27 in. for the large one.

To be sure, the formula makes no allowance for the resistances offered by the netting, and was not presented until after the completion of these engines, and so was not available for use, and the comparison merely serves to show the desirability of greater uniformity and the differences existing in the output of the same firm, differences which extend even to the rate of flare of the stack, the reason for which would be very interesting to have explained.

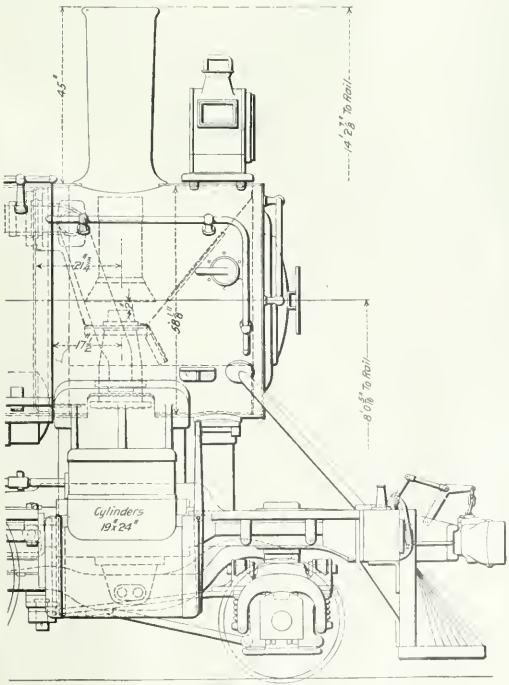


Mogul Locomotive with 19-in. x 24-in. Cylinders Built for the Isthmian Canal Commission at the Cooke Works of the American Locomotive Company.

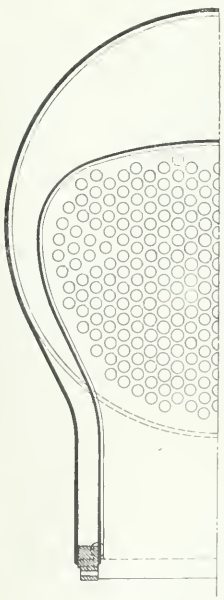
The larger engine also presents an example of dimensions that are high in mogul construction. The weight is not excessive, but 21,250 lbs. on each driving wheel is well up in the scale of modern practice. The boiler is of the extended wagon-top type, with sheets 5/8 in. thick on the conical section. While in the small boiler the firebox is carried by expansion pads and the mudring runs parallel to the top rail of the frame; that of the larger engine is carried by an expansion pad at the front and a rather heavy buckle plate at the rear, while the frame itself is cut away into a very irregular contour.

The outline of the firebox, illustrated in a special engraving, shows the great amount of flare at the top, and calls to mind criticisms that have been made of similar designs wherein it has been urged that the large amount of steam passing over the sheet in rising, keeps the water away, increases the temperature at the upper rows of staybolts, and tends to increase the breakages that occur at that point.

It is also interesting to note the difference in the thicknesses of the several sheets of the firebox of the two engines for the same boiler pressure. The spring suspension is arranged to use semi-elliptic at all of the drivers, helicals being found only on the truck. This arrangement places a yoke over each of the two rear pairs of driver boxes with hangers reaching down to the ends of the semi-elliptics set between the rails of the frame. These springs thus put a downward pressure on the frames at each end, and by a multiplication of the motion at the hand, will contribute to the ease of motion of the machine, as has been found to be the case on caboose cars where a similar design of spring suspension has been used.




Front End Arrangement for Mogul Locomotive With 19-in. Cylinders.



Half Section Through Firebox

Another point to which attention may be called is the short tube used in both cases. The tubes are only 11 ft. 8 in. in the light engine, and 12 ft. 3 3/16 in. in the large engine, but the shortness of the tubes is compensated by the number, which brings up the old and still unanswered question as to the relative value, for evaporative purposes, of the several sections in the length of the

tube. The following are some of the principal dimensions of these engines:

| | | |
|---|---|---|
| Cylinders, diameter | 19 in. | 20 in. |
| Piston, stroke | 24 " | 26 " |
| Wheel base, rigid | 13 ft. 4 in. | 14 ft. 6 in. |
| Wheel base, total | 21 ft. 3 in. | 22 ft. 8 in. |
| Weight on drivers | 114,000 lbs. | 127,500 lbs. |
| " total | 130,500 " | 147,500 " |
| " engine and tender | 215,500 " | 235,500 " |
| Heating surface, tubes | 1,431 sq. ft. | 2,029 sq. ft. |
| " firebox | 134 " | 174 " |
| " total | 1,565 " | 2,203 " |
| Grate area | 27.6 " | 31 " |
| Driving axle journal, length | 10 7/8 in. | 11 in. |
| Driving axle journal, diameter | 8 " | 9 " |
| Truck axle journal, length | 9 7/8 " | 10 " |
| Truck axle journal, diameter | 6 " | 6 " |
| Boiler, diameter, first ring | 58 1/8 " | 64 " |
| Boiler, steam pressure | 180 lbs. | 180 lbs. |
| Firebox, length | 96 1/4 in. | 108 1/16 in. |
| " width | 41 1/4 " | 41 1/4 " |
| " thickness, tube sheets | 1/2 " | 1/2 " |
| " " back sheet | 5/16 " | 5/16 " |
| " " side & crown sht | 3/8 " | 3/8 " |
| " " water, front | 4 " | 4 " |
| " " sides & back | 3 1/2 " | 3 1/2 " |
| Tubes, number | 256 | 316 |
| " diameter | 2 in. | 2 in. |
| " length | 11 ft. 8 in. | 12 ft. 3 3/16 in. |
| Tank, water capacity | 4,000 gals. | 4,000 gals. |
| Tank, fuel capacity | 6 tons. | 6 tons. |
| Valve travel | 5 1/2 in. | 5 5/16 in. |
| " lap | 1 1/4 " | 1 1/8 " |
| " exhaust lap | 0 " | 0 " |
| " lead in full gear | 1/32 " | 0 " |
| Wheels, driving, diameter | 54 " | 63 " |
| Wheels, truck | 30 " | 33 " |
| Tractive effort | 24,518 lbs. | 25,215 lbs. |
| Weight on drivers / Tractive effort | 4.64 | 5.05 |
| Total weight / Tractive effort | 5.15 | 5.84 |
| Tractive effort x diam. drivers / Heating surface | 847 | 722 |
| Heating surface / Grate area | 56.7 | 71.1 |
| Firebox heating surface / Total heating surface | 0.08 | 0.08 |
| Weight on drivers / Heating surface | 72.84 | 57.42 |
| Total weight / Heating surface | 83.38 | 66.50 |
| Volume of both cylinders | 7.88 cu. ft. | 9.45 cu. ft. |
| Total heating surface / Volume of cylinders | 198.60 | 233.12 |
| Grate area / Volume of cylinders | 3.50 | 3.28 |

## An American View of British Railways.*

Given, a railroad system which earns each year just about what it earned the year previous, while the capital charged against it is each year materially greater; how are dividends always to be paid at the "usual rate"?

This is a problem which can be worded in many ways; it is subject to much twisting and turning about, while local conditions may greatly modify either or both of the main premises. But the central fact of it is confronting every British railroad manager, and will not down; he has always the skeleton in his closet, and is fortunate if he can keep it hidden. Suffice it, then, to say, at the outset, that the average capitalization of the British lines, as reported by the Board of Trade, stands at some $273,000 per route-mile, while that of our lines is approximately $67,000 a mile.

Taken by themselves, these figures are meaningless. We are comparing single-track lines thrown across the Kansas plains, unfenced and unsignaled, with four-track roadways, splendidly built and safeguarded, leading into the heart of London. As our country grows up to its transportation system, the capital account will swell by leaps and bounds, and, in truth, expenditures during the last 20 years have been out of all proportion to the increase in route-milage. We have fairly entered into the period when the characteristic of railroad progress is the betterment and enlargement of existing facilities, rather than the opening of new territory with hastily constructed lines. But the fresh budget of capital expenditure charged each year against American railroads is bringing constantly increasing returns; the money buys new tools, which enlarge the output of the plant. In England, unfortunately, this is not true. The 23,000 miles of railroad in the British isles cover the country like the filaments of a cobweb; every traffic center is splendidly served already, and not much new is to be hoped for. Gross earnings increase each year, it is true; but they increase very slowly, while the railroad properties, built for all time, three quarters of a century ago, by engineers who had the hardihood to assume that their designs could not be bettered, cannot now be adapted to economical working, but must be carried as best may be, with their terrific burden of capital cost.

To put the matter in a word, the English managers, for the past 50 years, have been capitalizing maintenance in order to pay their dividend. They do not call it capitalizing maintenance. Theoretically, the strict up-keep of the line is paid for out of earnings, and the new capital goes into permanent betterments, larger and more powerful locomotives, heavier bridges, and many other items that leave the company with new assets to set against the new liabilities. But it is only too evident that, in the face of the sharp and ever-present competition in all quarters, these capital costs do not bring new traffic—for there is not much new traffic to be brought—but only serve to retain the existing business, and to keep it from falling into the hands of rival companies. British railroads do not suffer from competition in rates; but they are gradually being bankrupted by competition in facilities.

At the bottom of the difficulty lies the sacredness of the dividend. Broadly speaking, American railroads were built on the proceeds of bond issues; much, if not most, of the original stock was put on the market as a speculative venture, and when the load of capital became too great for the property to bear, the bondholders took possession, wiped out the stock, and reorganized on the best basis they could. Dividends were paid when it seemed expedient; not because the stockholders were deemed to have any particular right to them. The best American railroad practice to-day not merely maintains the property out of earnings, in the British sense of the word *maintain*, but puts it in such shape that it can continue to hold its place in its competitive territory without new capital costs. After that, a generous surplus is carried forward, and then the balance of the earnings is available for dividends.

But British railroads have no bonds; there are simply three classes of stock, debenture, preference and ordinary, receiving dividends in the order mentioned, and profits are shared almost to the last penny—a great company, earning 12 million pounds sterling, carrying forward perhaps £25,000 as the year's surplus.

For example, the balance carried forward as surplus by the Great Western Railway for the half year ending June 30, 1904, was equal to only one twenty-fourth of the common stock dividend requirements for the same period. The dividends, that is to say, absorbed 96 per cent. of surplus net earnings, after a scanty charge for maintenance. Dividends on the Pennsylvania Railroad in 1904 absorbed only about 64 per cent.; on the Lake Shore & Michigan Southern they absorbed less than 40 per cent. Moreover, the English road includes its entire surplus carried forward in the sum available for dividends; while both of the American roads have tremendous accumulated surpluses from past years which they do not so include. The accumulated surplus of the Pennsylvania at the time of its last report amounted to nearly 25 millions; the Lake Shore had nearly 17 millions; the Great Western (England) carried forward $125,000 as its sole reserve.

Just as the British railroad carriage started from the stage coach, and has never gotten far away, so the dividend system is based on the practice of the little manufacturing concern whose three owners repair the roof out of surplus earnings, and divide the cash balance at the end of the year. But the proprietors of the manufacturing concern are on the ground; if they are confronted with competition they can intelligently take counsel among themselves and agree to spend some of their profits in new facilities. Not so the thousands of railroad shareholders. The standard of dividends set by the company may have been extravagantly high at the outset, so that it is maintained at great sacrifice by starvation of the property; but that does not interest them; they want their 5 per cent., or 4, or 3½ per cent. on an investment made in times of greater profits, and they look sharply to the chairman and his board for it. American charges are flexible, for the dividend—which is not a charge at all—can always be reduced or suspended entirely. But the whole system of British railroad capital, based upon a small but regular return, as against the speculative returns in this country, depends on the dividend, and is extremely inflexible. So the capital has piled up, and must continue to pile up until earnings vanish. Our railroads took their hardships and deprivations in their youth; the English lines, after years of great prosperity, are looking forward to certain poverty in their old age.

It has often been said that British railroad traffic had the characteristics of a retail business, while American railroad traffic was analogous to a wholesale business. The extent to which this is true can scarcely be realized by the tourist; the difference is fundamental, and the conditions under which the lines are worked

*From a paper by Ray Morris, in the *Atlantic Monthly*.

are as wide apart as the two continents. Some of the British lines have recently complained bitterly of the serious inroads into their passenger revenue made by tramways working within a radius of, say, three miles from the cities—a traffic that the American manager never had, and does not want. The extreme minuteness, if the term may be so used, of the British merchandise business, tends to destroy all comparisons with American freight-carrying. As a result of these things, visiting railroad offices in either country, newly come from the other, are perplexed and dismayed rather than enlightened by what they see. The British manager on a visit to America sees faulty permanent way construction, locomotives built to be "scrapped" after seven or eight years' service, unpunctual passenger trains, and a great proportion of the country's mileage abounding in grade crossings and worked without block signals. On the other hand, the American manager in England sees a freight traffic that has degenerated into a parcels business, and a network of lines, extravagantly built and extravagantly worked, handicapped by an official formalism that reaches all branches of the service alike, while the capital account hangs over the lines like a black cloud, certain some day to descend in a storm that will wipe out many time-honored values.

British railroads do not have presidents, and there is nobody on the official roll whose authority exactly corresponds to that of the American chief executive. The chairman, often titled and usually a layman, finds it his chief duty to preside over semi-annual meetings and to answer the extremely pertinent questions put to him by the proprietors—for every British shareholder feels the weight and dignity of his proprietorship, and may not be gainsaid. To make, for the moment, a technical distinction, the characteristic organization of a British railroad is departmental; the characteristic American organization is divisional. That is to say, we are prone to make each operating division of the road a separate entity, ruled by its superintendent, who reports to the general superintendent of all divisions. On most of the larger systems there are a group of vice-presidents, each responsible for a main branch of the business, but reporting in turn to the president, while they give the division superintendents, who are the operating units, as free a hand as possible. Our general managers are little more than full-powered general superintendents.

But in the British departmental organization, the branches of the business proceed in parallel lines that do not converge in any central authority. The British general manager is the operating head; but the locomotive-chief gets about the same salary, and theoretically reports to no one but the non-technical directors; while main questions of policy and finance are taken away from the general manager by the board. The chief traffic-manager has a position almost, though not quite, as independent as the locomotive chief. The result is that the general manager, whose duty it is to move the traffic, may or may not be able to haul the trains he wants to; it depends on the locomotive chief whether he can or not; and the locomotive chief, desirous of making a fine record of working economy for his engines, does not always care to overwork them for the sake of enabling the general manager to make a good record of another sort. British railroads often seem to obey the Scriptural injunction not to let the right hand know what the left hand is doing.

Yet in spite of these very patent defects which so seriously affect the economies of working, the fact must not for a moment be lost sight of, that the public service rendered by the British lines, the convenience to the traveler and the shipper, are far in excess of anything to be found in this country. The British Isles are absurdly small when compared with our vast areas, and this of course simplifies the operating problems; there are no snowdrifts to delay schedules, no sections of crudely built track awaiting perfection, and the locomotives are never far from their home shops. Yet, even with allowance for these advantages, both freight and passenger traffic are habitually handled with a regularity and certainty that deserve the highest degree of praise. In any large terminal in England the number of passenger trains that arrive either exactly on time or a minute or two ahead is far greater than that of trains even the least overdue; five minutes is usually a safe margin for an important connection. At Finsbury Park, a suburban station just outside London, trains pass on an average of one every two minutes night and day, yet this tremendous traffic is handled with clock-like precision. This punctuality, moreover, is not confined to the passenger service, and, in comparison with this country, it is in freight-working that it is the most marked.

The English method of handling fast freight is so different from ours in its whole conception and environment—at once so much more expeditious and so much more costly—that there is no common ground for a comparison. As far back as 1885, when Hadley wrote his "Railroad Transportation," he showed that freight could be received in London late in the afternoon and be delivered at the consignee's door, anywhere south of Scotland, the next morning. The main features of this service have not been changed much in the last 20 years; but it has been polished by competition to a wonderful degree of perfection as regards facilities, although the cost of it, both to the railroads and to the shippers, remains an unfailing source of astonishment to the American manager.

One of our great eastern roads sends out four fast freight trains daily from New York; the London and North-Western sends out 28 daily! Moreover, the English company cannot despatch these trains at its convenience, throughout the 24 hours, for the freight does not come in until late in the afternoon, and it must inevitably be delivered before working hours the next morning. So the trains must be worked on what is practically a passenger schedule, and to accomplish this they must be light. The maximum train for this kind of traffic is made up 36 little ten-ton wagons, and in the face of the conditions which have to be met, three tons of paying freight per wagon is considered good loading. That is to say, there must be a locomotive and a train crew for about every 100 tons of fast freight! Incidentally, it may be noted that a single locomotive and train crew handle 2,000 tons of paying freight, when grain is moving, on the New York Central; while this record is considerably exceeded by coal haulage over portions of the Pennsylvania system.

Through stress of competition, practically all kinds of freight are hauled in this extravagant manner in British practice, excepting only coal, pig iron, brick and articles that belong in a similar classification. As a result, the business methods of the provincial shopkeepers have been arranged to fit the conditions. A Leeds tailor carries only a small stock of cloth, his customers ordering by sample. If the order is received by 4 o'clock in the afternoon, the tailor can telegraph the number of the sample to London and receive the cloth by the time he opens his shop in the morning. The purchaser of goods that weigh 50 lbs. or so does not feel the freight charge, and gets a service unequaled in any part of the world; but the habitual shipper finds his freight bills extremely high, since the average rate received by the railroad companies on the goods moved by these fast trains is not far from a sovereign a ton. It is only fair to say that this rate, besides providing for rapid movement, also includes collection and delivery; but it has remained practically unchanged throughout the last 25 years, while every one who has followed the recent arguments against Federal rate-regulation in this country must have been struck with the great decreases in our own freight rates during a similar period. So far as freight movement is concerned, it is a safe generalization to say that advances in the science of transportation have been applied in this country primarily to the reduction of costs; in England to the improvement of facilities.

If I were asked to name the characteristics which, from the standpoint of the casual traveler, make British railroads most unlike American railroads, I should reply unhesitatingly, hedges, and the Board of Trade. Each of these terms is somewhat symbolic, as used. The hedges, perfectly trimmed and laid out like the boundaries of a model garden, suggest the neatness and careful exactitude that pervade the service. They may fairly be made to stand for the politeness of the employees, the "railroad servants," as well; for one does not expect to find rude servants in an old-fashioned garden. The traveler does not see the Board of Trade, but he is surrounded on all sides by its handiwork, and watched over by its inspectors. Specifically, the Board of Trade as a British railroad characteristic stands for the broad masonry station platforms, the overhead bridges from the up-line to the down-line, the absence of grade crossings, the efficient system of block signaling, and the careful inspection and report that follow even the most insignificant accident. More broadly, it denotes the great British public opinion, that may be inefficient, but is always honest and courageous, and carries an influence—whether it expresses itself in the shareholders' meeting or in the columns of the *Times*—which has no parallel in this country. Nor does public opinion, or public serious-mindedness, stop with the proprietors and the critics: the humblest railroad guard feels his responsibilities, and respects the traditions of law and order to an extent that is simply astonishing. He may be stupid; he usually is; but his fidelity to the book of rules and to his own small but essential share in railroad working seems to belong to a different race of individuals from the American trainman, with alertness and carelessness well mingled in his make-up.

The Board of Trade is a branch of the government, and its railroad department is concerned almost solely with public safety. It views public safety broadly; it will not permit any new line to be opened for traffic until its inspectors have passed on it; and the inspectors require compliance with almost countless arbitrary requirements that entail a tremendous expense on the railroad company and have, in considerable part, no real bearing on safety. Many of these requirements are traditional rather than expedient; if railroads were to be built *de novo* in the year 1906 it is certain that the Board of Trade would be immensely shocked, if not insulted, at the suggestion that a 100-ton locomotive should rely on wheel flanges less than 1½ in. deep to keep it on the rails, at a speed of 70 miles an hour. But the traveler who is not a shareholder has no occasion to worry over excessive safety, and he can feel assured that every British railroad on which he is permitted

to travel has passed a rigid examination at the hands of one of the most critical examining bodies in the world.

The Railway Department of the Board of Trade has four principal inspectors, who are retired army officers—at present three lieutenant-colonels and a major. These gentlemen naturally had no railroad experience prior to their appointment; in fact, the very circumstance of their army career indicates the impersonal, nonpartisan service which is expected of them. Without technical skill, except that which they have acquired in the prosecution of their duties, they stand for dignity and absolute integrity, as representatives of the government. One inspector personally investigates every accident, every new line which it is proposed to open for traffic, every installation of a new type of signal, and the like, and receives testimony much like a circuit judge, except that the proceedings are informal. In due course of time he presents his report, quoting the important testimony, and adding conclusions and recommendations of his own which have practically the force of statute, because of the power possessed by the Board to require compliance on the part of the companies. The reasons gravely alleged by the Board as the cause of a wreck often fail to convince; the remedies suggested may do nothing more than reiterate the need of care in train-working; but the limelight is turned squarely on all the operating methods and physical conditions contributory to the accident, and any real evils that may be discovered are dealt with in no uncertain manner.

For example, at the famous Hall Road accident, on the electrified portion of the Lancashire & Yorkshire, the whole system of facing-point switches throughout the country was under trial, although the primary cause of the accident was an order to proceed, wrongly given, by a signalman. The country was aroused by the accident; but the Board of Trade went about its investigation without haste or hysteria, and laid the entire blame where it belonged—on the mental confusion of the signalman. The American press as a whole can be relied on always to assume, tacitly or sonorously, that a serious railroad accident is due to "corporate greed," implying that if the shareholders cared to spend what they should, they could bring about a condition of perfection that would make accidents unheard of. The British press does not share this attitude of mind, because it places perfect confidence in its Board of Trade. When the inspectors of the Hall Road disaster fully exonerated the facing-point switch from the charge that it was accessory to accidents in general, the press had no more to say on this point. It is easy to imagine the heroic stand which our sensational papers would have taken in such a discussion. They would have formed their own conclusion months before the Board of Trade hearings were finished, exonerating the poor signalman—and incidentally publishing his portrait—placing all blame on the directors, and appealing to high Heaven and President Roosevelt for a law requiring the abolition of facing-point switches.

The British observer is naturally surprised to see that our safety measures are enforced primarily by the newspapers; he is scandalized to learn that the cause of some of our worst accidents is never known, and hence that preventive measures do not follow. For example, the Mentor wreck, on the Lake Shore, is still unexplained, after incomplete and unscientific examinations made by coroners' juries and the inefficient State Railroad Commission. Two things, however, have always worked to hinder really useful work by any national railroad commission in this country: the separate state government system, and the fact that internal communications played so vital a part in the development and in the prosperity of the land that public opinion, at the outset, was not at all critical. What was wanted was railroads; if they could be safe railroads, so much the better; but this was not the essential thing. The early lines across the plains, with all their crudities, were so infinitely superior to pack trains, both in efficiency and in safety, that their shortcomings were not judged harshly. Now we have awakened to the fact that a preventable accident is a criminal thing, and we hold our railroads in low esteem because they cannot at once alter their physical structure to conform to our point of view. It is fair to say, however, that we very greatly need an institution with inspection powers like those of the British Board of Trade, but with expense ideas tempered to the wide difference in situation.

To revert from the Board of Trade to the hedge characteristic of British lines: the baggage system, plus the cab arrangements, never fails to delight an American. He never knows, and never can be made to know, what there is in the system that offers the slightest hindrance to the professional collector of other people's baggage; he is fully convinced that the porter would place on his hansom any bag he designated as his own, without a moment's hesitation. In a country where checks are not used in ordinary baggage handling, the entire system rests on the simple affirmation, "This is my bag." Yet the claim departments of British railroads find that theft of baggage from station platforms is practically a negligible item in their accounting. From the standpoint of the ordinary traveler, the British method is incomparably superior to ours. A four-wheeler in London costs a shilling for the first two miles. Add a few odd pence for each piece of baggage carried outside, and construe the distance liberally, and you may arrive at the station, with all your paraphernalia, for a ridiculously small sum. English visitors to New York habitually dine in tweeds on the night of their arrival, because the expressman, who lightly guarantees immediate delivery of their belongings, finds it more convenient to call the following morning.

The Englishman travels with two kit-bags, a hat-box, an ulster and a rug, and never carries any of these things himself. He marvels at the hidden resources of the American dress-suit case, not understanding the stern necessity that requires us to provide apparel for the day in such form that we can manage it without relying on the porter or the expressman. It has always seemed to me that the polite porters who swarm about English railroad stations were, in the last analysis, responsible for the abominable coldness of the trains; for without the porter's assistance the traveler could not manage his ulster and his rug, and would be unable to regard a railroad journey as akin to a drive in an open carriage. Our trains are overheated, and we remove superfluous outer garments when we travel; English trains are really not heated at all, and the traveler must dress as he would dress on board ship.

Taking into consideration all the differences, great and small, it is hard to say with conviction that the railroad system of either country offers any marked advantage over the other in the comfort it affords the traveler. England is a land of short distances; and, speaking of the lines as a whole, they subordinate their freight business to their passenger business. In this country we unhesitatingly subordinate the passenger traffic. As a result, the English service offers many more short-distance trains, which run with infinitely greater punctuality. But the long-distance traffic—that is to say, the service between England and Scotland—lacks many comfort-giving features to which we are accustomed. The traveler in the fall and winter months is likely to be chiefly concerned by the coldness of the trains, mentioned above. He is also expected to remain in one place throughout the journey; there is no library car at the front of the train, no observation smoker at the rear. In recent years an excellent dining-car service has been maintained on the best trains; but dining-cars are still somewhat of a specialty, rather than an essential feature of a through train. As an alternative there is the basket lunch—a cold chicken, lettuce salad, bread, butter and cheese, designed to be eaten from the lap. Personally, I am inclined to think that an American dining-car affords more nourishment and considerably more variety than does a basket lunch; but this is a moot point. The dining-car at least gives the traveler a chance to move about, and to substitute oak and rattan for plush. The English dining-car, when found, is so thoroughly satisfactory that it may rest quite exempt from the criticism of a reasonably philosophic traveler.

The same is true of the British sleeping car, which, like the diner, is a recent development, but is now always to be found on the Scotch night expresses. Each passenger has a narrow compartment to himself; there are no upper berths, and there is an individual washstand in the compartment. If the journey begins at bed-time and ends at getting-up time, the traveler will be thoroughly comfortable; but if he is bound to a point not reached by his rising hour—Aberdeen, for example—he must needs make up his own berth and remain in his compartment; the cars are not convertible into day coaches, and he must be content with a basket breakfast, likewise eaten from the berth.

The upshot of a comparison between English and American railroads is that each country has provided itself with the system that, broadly considered, answers its own needs the best, and that, when all circumstances are taken into account, neither has much to learn from the other. Certain great defects stand out in each; English railroad financing and American railroad carelessness are both deserving of censure. Yet these defects are quite explainable in their outgrowth from the physical conditions at hand, and they are not amenable to any off-hand remedy. Likewise, certain points of especial attractiveness, such as the English baggage system and the punctuality of trains, and the American luxury of through travel, have arisen from a complicated set of local circumstances, and could not be transplanted unless all the circumstances were transplanted as well. Most forcible of all is the impression gained by such a study that the essential belief, the very creed and doctrine of one country, as regards the economies of its railroad working, may not be so much as discussed in another, where the same ultimate problem is gotten at in a wholly different way.

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A preliminary official statement of the results of the operation of the Russian railroads in 1905 shows in comparison with 1904 an increase of nearly 2 per cent. in mileage worked, a decrease of less than 1 per cent. in the number of passengers carried, and a decrease of 6½ per cent. in the number of tons carried. The gross earnings decreased about $25,000,000, or 8⅔ per cent., and the earnings per mile 9 per cent. The Transcaucasian Railroad, which extends from the oil wells on the Caspian to the Black Sea, had a decrease of no less than 40½ per cent. in gross earnings. That part of the Siberian Railroad east of Lake Baikal, over which

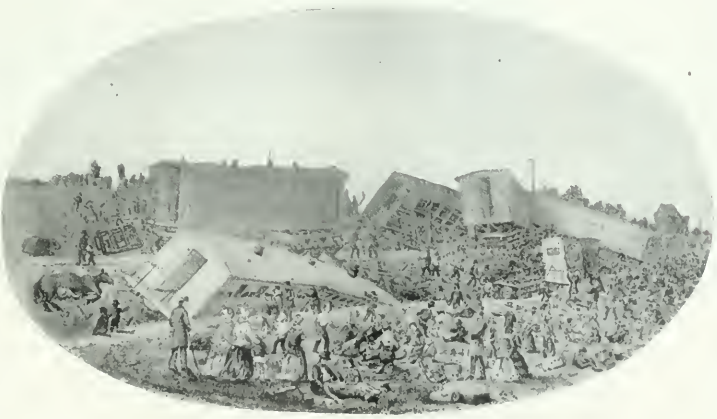
troops, etc., returned from Manchuria, had an increase of 50½ per cent. in earnings; the Asiatic Midland, for reasons which do not appear, a decrease of 19 per cent.

## A Train Accident of 1855.

Among the reminiscences published in connection with a recent collision in New Jersey was an allusion, by an old citizen of Burlington, in that state, to a disastrous wreck which occurred on the Camden & Amboy in that town on August 29, 1855, in which 21 persons were killed and 75 were injured. Through the courtesy of Mr. J. A. Anderson, the former Superintendent of the Pennsylvania Railroad Relief Department, now retired, we are able to reproduce a lithograph of the scene of the accident from a drawing which was made at the time by John Collins, a teacher residing at Burlington, now dead. Mr. Anderson was connected with the road in 1855, but did not visit the scene of the accident. He writes interestingly concerning the picture, as follows:

The scene, as depicted, must have been harrowing in the extreme, and one is led to reflect upon the coolness as well as the skill of the artist, who gives it in such minute detail. The picture is interesting, too, as showing something of the quaint costumes of the day and of the construction of the cars, which had side doors at the center and platforms level with the floors, to which the station platforms corresponded in height.

This accident was caused by the train, while backing to reach a siding, coming in contact with a carriage crossing the track. It was the rule then that, when a train having the right of track was late at the schedule meeting place, an opposing train might run to a "meeting post" and the train first arriving there had the right of way, the other being required to back to a siding. The carriage which was the cause of the disaster was being driven by Dr. John F. D. Heineken, a physician of Columbus, N. J., who had with him his wife and three children. All escaped injury, but both horses were killed and the carriage was wrecked. [The people of Burlington were so aroused and agitated that for several weeks the road was compelled to reduce the speed of its trains through the town to about four miles an hour.]



Derailment at Burlington, New Jersey, August 29, 1855.

This accident gave rise to some extraordinary inventions, designed to prevent like occurrences. One was known as the "Heineken whistle." This was a whistle attached to the cylinder of the locomotive, so arranged as to give a blast at each movement of the piston, which, at the moderate speeds of that day, gave the puffs at distinguishable intervals. I remember seeing this in use but do not know to what extent it was adopted nor when its use was discontinued.

Another invention, which was re-invented many years after, was a gate to be shot across a roadway by mechanism operated by an approaching train, when half a mile or so away. If everything worked well this would have been all right for the train, but it might have worked badly for any carriage which should happen to be in the way at the time. I never heard of this going into practical use.

Before the advent of the telegraph as a means for regulating the movements of trains, the methods devised for meeting the difficulties of this part of railroad operation were often remarkable for their ingenuity as well as sometimes for their clumsiness. Some 20 years ago the widely known veteran conductor of the Camden & Amboy, Andrew Quintin, gave me a copy of the following order which he had received:

"Instructions.—Philadelphia & Trenton Railroad, Line 3.—To Andrew Quintin.—Sir: You will leave Trenton at 7, Bordentown 7:30, and Burlington at 8 o'clock A.M. If no flag is up remain on turnout till C. & A. R. R. Line passes, and if no line is in sight when you get to Dauk's, proceed on carefully with a man ahead (at curves), and give New York line the preference, and then continue on to Camden at regular speed if you can arrive by 9:28 (regular time to be at Camden is 9:20) if you cannot arrive by 9:28 stop at deep cut, if you can reach there by 9:35, and remain there till 9:50 if Mail Pilot Line does not arrive. If you cannot reach deep cut by 9:50 stop at Fish House turnout till 9:55 if line is not in sight then proceed carefully to Camden, with man ahead as before.

"Returning you will leave Philadelphia punctually at 2 P.M., and proceed from Camden on the arrival of the Mail Pilot Line provided it arrives 2:30; if not in at that time proceed on.

"The general instructions of the Railroad have been altered so that the train first arriving at the turnout must go on to it.

"You will regulate your watch daily by the office time in Philadelphia.

"The N. Y. 7 o'clock line leaves Burlington at 8:30.

"WM. H. GATZMER.

"P. S.—You will take water at Rancocus when there is water there."

It is not clear whether the above applied to a single day or was in the nature of a time-table with special instructions. This was before the day of centralized management in the operating department. Mr. Gatzmer was then and long afterwards the General Agent of the company at Philadelphia, and his duties included pretty much everything of importance, financial and otherwise.

In the Book of Rules of the Camden & Amboy Railroad, which took effect in December, 1855, the use of the telegraph is provided for in the authorization of "messages" to be "written and signed by the conductor of a train or the driver of the engine who may order the message." The rules governing the matter are too long for reproduction here, but it may be said that they leave it to the conductor to determine whether his train shall go ahead, on authority of a message prepared by himself, as against a delayed opposing train.*

## Malaysian Railroads.

In the Federated Malay states, Provinces Wellesley and Malacca, the operated railroads amount to 396 miles, exclusive of the Sungei Ujong Railway. The length of branches is 74 miles, exclusive of the Sungei Ujong Railway, 25 miles, a guaranteed road worked by a company. All of the railroads in Province Wellesley, Malacca and the Federated Malay states—that is, Perak, Selangor and Negri Sembilan—have been built and are operated by the Federated government. The colonial government supplied funds to build the Malacca branch, Tampin to Malacca, 21 miles. When completed, the Federated government purchased it from the colonial government. The total expenditure on open lines up to Dec. 31, 1905, amounted to $18,630,961 gold, which includes all expenditures, and the formation of four ports, also works at Penang and Malacca ports. The whole of this money has been supplied from current revenue of the Federated Malay states.

The total length of the main trunk line, Johore Bahru to Prai, in Province Wellesley, will be 472½ miles when completed. There is a five-mile steam ferry between Penang and Prai, the northern terminus of these railroads. From Johore Bahru to Woodlands, Singapore Island, there is a steam ferry one mile; Woodlands to Singapore city the railroad distance is 15 miles. The total distance from Singapore to Penang by railroad will be 487½ miles, steam ferry six miles. The distance from Johore Bahru to Johore Negri Sembilan frontier is 120½ miles, now under construction, and good progress has been made for 30 miles from both ends. Exclusive of the construction in Johore territory, there are 33 odd miles under construction south of Tampin, 21 miles of which is ready for opening. The line should be completed in two years or less, when a through service can be begun. With completion of the main trunk line and branches, transportation facilities for products of the native states will be greatly improved. Other lines are contemplated running northerly through Pahang, for which preliminary surveys have already been made, and routes have been explored through Kalantan, a province of southern Siam, to Kota Babru at the mouth of Kalantan river on the coast of the China Sea. These prospective lines would open up valuable tin-bearing territories and give easy and cheap transportation facilities to sea ports.—*Consular Report.*

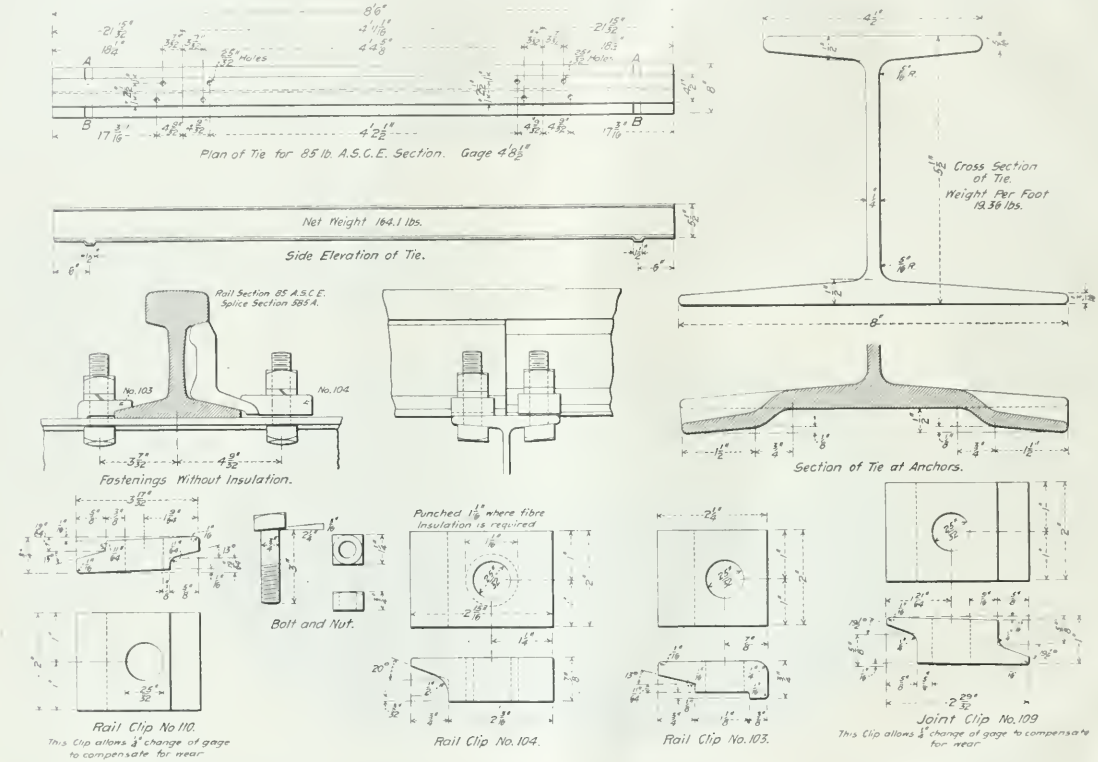
*The "meeting post" rule in the same book is as follows: "When trains from opposite directions are seen from each other between two turnouts, both shall stop, and the one farthest from the meeting post shall give three loud, short puffs of the whistle, and then go back—preceded always by a man on foot, with a red signal—to the turnout, to which the other shall follow closely, and pass without unnecessary delay to either train."

## The Carnegie Steel Tie.

We recently asked the Carnegie Steel Co. for information concerning the present status of steel ties in the United States. The reply to our inquiry from one of the officers of the company was so comprehensive that we print it below in full.

The first steel tie of this general pattern was made with a 4-in. I-beam having a plate 4½ in. wide riveted on the top, and one 8 in. wide on the bottom. Several of these were placed in tracks of the Lake Shore & Michigan Southern at Sandusky, Ohio, seven years ago, and an examination made not long ago showed that there was no deterioration. In fact, the edges of the sheared plates are as plainly defined as if sheared recently. At the same time this examination was made it was observed that wood ties which were placed in track at that time had decayed and were being replaced.

The Carnegie Steel Company followed this experiment with the installation three years ago of several lots of ties rolled in the same shape around Homestead Steel Works and on the Bessemer & Lake Erie. While these ties were put in by the regular track force with no special supervision, the results were sufficiently satisfactory to warrant an additional installation, and the Bessemer & Lake Erie, during 1905, put in 25,000 at various points on their line where it was most difficult to maintain the track. Between Euclid and Queen Junction, a distance of about five miles, the southbound main track is entirely equipped with these ties, and it is without doubt the most perfect piece of track on the road. While the curves are sharp a train running at a speed of 55 miles an hour runs as smoothly as if on tangent. The noise is less than on wood


Plan of Tie for 85 lb. A.S.C.E. Section. Gage 4'8½"
Net Weight 164.1 lbs.
Side Elevation of Tie.
Cross Section of Tie.
Weight Per Foot 19.38 lbs.
Rail Section 85 A.S.C.E.
Splice Section 585 A.
No. 103
No. 104
Fastenings Without Insulation.
Section of Tie at Anchors.
Punched 1⅛" where fibre Insulation is required
Bolt and Nut.
Rail Clip No. 110.
This Clip allows ½" change of gage to compensate for wear.
Rail Clip No. 104.
Rail Clip No. 103.
Joint Clip No. 109
This Clip allows ½" change of gage to compensate for wear.

The Carnegie Rolled Steel Tie and Details of Fastenings.

Steel Ties in Track of Pennsylvania Lines West near Emsworth, Pa.

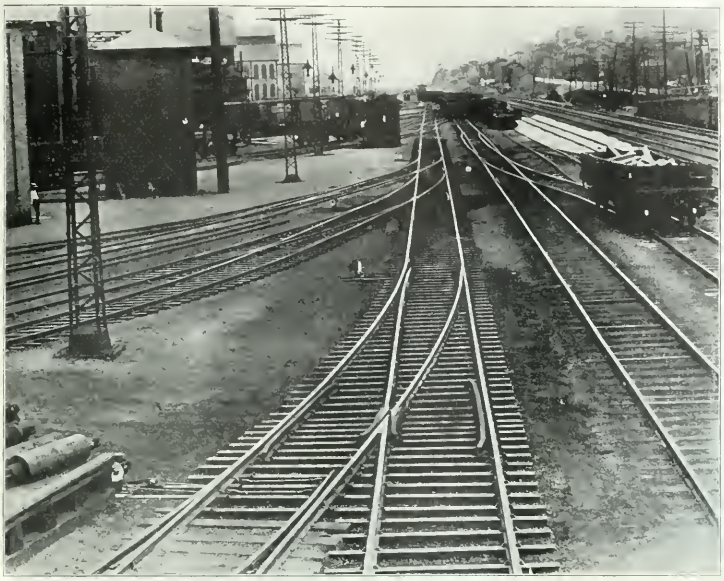
ties, the gage is uniform throughout and the surface and line can be maintained with less labor than needed on wood ties.

The traffic on this track is both passenger and freight, the speed of the passenger train being limited to 55 miles per hour, while the freight trains do not exceed 35 miles per hour. At points where installations were made two years ago it is demonstrated that the gage remains exactly the same as when ties are first installed, except for wear on rail. The wear on the rail is absolutely uniform, and examination of the wear of rail on wooden ties shows that the rail at the joints does not wear quite as fast as at other points, and that in a year's time, even with tie plates, the low rail turns outward. On steel ties this does not occur and there is much less flow of the material on the low rail than on wood ties. This road has ordered 80,000 of these ties for 1906 renewal, and is using them for maintenance by spotting them in where it is necessary to remove worn out and decayed wooden ties. In construction work they are laid down on the roadbed whether it be wet or dry, and results are practically the same as those from wood ties. In other words, the substitution of steel for wood entails very little additional inconvenience. The steel tie has a special advantage around switches as it can be cut to any length and the cost per foot is no more than for the ordinary cross tie, which, when a full switch set is considered, means that the first cost of a set of switch ties is not over 25 per cent. of the first cost of wood switch ties with tie plates.

There were 46 sets of switch ties placed in tracks at Homestead Steel Works during 1906, and all tracks built or rebuilt at these works will hereafter be equipped with steel ties, as it has been found that where traffic is extremely heavy and the radius of turnout is small, that there is an immediate economy in maintenance with the use of these ties.

The insulation required on account of automatic signals is met by the use of ¼ in. fiber shims beneath the rails and a specially insulated clip constructed by means of fiber placed between the clip and a steel bushing in such a way that there can be no wear on the fiber, the point of contact between the bolt and the clip being steel. The steel tie has been used somewhat in street railway work; the Pittsburg Railways, of Pittsburg; the Manufacturers Railway, of St. Louis, and Cleveland Electric Railway, of Cleveland, having installed last year quantities of cross ties and switch ties, and reports from all these points are that ties are giving good results. Physical tests of the tie show that a load of 170,000 lbs. can be placed upon it before there is any sign of failure. In a test of the fastenings recently made by mounting a rail on the tie, and standing it on end, applying the load vertically, it was found that with 17,500 lbs. load the top flange began to buckle, permitting the rail to release itself. A similar experiment with a rail spiked to an oak tie with two spikes showed a failure with a load of but 4,700 lbs.

The steel tie in principle should be an anti-creeper, as the fastening between the rail and the tie is rigid, and on the Bessemer & Lake Erie it has developed that less trouble has been experienced on account of rail creeping on the steel ties than on wood ties in same location. We have had no reports of any broken rails except on the New York Central, where there were quite a quantity broken during the winter of 1904-5. This it is thought was due to a very high carbon rail, as there were a number of breaks on wood ties also. The ties at this point were installed late in the fall and may not have been surfaced perfectly before the track froze up. The past winter, however, there has been very little trouble with any broken rails. Track men after some practice find the steel tie as easy to tamp as the wood tie.



Steel Ties in Yards of Homestead Steel Works, Pittsburg, Pa.

The following roads have installed these ties prior to 1906:

Pennsylvania Lines West of Pittsburg.
Lake Shore & Michigan Southern.
New York Central.
Bessemer & Lake Erie.
Manufacturers Railway, St. Louis, Mo.
Pittsburg Railways, Pittsburg, Pa.
Cleveland Electric Co.
Duluth & Iron Range.
Northern Pacific R. R.

The following railroads have been furnished steel ties for 1906 installation:

| | Miles. |
|---|---|
| Bessemer & Lake Erie | 30 |
| Union R. R. | 11 |
| Baltimore & Ohio | 1 |
| Pennsylvania Railroad | 1 |
| Buffalo, Rochester & Pittsburg | 1 |
| International Railway, Buffalo | 5 |
| Mexico El cirle Tramways, City of Mexico | 4 |
| Entre Rios Ry. Argentine Republic | ¼ |

Besides the above, lots varying from 10 to 100 have been furnished to three or four other railroads.

Attention should be called to the punching in the top of the tie. At present four holes are punched at each end, the inner holes of the group taking care of the intermediate points of rail, the outer taking care of the joints. Almost all the ties in track

Steel Ties in Street Car Track—Cleveland Electric Railway Co.

Steel Ties in Curve near Otis, Ind.—L. S. & M. S.

to-day are prepared in this manner. We, however, have placed some in tracks of the Bessemer & Lake Erie where we have notched the splice bars sufficiently wide to admit the clip, thereby eliminating the use of two kinds of clips. This method will be of advantage inasmuch as the inner group of holes at each end of the tie can be for the rail in track at present, while the outer group can be used for the next heavier weight of rail a road is liable to use.

Reference to the blue print shows two kinds of rail clips. Clips Nos. 103 and 104 are used altogether on the Bessemer & Lake Erie. Clips Nos. 109 and 110 have been furnished to the Buffalo, Rochester & Pittsburg Rail, the Pennsylvania and the Baltimore & Ohio. These clips allow an adjustment in the gage of the track made by turning the clip upside down, which causes a movement in each rail of $\frac{1}{4}$ in. This was done so that after the rails had worn off an inch out of gage they could be readjusted to the original gage.

### Observation Car for the Manitou & Pike's Peak Railway.

Last week the new rack locomotive for the Manitou & Pike's Peak Railway was described and illustrated. A new observation car for the same service has just been completed by the American Car Company, St. Louis, which is illustrated herewith. It is the Brill semi-convertible type, both sash, the upper and lower, being arranged to raise into the roof, giving the entire window opening, from arm-rail to letter-board, for the free circulation of air. This also permits an unobstructed view for the passengers, giving full opportunity to view the scenery as the car ascends or descends the mountain.

There are some special features in the design of the car, one being the arched roof instead of a monitor deck. To provide suitable ventilation when the windows are closed, there are three Star ventilators in the roof. The car is 33 ft. 4 in. long over end panels and 41 ft. 4 in. over crown pieces. There is a 3-ft. platform at the forward end and a 5-ft. platform at the rear. The body is especially designed to withstand the stresses of the constant vibration of the rack locomotive.

Convertible Car for the Manitou & Pike's Peak.

The seats have the proper angle to enable the passengers to sit level when the car is on the steep mountain grades. They are covered with plush and the ceiling is painted a dark green, the finish of the interior being cherry. The curtains are silk Pantasote, in green to harmonize with the other decorations. The interior is most pleasing in appearance.

The front end of the car is vestibuled. The rear dash-board is made with an opening in the middle, with a slide therein, to permit passage from car to car when desired. The window sash are the Brill semi-convertible type with the latest design of metal sash stiles. This type of car allows the omission of sash pockets required for drop sash, giving an additional interior width of about 7 in., which is utilized for longer seats and a wider aisle.

The car will be mounted on a special design of truck of the railway company. The truck shown in the view was placed under the car merely to enable the photograph to be taken.

### Belpaire Versus Radial Stayed Boilers.

At the last convention of the Master Boiler Makers' Association, Mr. W. H. Laughridge read a paper in which he urged the advantages possessed by the Belpaire boiler in comparison with those of the radial stayed type, on the ground that it is the more scientifically designed and better constructed of the two. The first cost is somewhat higher but this fades to insignificance when the expense of maintenance is considered. This decreased cost of maintenance appears in the fact that it is not subject to the same ailments as other boilers, for which no cure has yet been found.

For example, cracking of the firebox, flue sheet at the top flange and the side sheets where they join the flue sheet, occurs very frequently in the radial stay type of boiler but never in the Belpaire. The reason for this is that the Belpaire, with its flat crown sheet and short right angle flanges on the sides, stayed to a corresponding flat surface on top, permits both sheets to breathe; a condition essential to the life of the sheet, and the more evenly this breathing, or expansion, is extended over the entire surface, the less will be liability to fatigue and rupture.

The radial boiler with its crown sheet arched transversely with side flanges from 5 to 20 in. deep, formed with a radius of from 3 to 10 in., and stayed to a semi-circular top sheet, forms a combination which can be guaranteed to prevent the crown sheet from breathing and also the adjacent sheets. The result is that the top of the flue sheet cracks, and also the top of the side sheet where it joins the crown sheet.

It is quite natural that this should happen, because the flange riveted to the end of the crown sheet makes it impossible for the top of the tube sheet to expand uniformly in any direction. So the arched sheet, being stiffer than the tubes, travels forward and cracks the tube sheet. The reason why this occurs in the radial stayed boiler and not in the Belpaire is because the former is arched and rigid, and the tube sheet is higher at the center, and expands more at that point than it does at the corners, causing an unequal strain. But in the case of the Belpaire, the flat surface expands uniformly with a distribution of the stresses which are not concentrated at one point. The trouble with the radial stayed boiler does not end here, as the staybolts share in the destruction, and for the same reasons. The top and bottom of the firebox being rigid, the only alternative for the vertical sheets is to bulge between the staybolts, the result of which is that many more staybolts are broken in the radial stayed than in the Belpaire boilers.

Interior of Convertible Car for the Manitou & Pike's Peak.

### Some Essentials in Locomotive Boiler Design.*

BY D. VAN ALSTYNE,
Mechanical Superintendent, Northern Pacific Railway.

When we consider that boiler repairs constitute one-third of cost of locomotive repairs, fuel one-half of total cost of locomotive operation, and that one-half of engine failures are directly or indirectly chargeable to boilers, we cannot fail to realize the importance of directing a large part of our effort in locomotive design toward production of a boiler which has minimum cost of repairs, maximum efficiency and is most reliable. Some results to be sought for in good boiler design are:

1. Reliability and economical maintenance, i.e., freedom from cracked sheets, leaky seams, leaky and broken staybolts and leaky flues.

2. Continuous development of maximum horsepower within the capacity and endurance of the average fireman.

3. Efficiency approaching as closely as possible to that of best stationary boilers.

Reliability and low cost of maintenance depend chiefly on freedom of circulation around the firebox. Since circulation depends upon the head creating it and the size of the passages through which the water must flow from the barrel of the boiler to water legs around firebox, it follows that the greater the depth of firebox and the wider the water legs the more rapid the circulation. This depth should be obtained by maximum depth of throat sheet and not by raising the crown sheet at the expense of steam space.

Experience with smoke consumers and fuel oil has demonstrated the inability of the ordinary locomotive firebox to withstand the heat of perfect combustion, no doubt due to the fact that natural circulation is unable to supply the firebox with water rapidly enough

*A paper read before the North-West Railway Club, at St. Paul, Minn.

to prevent overheating. It is doubtful if it is possible through natural circulation under the best possible conditions to build a boiler whose firebox will withstand the heat of perfect combustion, but when coal is burned in the ordinary manner the better the circulation the less firebox troubles. It is probable that there is a point beyond which the speed of natural circulation cannot be forced and somewhere below which is the maximum reliable capacity of the boiler; and so far as the firebox is concerned it would appear that forced circulation is very desirable if it could be made practicable.

The greater the length of firebox the greater the volume of water required to pass from the barrel of the boiler into the water legs, hence side sheets and stayholts of a short firebox are less likely to give trouble than a long one. The tendency, therefore, should be toward a decided increase in depth of throat and width of water space and as short a firebox as is consistent with necessary grate area. The result will be an exceedingly heavy and bulky boiler at the firebox, neoessitating the use of a trailer truck which it is likely will eventually have four wheels instead of two.

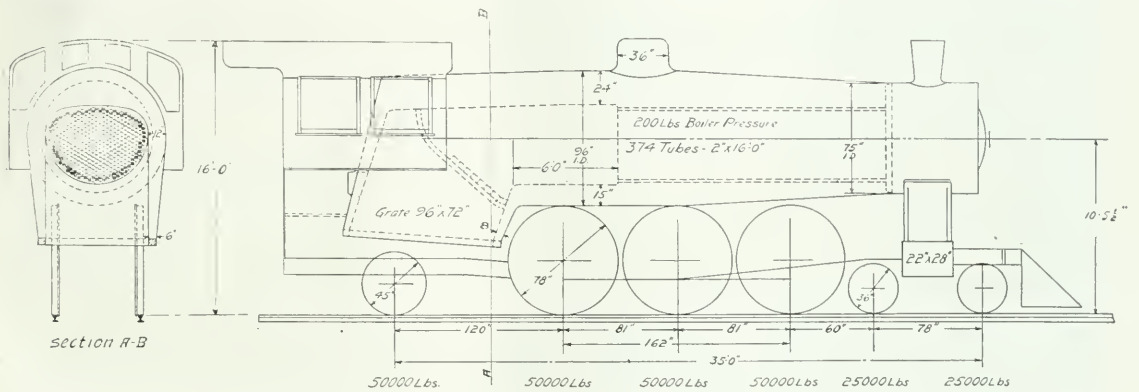
With reference to flues, considerable observation leads me to believe that a comparatively wide bridge—say 1 in., or possibly more —is desirable for large boilers because of the greater stiffness of the flue sheet, and probably better circulation between flues. Wide spacing, however, does not cure leaky flues, which are the most difficult boiler trouble to control. I think it can be satisfactorily shown that the rolling of a flue into a sheet is a water-tight job to withstand almost any degree of heat, provided the flue and flue sheet can be made to expand and contract together, and therefore that when flues leak the conditions are such as to make the flue try to expand more than the sheet, and in so doing it is compressed and made smaller than the flue hole in the sheet. The length of flue, quality of water and coal, method of firing and working injectors, weather and severe service all have an influence on the leakage of flues, and this influence is exerted chiefly through their effect on the size of the nozzle. Whatever causes, therefore, have the greatest tendency toward reducing the nozzle would be the most productive of leaky flues. These, I believe, are poor coal and severe service. The smaller the nozzle the more severe the blast and the greater the blow-pipe action on the end of flues, making them hotter than the sheet, which compresses them so that they are smaller than the sheet when they cool down. So far as my investigation goes, the great majority of leaky flues are below the center line of the boiler, indicating that the short flames of highest temperature enter the lower flues. Hence the need for the greatest possible depth of firebox below the flues so that these hottest flames cannot reach them.

Any other means of keeping the intensest heat away from flue ends will have the same good effect on flue leakage, and recent experience with a combustion chamber which sets the flue sheet 3 ft. ahead of the throat sheet has shown a marked decrease in flue leakage. Of utmost importance, however, is the care of boilers. The most poorly designed boiler is made better by more care, while the best designed boiler will not do well if neglected, and some of the important features in good care of boilers are regular and thorough washing out and blowing off, washing out and filling up with hot water, uniform boiler feeding and avoidance, as far as possible, of working injectors when the engine is not working steam, removal of broken staybolts promptly, and intelligent expanding of flues. Water treatment has done much to reduce boiler troubles, but it has its limitations and should not be attempted until the possibilities of design and systematic maintenance have been exhausted.

To sum up, the locomotive firebox in its fullest development should be much larger and heavier in proportion to the barrel than it is now. It is quite likely that it will be necessary to carry the overhanging weight back of the drivers on a four-wheel trailer truck. The tendency for road engines, either freight or passenger, will be to make the dead weight due to increased size of boilers a larger percentage of the total weight. This increased dead weight, however, should not be a matter of concern so long as it increases the reliability and efficiency of the boiler. The limiting capacity of the fireman is sufficient reason in itself for striving in every way to increase boiler efficiency, either through better boilers, superheating or compounding.

I think it is not an over-statement to say that no heavy road engine should be built with weight on drivers more than 70 per cent. of the total weight, and the lower this percentage is the more reliable and efficient the engine will be; it being understood, of course, that as much of the dead weight as possible is put into the boiler.

These principles are illustrated in the accompanying illustration of a heavy Pacific type locomotive. This represents an engine that has never been built—that is, no passenger engine of that weight has ever been built. Everything is exaggerated on it in order to show the possibilities, and what the views set forth in this paper would lead to in locomotive design. It will be noticed on the cross-section that there is 12 in. of water space at the crown sheet and 6 in. at the mud ring; that there is 8 in. at the throat, and the bottom of the mud ring is about 4 ft. below the lowest flue. The length of these flues, on account of the large drivers, would be 22 ft. if the combustion chamber were not in. This engine has out of a total of 250,000 lbs. only 150,000 lbs. on the drivers. This is rather a small percentage, but not so small as a good many Atlantic type engines now running. It will also be seen that the total heating surface, 3,527 sq. ft., would ordinarily be considered low for an engine of that size; but the greatest possible number of square feet of heating surface is not the thing most to be desired. What is wanted is the greatest possible number of feet of heating surface that will be effective. What seems to be an especially good feature of the combustion chamber, if it is practical, is that it very materially increases the heating surface of the firebox. This is 334 sq. ft.; and it does not need much argument to prove that the firebox is what does the best work in an engine's steaming. There is not much to be gained in getting shorter flues, but no doubt there is some advantage. The great advantage of the combustion chamber is in getting the flues away from the fire.




General Design of Large Locomotive.

DISCUSSION.

In the discussion of the paper it was brought out that after having been in service several months the tubes of the engine with the combustion chamber were free from any evidence of fatigue, and the chamber itself from any leakage. This is in marked contrast with the combustion chambers used on a few Northern Pacific engines some time ago, which were not a success. The success of the later engines is probably due to the fact that the sheet is flanged evenly, with an easy bend. The engines referred to that gave trouble with leakage are excellent steamers.

In the matter of leakages, it was claimed that the tubes on light engines gave much less trouble than those on heavy ones, though the temperature of the fire be the same in both cases. This was partly attributed to the increased length of tube in large engines. Two classes of freight locomotives furnish a case in point. The smaller engines are moguls weighing about 125,000 lbs. on drivers, and on low grades these engines have given the most satisfactory

service of any modern engine. They run from one water station to another, and are going all the time, and there is little or no staybolt trouble. They have been run 17 or 18 months between shoppings, and without a broken staybolt. Trouble with tubes is reduced to a minimum. The other engine is a consolidation, with the boiler exactly the same type but larger. These engines do not give nearly the service in the same districts as the moguls. Flues pull loose and staybolts give a great deal of trouble.

The Pacific type of boilers are built on the same general lines, and, while these engines are in very severe service, the trouble on the road is not great. It is after the engines reach terminals that the trouble begins.

With reference to circulation, experience with smoke consumers and fuel oil has shown the inability of ordinary locomotive fireboxes to withstand the heat of perfect combustion, and also that a most excellent smoke consumer was also a firebox consumer. It made a fine steaming engine, but it was impossible to keep up the firebox. It has been the experience very generally with smoke consumers that they require such rapid circulation that water is not supplied fast enough to carry away the heat. This has also been true of fuel oil burners. It is out of the question to turn the intense heat of the combustion of fuel oil directly against the sheet, and it is doubtful if it is possible to create sufficient natural circulation in a large boiler to take care of perfect combustion.

In regard to care of boilers, it was urged that the development of the locomotive has brought about such conditions in train operation, especially increased tonnage, that on most railroads the fireman cannot stand the strain. This is not altogether due to the fact that firing is so hard, but that so much time is spent in getting over the road. This is a serious difficulty on the large railroads. The modern locomotives of to-day would be far more economical if the runs were not over 10 or 12 hours. On any locomotive, good or bad, if it takes 18 hours to get over the road the service of the last eight hours will be much inferior to that in the first 10 hours—firing, running, and everything else.

With shortening of hours must come education of engineers and firemen in the care of an engine on the road, especially when standing on sidings. They arrive at night and are housed, but no work is done on them. There was a great deal of trouble with leaking, and it was hard work to fire them in the morning. The plan of keeping them hot all night was then adopted, with marked success. As the tubes of the Pacific engines that gave trouble were 18 ft. 6 in. long, and as the combustion chamber of the engine under consideration had a depth of 3 ft., it was suggested that this shortening of the tubes might have something to do with the freedom from leakage.

It will also be of advantage to increase the width of the bridge between the tubes. Ample space for water circulation is space put to a good advantage, and, in one case, 40 tubes were removed from a boiler having about 200, with no detriment to its steaming qualities, while the trouble with leaky tubes was lessened. Much of the trouble with leaky tubes was attributed to the small size of the exhaust nozzle on heavy engines, which is not large enough for the cylinders. These small nozzles are needed for the poorer grades of coal, and then, when better coal is used, no advantage except better steaming is gained. There is no doubt that, when pulling out of a station with a heavy train on a heavy throttle and the lever in the corner, there is a severe strain on the flues. Heavy local trains show it. Frequently the engines on such trains have more leaky flues than a through train that goes right along, for the reason that, with the severe exhaust in starting with the lever in the corner the ash pan opening cannot take care of all the draft, taking it through the firebox and heating it before it comes to the flues; therefore a certain amount must come through the firebox door. The way to overcome this difficulty is to mild the exhaust getting out of the station—not to have the pull on the tubes as at present. It would, therefore, be well to experiment further with the front end when, by a proper regulation of draft, there would be less trouble with leaky tubes.

The author of the paper took the position that the fundamental cause of leaky tubes is that the intense heat in the lower tubes tends to make them expand and the fire sheet, which is somewhat cooler at the bottom because all the cold water is there, has less tendency to expand with the flues. Therefore the flues try to get bigger than the hole, and when they cool they are smaller, because they have been compressed. Therefore a benefit will be derived from setting the flue sheet ahead. It protects the tubes from the intensely hot short flames. Anyone who has observed the fire in fireboxes has noticed that some of the flames are short and intensely hot. These little short flames do not reach the upper tubes, while the long flames can be seen to enter them. Thus there is not only the intense heat at the tube ends, but cold water on the water side of the tube-sheet tending to keep it cool.

Another explanation for tube leakages was based upon the suggestion that possibly expansion or contraction of the various parts of the boiler has become more aggravated with the larger boiler, and in consequence a different method in construction is necessary. There are engines running out of St. Paul that are in as heavy service as any engines of their class in the country, and are working almost all the time at their maximum capacity. They are Schenectady engines with shallow fireboxes, and their flues are almost absolutely free from leakage. It is a rare thing that one of those engines fails on account of flue trouble. They are also remarkably free from staybolt leakage. Poor coal is also partly responsible for tube leakages. The poorer the coal, the more tube leakages.

It was stated that the rolling of a flue into a sheet is a water-tight job. This statement is based on an experiment made by Mr. Kinsell two or three years ago. He took a piece of boiler plate about $^{7}/_{16}$ in. thick, and rolled short pieces of flues into it every way he could think of—without ferrules, with ferrules, with iron and copper ferrules, and with and without beads. Then he put it into a spring furnace until it was cherry red; took it out and dropped it into water a large number of times. When this had been done it was scarcely possible to loosen those tubes with a hammer. This seems to show that the flue and sheet expanded and contracted together and stayed tight.

Experiments made by a master mechanics' committee a few years ago on boiler temperatures showed that there was a decidedly higher temperature around the top flues than there was at the bottom. In fact, they melted fusible metal at above the temperature of saturated water under the water line, and the indications were that there was no water around them, although it was probably only momentary. Now those flues with the water excluded from the sheet and less heat going into them gave the sheet an opportunity to expand and contract with them. Experience also seems to show that compound engines give less trouble with their flues than simple engines. Records that were kept for five years on the Great Western showed that the flues and side sheets would run 50 to 100 per cent. longer in compounds than they would in the same simple engines. This probably applies to any class of compounds against the same simples.

The difference was attributed to an even exhaust. A high official of an American railroad who has just returned from abroad was said to have been particularly impressed with the soft exhaust of foreign locomotives, particularly in France. He inquired the reason. Much is due to the use of variable exhaust nozzles and the absence of diaphragm plates in the smoke boxes. The methods employed by French and English railroads make it possible to give to each class of new locomotive as it is introduced on the road most careful attention as to the adjustment of the front end appliances. New designs of locomotives are not introduced so frequently as is common in this country. Each new design receives the personal attention of the motive power official in such a way that the first example of the new class is made perfect as to the adjustment of its front ends before others are built. Such methods enable foreign locomotive men to avoid the use of the diaphragm plate, which Dr. Goss showed in the *American Engineer* tests was responsible for one-third of the work of the exhaust jet. Variable exhaust nozzles have been repeatedly tried in American practice, but the device has never become common practice. The principal reason for this is the difficulty in training American engineers to use such a device properly. They do not even use the starting valve of compounds property, for compound starting valves are often found left open during an entire run. It is different in France, where locomotive engineers work under a system of premiums which involve fuel consumption, punctuality and other satisfactory service. French locomotive engineers are safely trusted with variable exhaust devices, and they use them and use them properly. In starting out from a station the nozzle is enlargd to save tearing the fire, and on the run the nozzle is adjusted to suit conditions. In case steam pressure runs down, it may usually be quickly restored with the nozzle; but if the nozzle is thus restricted it is done so with care because of its effect on the earnings of the men at the end of the month, through the consumption of more coal. There is a long history back of the good work of the French locomtive engineers, and one which would make a profitable study for those who appreciate the soft exhaust of their locomotives.

To apply this to American practice it would appear that where a 5-in. nozzle is required with poor coal on a heavy grade, with good coal it simply tears the fire to pieces and burns fuel uselessly. At the same time it is hard on the tubes and the fire, especially when pulling out of a station. Therefore it seems to be only a question of time when it will be necessary to use a variable nozzle in the front ends of American locomotives in order to properly regulate the exhaust. There should also be education of officials, teaching them that a man cannot stay out 25 hours and give good service. Human endurance has a limit, and 25 hours is far too long for any man to work.

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The official in charge of the Austrian Railroads Ministry, Wrba, who had spent his life in the government service, has been retired, and in a new cabinet the Railroad Minister is Dr. von Derschatta, leader of the German Popular party in the Parliament. At the same time the head of the commercial department of the State Railroads became Minister of Commerce in that cabinet.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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## TRAIN COLLECTORS AND TRAIN AUDITORS.

The only difference between a train collector and a train "auditor" appears to be that the collector is a regular and constant employee on the train to which he is assigned, while the "auditor" is an occasional collector. Inview of the recent employment of "auditors" on a number of large western roads it is of interest to note this difference. In his first trip on a given train the work of the auditor is "surprise checking," but not exactly "spotting." Collectors have been employed at various times on a considerable number of roads, but after a short time—from six months to two years—have been taken off. The Pennsylvania had collectors 30 years ago, but appears to have thoroughly satisfied itself very soon, for they were taken off and the road has had none since. The Rock Island, the Chicago & Alton, the Missouri Pacific, the Missouri, Kansas & Texas, the Wabash, and the Burlington are all now trying the auditor scheme. The Wabash formerly had collectors. These were all dismissed when Mr. Delano took charge of the road, about a year ago, but it is reported that auditors are now employed on that road. The auditor, armed with proper authority from the general manager, boards a train at any time and any place, without previous notice to the conductor. Just as a traveling auditor comes into a freight office and takes possession of the books and cash drawer as though he owned them, the train auditor takes the conductor's work out of his hands completely, so far as concerns the collection of tickets and fares.

The somewhat rapid spread of the auditor idea would seem to indicate that satisfactory results are secured. It is, of course, absurd to assert that the auditor is put on because the conductor of the train needs all of his time for other duties. If this were true, the only consistent arrangement would be to have the auditor on each important train every day. Again, the duties of the conductors on some trains are very much lighter than on others, and the need of relieving them is correspondingly less pressing; yet we find that train auditors are sent to "work" trains on some of the easiest runs. While the work of the train auditor outwardly resembles that of the auditor of station accounts, as has been suggested, it must be borne in mind that there is nevertheless a radical difference. The auditing of the station accounts is to test the accuracy or honesty of the work of the station agent for a term of weeks or months preceding; but the work of the conductor for every day previous to that on which he is "audited" has been settled beyond recall. Any errors or frauds committed in the past are incurable. This being so, the purpose in employing the train auditor is, manifestly, (1) to find out, if possible, how a conductor does his work; this by having the same kind of work done by some one else. (2) To keep conductors keyed up to a high degree of faithfulness and efficiency by the knowledge that at any moment an inspector may appear to look for flaws in their work.

As is the case where "spotters" are employed under the old methods, there is no need for a conductor to feel that the action of the company reflects on his honor. Surprise checking is sufficiently justified by the need of correcting careless habits. If a conductor fails to collect a fare, the attitude and the function of the auditor who discovers the failure is the same, whether it was due to carelessness and inefficiency or to the fact that the conductor had secretly received money from the passenger and was paying back the "gift" by giving him a ride at the expense of the company.

On one of the Chicago roads on which train auditors have lately been put in service the men employed are quite young and some of them have had little or no railroad experience. Indeed, the instructions to the conductors and to the auditors recognize this, fully. The conductor is not made into a sort of freight conductor, where he can ride in the engine half the time if he sees fit; he continues to have oversight of the passengers, and assists the train auditor, if so requested, in cases where, by reason of crowds, passengers might leave the train before their tickets had been taken. In case an auditor has any dispute with a passenger he must turn the case over to the conductor, and the conductor decides it wholly according to his own judgment. Train auditors do not take any part in the management of the train or the work of the members of the train crew, except in cases of emergency, when the train conductor may call on them.

It seems probable that the train-auditor scheme will prove permanently useful, if care is taken to employ competent men—which does not appear to be the case on all of the roads where the experiment is now being tried. There is no hope of making dishonest conductors honest by machinery; but our method of collecting fares would still be extremely unbusinesslike and in need of safeguarding if every conductor in the country were the perfection of honesty. "Jacking up" will therefore be a perpetual necessity unless we radically change the methods. Only by the use of a cash-register can a grocer keep his own methods correct and efficient, to say nothing of his hired clerks. In like manner a dozen honest conductors

who owned a railroad would owe it to themselves to have a man to discipline them and nip in the bud every slipshod habit. Irregular collectors will cost materially less than to regularly assign one to each train for every trip, for the expectation of being inspected has, with honest men, almost as good an effect as actual inspection. To detect and discharge the dishonest conductor is a problem requiring particular and independent attention. The manager who sets out to do this will realize, of course, that "auditing" and "spotting" are only preliminary measures, after all. They may serve, like a grand jury, to show "probable cause"; but to settle a case in a way to warrant decisive action, more elaborate procedures are, of course, necessary.

## INTERNAL COMBUSTION ENGINES FOR SHOP POWER.

The description of a combustion engine published in another column is interesting as indicating the trend that the development of power has taken within the past two decades. The internal combustion engine has been brought to a high degree of perfection in the small sizes, such as are used for motor boats and automobiles, but their liability to at least temporary failure under these working conditions has caused them to be regarded with suspicion by those who are responsible for the selection of a motor for a large plant where reliability is of the first importance, outranking even that of efficiency.

That there has been a reason for this suspicion there is no doubt, but recent experiences and investigations have gone to prove that the internal combustion engine has reached a stage in its development when it can be regarded as quite as reliable as the steam engine, while its economical utilization of the heat developed is well in the lead.

The advantages are the entire absence of that never-failing source of danger—the steam boiler, the possibility of operation without constant skilled attention, and the more economical use of the heat developed.

Of the two, the getting rid of the boiler and constant attention, nothing need be said. As to the economical use of the heat, while this may be readily granted, the actual economy arising from the use of the internal combustion engine depends upon the initial cost of producing the heat. Where oil or gas is very cheap and coal expensive, then the cost of operation will be in favor of the oil or gas engine. But as the price of coal drops and that of oil or gas rises a point is reached where the two are on a par and beyond which the steam engine will be the cheaper of the two. The question of selection, on the basis of economy of operation only is, therefore, a local one which each user must answer for himself.

Recent investigations by the Baldwin Locomotive Works have led them to decide to use a large number of internal combustion engines, probably the Hornsby-Akroyd, which is very reliable, and nearly as efficient as the Diesel. They are especially suited for power development in limited spaces and where the use of steam is dangerous. Further than this, the handling of coal in the heart of Philadelphia has had an important bearing on the decision. In the several shops that are crowded with workmen the bursting of even a single steam fitting would be dangerous to life as well as property, so that there is a considerable mental tension imposed on those who are responsible, especially while the works are in operation for 24 hours of the day.

This desire to secure a reliable and less dangerous means of providing the necessary power in the plant has led to the decision to use nothing but internal combustion engines in the new Baldwin plant that is being erected at Eddystone.

Aside from increased safety, there is decreased cost of operation. It is estimated that instead of obtaining 65 per cent. of the efficiency of the engine at the shafting, as in the case of the steam engine driving a dynamo and, with the current driving a motor, an efficiency of 90 per cent. of the internal combustion engine output will be obtained by coupling direct to the shafting.

On this basis, if it is assumed that the steam engine will utilize 12 per cent. of the heat of the fuel and the internal combustion engine no more than 30 per cent., it would even be possible to pay three and a half times as much per 1,000 heat units for the internal combustion as for the steam engine and still have the cost of operation of the two on a par.

As a matter of fact, the Baldwin tests in service sustain the accuracy of this inference. Rating coal at $3 per ton and crude oil at 1.99 cents per gallon, it has been found that the total cost per brake horse-power hour at the engine shaft is .786 cents for the steam engine, .436 cents for the Hornsby-Akroyd engine and .42 cents for the Diesel. A compound condensing steam engine was used in making this comparison, and its boiler evaporated 8.05 lbs. of water per pound of coal. These tests also showed an oil consumption of 11.3 gallons per 100 brake horse-power hours for the Hornsby-Akroyd engine and about 7.2 gallons for the Diesel, the lesser difference in the total cost of operation as noted above being made up of other items not enumerated. In this the specific gravity of the oil is .908, so that a gallon weighed about 7.57 lbs.

In the matter of closeness of regulation it was found that there was a variation of but 1.74 per cent. in the rate of rotation of the fly-wheel of the Hornsby-Akroyd engine, which brings it within the allowable variations for the driving of electrical machinery.

These facts are cited to indicate what can be done in the way of efficiency and a saving in power-plant operation, and that the use of this type of engine is now so well advanced that it has passed beyond the experimental stage, so that when safety and reliability are the requisites it will be found to fulfill the requirements, while the cost of operation depends on the relative prices of coal and oil that prevail at the point of application. The matter should, therefore, be of especial interest to railroad men especially in such districts as Texas or California, where crude oil can be purchased in abundance at a low price.

That the wide introduction of this type of engine would serve to enhance the cost of oil is probably true, when viewed from the standpoint of the increasing cost of gasolene under the demands for automobile work, just as it was estimated a few years ago, that should the Pennsylvania Railroad adopt oil as a locomotive fuel on all of its engines it would have required the total supply of the United States at that time—a condition that would have made the cost prohibitive.

There is little prospect, however, that there will be such a demand on the part of stationary engine users, so that the adoption of the internal combustion engine need not be influenced by any such fears.

## THE EXPRESS COMPANIES.

The organization and operations of the express companies are at the present moment attracting considerable attention. One of the reasons for this is that, by a readjustment which seems probable, the Adams Express Company will lose nearly one-third of its present mileage to a new company called the Northern Express Company. It is probable that this company, organized as the successor of the Northern Pacific Express, is to consolidate the Great Northern Express and the Northern Pacific Express, which now operate each over the road named in its title, and on the expiration shortly of the Adams Express Company's contract with the Chicago, Burlington & Quincy, to add to its mileage that 8,500 mile system, thus consolidating the express business on all of the Hill lines. More important than this in its effect on the express business, determined effort is being made by a considerable proportion of the stockholders of the Wells-Fargo Express Company, another of the four leading companies, to obtain larger dividends. Their contention is that the company is earning at least 30 per cent. a year and can conservatively afford to distribute 16 per cent. in dividends. This movement has already been successful in securing an increase of the dividend rate from 8 to 10 per cent. and the publication of some slight information about the financial condition of the company. A similar movement has been contemplated by stockholders of the United States Express Company, which now pays 1 per cent. dividends, and is alleged to earn at least 18 per cent. on its stock. By far the most important of the causes directing attention to the express companies is the fact that they have been brought under the operation of the new Interstate Commerce law.

The *Wall Street Journal* in a sketch of the four express companies which it is estimated do about 90 per cent. of the express business of the country—the Adams, the American, the United States and the Wells-Fargo—shows that the combined mileage of railroad over which they work is 158,000 miles, and that their combined capital is $48,000,000. The Adams, the American and the United States are joint stock companies. The Wells-Fargo is incorporated in Colorado. These four large companies appear to be in very friendly relations one to another. L. C. Weir, President of the Adams Express, and J. C. Fargo, President of the American, are directors in the United States Express Company. Also nearly one-half of the directors of the four companies are railroad directors. Of the 13 Wells-Fargo directors, eight are officers or directors of railroads; of the nine American, three are railroad directors; of the seven Adams, and of the seven United States, three each are railroad

directors. In addition to this inter-relation of control, two of the three smaller companies are openly or practically controlled by the larger group. The American Express Company closely controls the National, which has $5,000,000 capital, and operates over 7,000 miles of road, and the Adams controls the Southern Express Company, which has about the same capitalization and operates a mileage of about 32,000 miles. The Pacific Express, the third of the smaller companies, has a mileage of 22,000, and operates largely west of the Mississippi, its principal railroads being the Union Pacific and the Missouri Pacific. Its board of directors contains four Gould and two Harriman representatives. The mileage of the four most important companies is as follows: Adams, 29,000 miles; United States, 30,000 miles; American, 43,000 miles; Wells-Fargo, 56,000 miles.

The express companies of the United States make no reports of their operations. The only clue to their gross business lies in figures published by the Interstate Commerce Commission showing the amounts received by the railroads from the express companies, which are, roughly, about 50 per cent. of the gross earnings of the express companies. The railroads' income from the express companies has increased from $28,000,000, in 1900, to $41,000,000, in 1904. During this five years the railroads of the country increased their earning capacity 33 per cent., and at the same time enlarged their capitalization by 15 per cent. Basing the estimate on the payments to the railroads, the business of the express companies increased 47 per cent., with no increase of capital. Besides these payments of 50 per cent. to the railroads, operating expenses probably require another 40 per cent. of gross earnings, leaving 10 per cent. as the net earnings to the express companies. On this basis the net earnings of the express companies have increased from $5,000,000, in 1900, to $7,500,000, in 1904. Thus although no definite figures are obtainable, it is abundantly evident that the express business of the country is highly profitable.

The whole question of larger disbursements to stockholders appears to be bound up in the question of publicity for express company accounts. At present no returns whatever are made and the stockholders are left to conjecture as to the real earnings of their companies. This is the dangerous feature in express company management as it exists to-day. Leaving out of consideration the question of a parcels post operated by the government which, if the example of similar service abroad is any precedent, could carry a large part of the express business at a much lower rate, the time has passed when so important a public business should be conducted so secretly. Not only the stockholders of the express companies, but those of the railroads, have the right to know under exactly what arrangements this highest grade traffic is being carried on. On the expiration of a contract with an express company the stockholders of the railroad should be informed of the conditions and have a chance to form an intelligent opinion as to whether it is to the advantage of the railroad to continue the contract, and if so, on what terms. The present day agitation against corporations has been largely caused by secrecy such as this in regard to matters vital to the financial interests of stockholders—a condition always likely to result in manipulation by an inside ring—and it seems reasonable to expect that the veil of mystery hitherto surrounding the express business will soon be drawn aside. The Interstate Commerce Commission will no doubt now require the express companies to make full reports of their business and of the arrangements under which it is done. Such statements will make clear the whole question of whether larger dividends should be paid, and, from the railroad standpoint, of whether the present express contracts are equitable.

The following table gives the most important railroads over which the principal express companies operate. In cases where more than one company operates over a road the most important company is mentioned.

*Wells-Fargo Express Company.*

| | |
|---|---|
| Atchison, Topeka & Santa Fe System | El Paso & Southwestern System |
| Southern Pacific System | Kansas City Southern |
| Chicago, Rock Island & Pacific | Mexican Central |
| St. Louis & San Francisco | Mexican International |
| Erie | San Antonio & Aransas Pass |
| Chicago Great Western | Vera Cruz & Pacific |
| Denver & Rio Grande System | Tehuantepec National. |
| Colorado & Southern | |

*American Express Company.*

| | |
|---|---|
| New York Central Lines* | Missouri, Kansas & Texas |
| Chicago & North-Western System | Central Vermont |
| Illinois Central System | Chicago, Indianapolis & Louisville |
| Boston & Maine System | Buffalo, Rochester & Pittsburg |
| | Bangor & Aroostook. |

*Except Lake Erie & Western.

*United States Express Company.*

| | |
|---|---|
| Chicago, Milwaukee & St. Paul | Chicago & Alton |
| Philadelphia & Reading System | Delaware, Lackawanna & Western |
| Baltimore & Ohio System | Lehigh Valley |
| Cincinnati, Hamilton & Dayton and Pere Marquette | Ohio Central Lines |
| | Lake Erie & Western. |

*Adams Express Company.*

| | |
|---|---|
| Pennsylvania Lines | Chesapeake & Ohio |
| New York, New Haven & Hartford | Richmond, Fredericksburg & Potomac |
| Chicago, Burlington & Quincy | Western Maryland |
| Iowa Central and Minneapolis & St. Louis | Kansas City, Mexico & Orient. |

*Southern Express Company.*

Operates over all important railroads in southern territory, including the Norfolk & Western. Adams Express also operates over Louisville & Nashville.

*Pacific Express Company.*

| | |
|---|---|
| Union Pacific | International & Great Northern |
| Missouri Pacific | Texas & Pacific |
| Wabash System | Texas Central |
| St. Louis Southwestern | Detroit, Toledo & Ironton System |

*National Express Company.*

| | |
|---|---|
| Delaware & Hudson | Toledo, St. Louis & Western |
| New York, Chicago & St. Louis | Wisconsin Central. |

Also operates jointly with the American over several railroads.

## BLOCK SIGNALS FOR FAST AND FREQUENT TRAINS

The diagram for use in adjusting block-signal sections to the speed and frequency of trains, which an anonymous correspondent offers on another page, tempts the reader to apply it to a concrete example; and as it seems to be adapted to an example with which we are familiar—the New York Central at its New York City end—we have so applied it. Indeed, as the diagram assumes the use of an overlap the length of a block we guess that it was made by and borrowed from the New York Central. The first conclusion one reaches is that the New York Central had better prepare to run 15-car or 20-car trains. If it does not its line will soon be overtaxed with trains during the busy hours of the morning. The maximum length of block sections on the electrified zone is to be about 3,250 ft., we believe; and with this length trains running a mile a minute must be kept a fraction over two minutes apart. Even now it is found desirable every day to run trains at shorter intervals than that.

When two suburban divisions converge into one, as is the case at Mott Haven, five miles out from the Grand Central station, the limit of the capacity of a railroad quickly shows itself. The passenger department must of necessity strive to please the clamoring commuters on both divisions by running trains every five minutes at each station—which means perhaps every three minutes, two minutes or one minute when *all* the trains on the line are counted; but to the operating officer the shortness of the trains, when looked at in connection with the great length of the blocks seems extravagantly wasteful. He feels like asking the P. T. M. and the G. P. A. to let their kindness of disposition work a bit within the family once in a while. With 3,240-ft. blocks, multiplied by three, and trains 520 ft. long, only one-twentieth of the track is occupied by cars—a condition that must invite scornful comments on railroad economy from the moving-platform enthusiasts.

It seems to us that our correspondent has figured his time interval rather too short. To run trains at high speed enginemen ought to be allowed, say, ten seconds in which to see a clear signal before reaching it; otherwise they will be constantly tempted to run too close and take risks. The computation should be:

| | |
|---|---|
| Block | 3,240 ft. |
| Distant | 3,240 " |
| Overlap | 3,240 " |
| Train | 520 " |
| Time to clear signal, 4 seconds x 88 | 352 " |
| Time to see signal, 10 seconds x 88 | 880 " |
| Total | 11,472 ft. |

Or, 2.17 miles. This is an increase of 8½ per cent.; or a reduction in the capacity of the road of 7.8 per cent. By lengthening the train to twice 520 ft. we make the total 11,992 ft. We increase the demand on the time of the track only 4½ per cent. and (with that deduction) increase the capacity of the line 100 per cent. if the whole train is made up of cars, as in electric practice. The New York Central standard electric car is 60 ft. long over all, making 1,020 ft. for a 17-car train.

Our correspondent holds that as a regular thing good practice demands that a distant-signal indication should not be repeated; should not be given any farther back than the next home signal. As speeds and frequency increase there must be more and more cases where this desirable element of simplicity will have to be given up. For example, to again take this concrete instance near home—the outer tracks for 25 miles north of New York City will be used for local passenger trains and should have many short blocks. Each station must be in a short block, so that the length of time spent by a train in the station block shall not be disproportionately long as compared with that spent in the blocks where there are no stations. This means perhaps 1,600 ft. blocks, say half the New

York Central maximum. But with the heavy through passenger business of this line occasions must be frequent when this outer track is needed for express trains. These trains often become "bunched" together when behind time, and it is not always convenient to drive the through freight trains off from the inner tracks. Also, many semi-express trains often have occasion to run on the outer tracks without stopping, and therefore need to have facilities for running at high speed. In view of these conditions, it is desirable to signal the outer tracks for express speeds—say, sixty miles an hour; and with short blocks this cannot be done unless the distant signals are set back two or three blocks.

And, with suitable instruction and discipline, this would seem to be wholly unobjectionable, so far as the engineman is concerned. The distant signal has fared pretty hardly in America. It has been kicked, neglected and abused in a way entirely at variance with its usefulness and importance, and it is high time that we relieve it from the humiliation of always being made secondary to everything else!

## Restricted Accounts and Memoranda.

A feature of the Hepburn law that may or may not cause much embarrassment and expense to the railroads—depending upon the manner in which it is enforced by the Interstate Commerce Commission—is the provision empowering the Commission, in its discretion, to prescribe the forms of any and all accounts, records and memoranda to be kept by carriers, including the accounts, records and memoranda of the movement of traffic as well as the receipts and expenditures of moneys, and making it unlawful for carriers to keep any other accounts, records or memoranda than those prescribed or approved by the Commission. The law provides that the Commission shall at all times have access to all such documents kept by carriers, and that it may employ special agents or examiners to inspect and examine the papers. A strict interpretation of this provision would seem to require all railroads to have their present forms of accounts, records and memoranda approved by the Commission on or before August 29, the date when the law becomes effective, whether the Commission is prepared by that time to prescribe uniform forms or not. It is not probable, however, that the Commission will require this. Its employees are now working on a scheme of uniform records to be submitted to the Commission, and it is probable that before any orders are issued for putting this scheme into effect it will be submitted to practical railroad men for their criticism and suggestions.

The power to prescribe uniform statistical reports and uniformity in the keeping of accounts, records and memoranda is one that the Commissioners have contended for very zealously. A recent magazine article by Commissioner Prouty indicates that they hope to accomplish two things through the exercise of this power. They hope that it will enable them to trace and detect departures from the published rates and rebates and discriminations of all kinds. They also believe that it will enable them to determine with more certainty whether railroad rates that may be called into question are such as are required to yield a fair return on the property. Many of the reports and opinions of the Interstate Commerce Commission have shown that its members regard with disapproval the policy of those roads that make a practice of charging improvements to operating expenses, and it may be expected that any uniform system prescribed by the Commission will attempt to provide for a distinct separation between operating expenses and improvements. It is evident, however, that great difficulty will be experienced in drawing a sharp and distinct dividing line between expenditures for maintenance and those for betterments. In a case, for instance, where light rails are being replaced with heavy ones, part of the expenditure might properly be apportioned to maintenance and part to improvements, and it will be interesting to see how the Commission deals with such expenditures.

The law gives to the Commission very wide discretion, and there can be no doubt that, as was pointed out in the Senate when this provision was under discussion, it might be so enforced by the Commission as to subject to punishment every railroad official and employee who might make any note or memorandum whatsoever concerning the railroad or its operation if the form of such note or memorandum had not been first approved by the Commission. It is hardly to be expected that the Commissioners will go to such extremes in the exercise of the discretion given them. They can hardly conceive it necessary to go further than to prescribe the forms of such accounts, records and memoranda as are necessary for the disclosure of all the operations of the road, leaving its officers and employees free to use such additional records and memoranda as may from time to time be necessary.

One of the most serious dangers is that the enforcement of this provision will tend to prevent improvements in railroad accounting and in the records of railroad operations. When a system has once been prescribed by the Commission no improvement, however great it may be, can be adopted until it has been approved by the Commission. What one road might consider an improvement might meet the approval of the Commission, and might be prescribed for all roads, though others might not consider it an improvement in any respect. The conditions on different lines vary so greatly that a system suitable for one line may not be entirely suitable for another. It will doubtless be within the power of the Commission to permit more or less diversity on different railroad lines, but the tendency in the direction of prescribing absolute uniformity seems to be so strong that there is little probability that much diversity will be permitted.

## June Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of June, printed in another column, contains accounts of 28 collisions, 26 derailments, and two other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | June | Killed. | Injured. |
|---|---|---|---|---|
| 1. | Marion, N. J. | 2d | 0 | 1 |
| 2. | Atlanta, Ga. | 6th | 1 | 6 |
| 3. | Mengo, Mo. | 8th | 1 | 22 |
| 4. | Eatontown, N. J. | 11th | 1 | 23 |
| 5. | Marine, Ill. | 14th | 0 | 11 |
| 6. | Adrian, Mich. | 25th | 0 | 9 |
| 7. | Gladbrook, Iowa. | 25th | 0 | 6 |
| 8. | Jamestown, Cal. | 27th | 2 | 2 |
| 9. | Martin, Fla. | 29th | 2 | 0 |
| 10. | Ipawa, Ill. | 30th | 1 | 3 |

The two most conspicuous accidents in this list are, perhaps, the first and the fourth. They happened to passenger trains which run at high speed and carry important traffic; they occurred on important lines, near the largest city in America—lines managed by enterprising officers, not pinched for money—and yet they will be universally classed as due to the lack of well-known safety devices which are generally approved and not very costly. The primary cause was in the one case carelessness of a drawbridge tender who neglected to see that all trains were held back before he opened the draw, and in the other case negligence of a trainman who did not reset a switch after using it. But everybody will look at the secondary causes; the absence of mechanical safeguards against these kinds of carelessness. That carefulness which insures safe drawbridges and switches is a matter of habit, and the management of a railroad is responsible for providing the groove in which draw-tenders' and trainmen's habits shall run. This draw-tender appears to have allowed the passenger train to approach within a third of a mile under clear signals and then to have suddenly changed the signal to indicate stop. If he had changed the signal in the face of the engineman, it would have been gross misconduct, for the train had received a clear distant signal which was a warrant of a clear home signal; but he did worse than that; he changed the home signal *after* the engine had passed it. With an electric lock on the drawbridge controlled (kept locked) by the presence of the train on the track, this error would have been prevented. Such locks are so arranged that they can be unlocked only when the approach track is free of trains back as far as the distant signal, and a little farther. In this case the home signal would seem to be located unnecessarily remote and the distant signal much too remote. The bridge tender has far too much time in which to change his mind. With the signals nearer the bridge he would have been much less likely to make this blunder, even if not restrained by an electric lock.

The proper mental groove for the habits of a freight train man who has to turn switches is very hard to maintain. Railroad superintendents have been trying for 80 years to hit upon the best rule but have not yet found one which is workable and perfect. They have, however, found an antidote for the dangers connected with an imperfect rule, and that is the interlocked distant signal. This simple device, costing from $75 to $250, compels the switch tender either to leave the switch in the right position, when he goes away, or to display, a half mile away, a warning that it is not in the right position.

In printing simple homilies like this, which we have been doing for the past 30 years, a query always arises as to the reasons why some of our good railroad managers do, and some other good managers do not, use well-known safeguards at well-known danger spots. To answer this question is as difficult as ever, speaking generally. But concerning one railroad system, embracing 10,942 miles, we can quote from a letter from the manager dated July 3, 1906, as follows:

"It is our intention to instal electric distant signals for all facing points on main lines.

"We intend to instal mechanical distant signals for all facing points on branch lines."

As the lines referred to are largely single track, these statements might almost as well read "all switches," as all are facing points.

The number of electric car accidents reported in the news-

papers of the United States in the month of June was 24, in which 16 persons were killed and 247 injured. Of the killed 11 and of the injured 75 are chargeable to the derailment of a runaway car near Providence, R. I., on the 3d. This accident occurred to an excursion party about 1 o'clock in the morning, and it appears to have been due to the unfamiliarity of the motorman with the line. He had not run on that line since about one year before and even then his experience was confined to a single trip.

# CONTRIBUTIONS

## Block Signaling for a Maximum Traffic.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The problem of signaling a road for the running of the greatest possible number of trains has not often presented itself for solution. The time is fast approaching, if it is not already here, when the problem will have to be solved by many signal engineers. A number of the large terminals are signaled for a heavy traffic, and possibly for a maximum train service, but in a majority of cases the speeds are moderate, and the end most generally sought has been to make the blocks of equal length, while giving a good view of the signals.

The conditions that determine the length of the block and consequently the number of trains that may be run in a given time are:

1. The speed.
2. The braking power and consequent distance required in which to stop a train running at maximum speed.
3. The grade of the track.

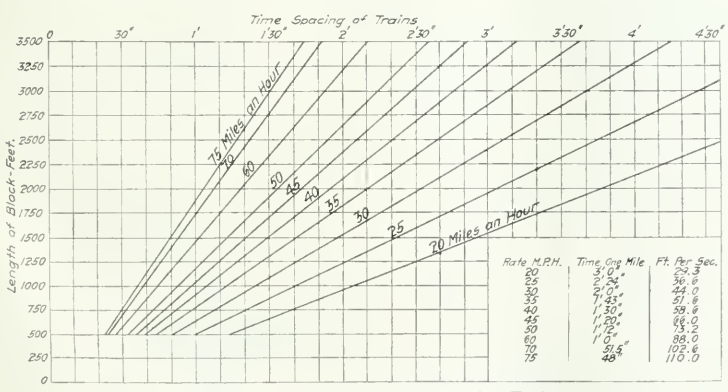



Chart for Time-Spacing Block-Signaled Trains.

4. The time required for the signals to change from the position indicating "Stop" to that indicating "Proceed."
5. The length of the train.
6. The position of interlocking plants, stations and other local conditions which cause an irregular spacing of the signals.

The number of trains that may be run in a given time is, of course, dependent on the speed. The greater the speed the greater the number of trains that may be run. To provide for a maximum train service it must be possible to run trains at the greatest speed local conditions permit, and the blocks must be of such length as to allow this speed to be attained with safety.

To run a train safely at a given speed it is necessary to keep the engineman informed, at all times, of the conditions of the track in front of him and if it is proper for the train to proceed. If it is not safe to proceed the engineman must be warned at a point sufficiently far away from the stopping point to enable him to bring the train to a stop before passing it. The higher the speed the greater the distance from the stopping point the indication to stop or to proceed must be given. To give the indication at a less distance away than is required for the train to be brought to a stop is inviting disaster.

The distant indication is given by the distant signal, and it is therefore necessary that this signal be placed far enough from the home signal to enable a train to be brought to a stop in the distance between the two signals. The braking power then becomes as important an element in determining the length of the block for a maximum train service under safe working conditions as are the factors of speed and grade. With good practice demanding that, as a regular thing, the indication of a home signal shall be repeated by one and not by two distant signals, it follows that for the average conditions the distance between the distant and the home signal is the length of the shortest block that may be used with safety.

The speed of a train is affected by gravity assisting or retarding its motion according to the grade of the track. Any power affecting the speed of the train will have a corresponding effect on the braking power, and the length of the block must therefore be proportioned to the grade.

The length of time required for a signal to change from the stop to the proceed position has an important bearing on the efficiency of a signal system and the consequent spacing of trains. The time required for a signal to assume the clear position is only a few seconds; but, as the home signal does not commence to clear until the train has passed out of the block, the next following train is delayed, while the home and the distant signals are clearing. The practical result is the same as if the block had been lengthened the distance the train will run in the time the two signals are clearing. A maximum train service requires a minimum time for the clearing of the signals. A change from one second to five seconds in the time required to clear a signal—lengthening the time four seconds—will reduce by 10 per cent. the number of trains it is possible to run when the speed is 60 miles an hour and the length of block equal to the braking distance.

The length of a train will affect the number it is possible to run in a given time, for the signals do not commence to clear until the rear of the train has passed out of the block; the train must run its length, in addition to the length of the block, before the signals will clear for the following train. Trains running at speed are spaced the length of the train, plus the length of the block, plus the distance between the distant and the home signals, for with the short blocks necessary for a maximum train movement the application of the brakes at the distant signal, as will be necessary if the signal, when passed, is indicating caution, will reduce the speed so materially that trains will be spaced a greater distance than if they were run far enough apart to get a clear indication at each distant signal.

The position of interlocking plants, stations and similar local conditions, the situation of which is fixed and cannot be changed to permit of the best placing of signals, will affect somewhat the time-spacing of trains. Where the interlocking and station signals occur at such intervals that the blocks are of equal length, the regular spacing of trains can be maintained, but where the blocks are of unequal length trains will be kept further apart and the situation must be carefully studied. At those places where the blocks will be shorter than the required distances between the distant and the home signal the indication of the home signal must be repeated by two distant signals, and the furthest of the two is likely to be found a greater distance from the home signal than the necessary braking distance, thus giving an indication so far away that the train may be stopped some time before reaching the home signal.

Having the information at hand in regard to layout of tracks, grades, curvature, station locations, etc., it is necessary before the signals can be located on the plan that an assumption be made as to the maximum speeds which trains will be allowed to attain on the different parts of the line. The chart shown in the accompanying cut, giving the time spacing of trains for various lengths of blocks and speeds is convenient for reference when comparing one arrangement of signals with another and when consulting with the officials of the operating department in regard to permissible speeds and the probable time intervals between trains. This chart shows, in minutes and seconds, at the top of the diagram, the necessary time interval between trains at various speeds, with block signals fixed at different distances apart, as shown at the left of the diagram. The length of a train is assumed to be 520 ft., and provision is made for having at all times two home signals in the stop position behind a train. Therefore, to give each train a clear distant signal, the time intervals between trains must be equal to the time required to run three times the length of one block, plus the length of the train, plus the distance run during the time (assumed to be 4 seconds) required for the home and the distant signals to move from the stop to the clear position.

A braking chart is also desirable. This shows the distances in which trains of various weights and lengths may be stopped by emergency and service applications of the brakes when running at various speeds. It is required in order to determine with reasonable certainty the distances that should be provided between the distant and the home signal and for the minimum lengths of block.

A paper location of the signals can first be made in the office to advantage, after which the ground should be carefully gone over to make sure that the signals can actually be placed in the position proposed, that the view is the best possible, and that there are no local conditions to interfere with the plan. * * *

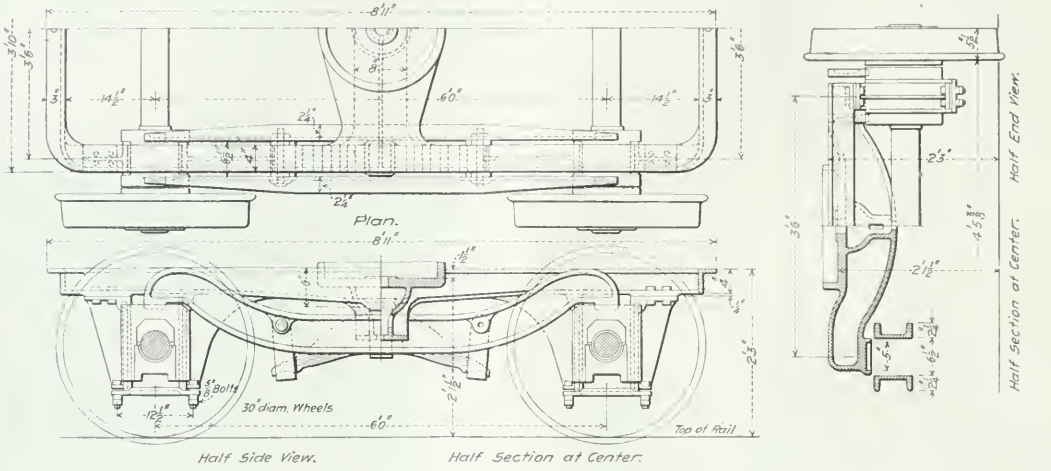
### Symons Cast Steel Trucks.

The four-cylinder balanced compound locomotive built for the Plant System in 1902 by the Baldwin Locomotive Works had a boltless cast-steel tender truck designed by Mr. W. E. Symons, then Superintendent of Motive Power of that system. A number of car trucks of practically the same design were also in service at that time. However, the truck proved to be of rather too rigid construction for usual track conditions, the results of its trial at that time indicating the need of certain changes in order to adapt it better to service requirements. Mr. Symons has recently revised and perfected the design in the light of the results referred to and we present herewith the detail drawings.

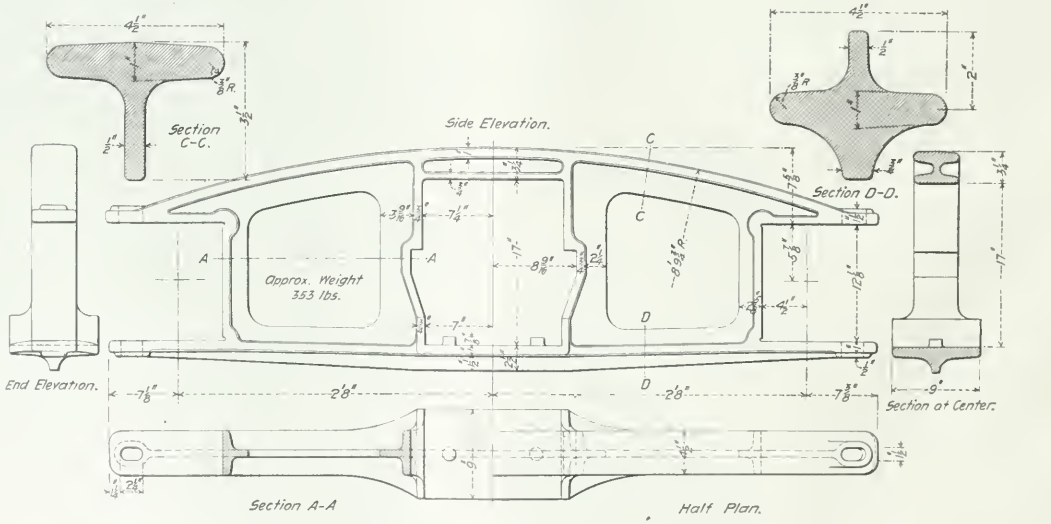
Simplicity of design in combination with maximum strength and the requisite flexibility were the principal objects sought. The side frame is formed in one piece. Its chief feature of peculiarity is the provision of horizontal jaws for the journal boxes, which are retained each by a wrought iron key of the form shown in the details. The most radical change from the first design has been in the transverse member of the truck frame, which originally was of cast steel. The present arrangement provides the requisite flexibility which was lacking in the previous design and also effects a material reduction in weight. Instead of a one-piece spring plank, two 5-in. x 3-in. x ⅜-in., 9.8-lb. angles are used, with the shorter leg up. Drawings of two different arrangements are shown. In one of these a 1¾-in. hole in the longer leg of the angle, 4½ in. from the end, fits over a boss cast on the lower bar or tension member of the frame, the angles being 4 in. apart when in place. A cast-steel spring seat, a detail of which is shown, slips between the columns from the inner side of the frame. It rests on the angles, fitting between the vertical legs, and a lip on the outer side at the bottom drops down over the angle ends, coming flush with the top of the lower bar of the frame. The spring seat is held in place by two tapered wrought-iron keys driven between it and the columns.

In the other arrangement the spring seat is cast integral with the side frame, eliminating the keys and further reducing the weight by lightening certain of the sections. Openings for the angles are cored below the spring seat so that they occupy the same relative position as in the first arrangement. Each end will, however, be riveted at three points to the steel casting—one through the vertical leg to the spring seat, and one each at the inner and outer sides of the bottom bar of the frame, which, it will be noted, is 9 in. wide under the spring seat. The location of the rivets will be such that they may be inserted or removed from the outside or bottom, as the case may be.

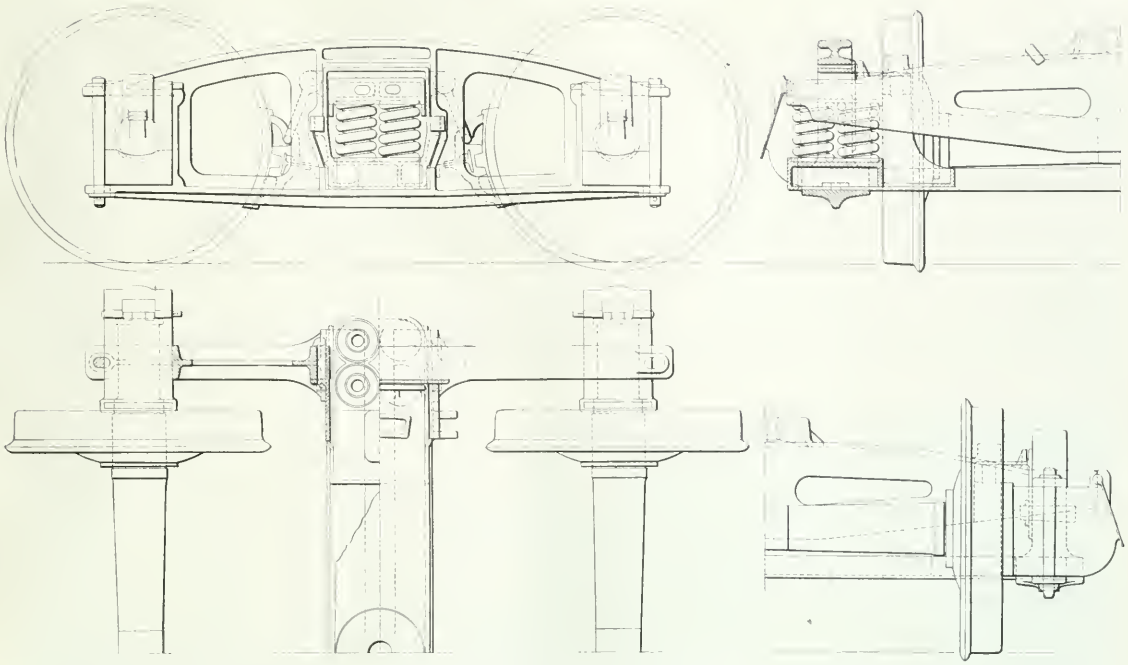
The bolster is cast in one piece, with the center plate and side bearings integral therewith. It will be noted that the center plate is placed in its natural position—that is, the reverse of the up-side-down position in which most car builders persist in applying



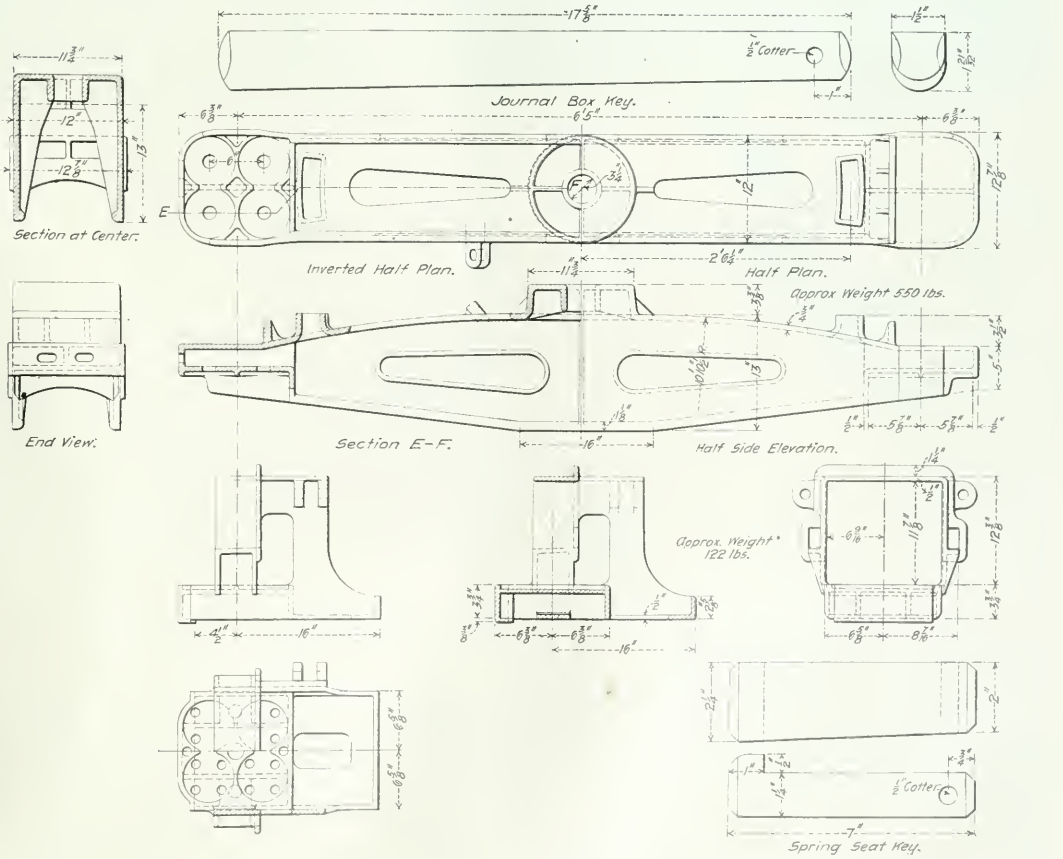

Symons Cast Steel Locomotive Truck.




Details of One-Piece Cast Steel Side Frame for Freight Car Truck.



Symons Cast Steel Freight Car Truck.




Details of Bolster of Symons Cast Steel Freight Car Truck.

it. Other features of the bolster are all plainly shown by the drawings.

The rated capacity of the truck is 100,000 lbs. The areas of the different principal sections are indicated and the approximate weights of the various members set down. From these latter the approximate total weight of the frame would be 1,140 lbs., and including the bolster, 1,690 lbs. A liberal factor of safety was allowed in estimating all of the sections to permit a material reduction of the weight for lighter capacity cars.

Mr. Symons has also designed a four-wheel locomotive truck, the drawings for which are shown herewith. A principal object of the design was to provide a main frame of cast-steel formed in one piece in order to reduce greatly the number of parts to be fitted and thereby reduce the production and maintenance cost, while increasing the strength and durability of the truck. Also, the design will permit the application of the wheels and axles without having to jack up the truck a height equal to the length of the pedestals.

The main frame, as already mentioned, is a single casting. The inner pedestals are likewise an integral part of this casting. The outer pedestals, however, are removable, as the drawing shows, to permit the application and removal of wheels and axles without jacking up the truck. Each pedestal has near the top of the bearing plate a recess into which a lug of the corresponding shoe fits. The design and arrangement of equalizers, hangers, springs, etc., is clearly shown by the drawing.

## The Anthractie Coal Fields of Pennsylvania.

In the *Railroad Gazette*, June 1, a list was printed of the principal coal carrying railroads of the country, together with as much additional statistical information about tonnage hauled and tonnage underlying as could be secured. One of the tables—that estimating the underlying anthracite belonging to each road—was attributed to Mr. W. W. Ruley, Chief of Bureau of Anthracite Coal Statistics. Mr. Ruley, however, informs us that he is not the author of this estimate. He has kindly furnished the following additional data, which shows excellently the general location of the anthracite fields and the annual output from each region from 1820 to 1905, inclusive, although the apportionment of holdings as between carriers and the unmined tonnage is not estimated.

The Regions of Anthracite Production.

The accompanying table and map was compiled by Mr. Ruley under the direction of Mr. David T. Day, Chief of Division, and published by the United States Geological Survey. The Wyoming Region, as shown, embraces the entire northern coal field and the Bernice Basin. The Lehigh region embraces the eastern middle coal field and that part of the southern coal field lying between the Lehigh and the Little Schuylkill rivers. The Schuylkill region embraces the western middle coal field and that part of the southern coal field lying between the Little Schuylkill and the Susquehanna rivers. It will be noted that the Lehigh region was the first to be developed, starting with 365 tons in 1820, and growing to an output of 7,849,205 tons in 1905, the year of maximum production. The Wyoming region was not mined until 1829, but now gives much the most considerable annual tonnage, with a maximum of 35,857,897 tons in 1905. Until about 1867 the Schuylkill region, dating back to 1822, was the principal source of tonnage.

| Years. | Total shipments. Tonnage. | Wyoming. Tonnage. | Per ct. | Region Lehigh. Tonnage. | Per ct. | Schuylkill. Tonnage. | Per ct. |
|---|---|---|---|---|---|---|---|
| 1820.. | 365 | ..... | .... | 365 | ..... | ..... | ..... |
| 1821.. | 1,073 | ..... | .... | 1,073 | ..... | ..... | ..... |
| 1822.. | 3,720 | ..... | .... | 2,240 | 60.21 | 1,480 | 39.79 |
| 1823.. | 6,951 | ..... | .... | 5,823 | 83.77 | 1,128 | 16.23 |
| 1824.. | 11,108 | ..... | .... | 9,541 | 85.90 | 1,567 | 14.10 |
| 1825.. | 34,893 | ..... | .... | 28,393 | 81.40 | 6,500 | 18.60 |
| 1826.. | 48,047 | ..... | .... | 31,280 | 65.10 | 16,767 | 34.90 |
| 1827.. | 63,434 | ..... | .... | 32,074 | 50.56 | 31,360 | 49.44 |
| 1828.. | 77,516 | ..... | .... | 30,232 | 39.00 | 47,284 | 61.00 |
| 1829.. | 124,083 | 7,000 | 6.25 | 25,110 | 20.40 | 92,045 | 73.35 |
| 1830.. | 174,734 | 43,000 | 24.60 | 41,750 | 23.90 | 89,984 | 51.50 |
| 1831.. | 176,820 | 54,000 | 30.54 | 40,966 | 23.17 | 81,854 | 46.29 |
| 1832.. | 363,271 | 84,000 | 23.12 | 70,000 | 19.27 | 209,271 | 57.61 |
| 1833.. | 487,749 | 111,777 | 22.91 | 123,001 | 25.22 | 252,971 | 51.87 |
| 1834.. | 376,636 | 43,700 | 11.60 | 106,244 | 28.21 | 226,692 | 60.19 |
| 1835.. | 569,758 | 90,000 | 16.05 | 137,250 | 23.41 | 339,508 | 66.54 |
| 1836.. | 684,117 | 103,861 | 15.18 | 148,311 | 21.68 | 432,945 | 63.16 |
| 1837.. | 869,441 | 115,387 | 13.27 | 223,902 | 25.75 | 530,152 | 60.98 |
| 1838.. | 738,697 | 78,207 | 10.59 | 213,615 | 28.92 | 446,875 | 60.49 |
| 1839.. | 818,402 | 122,300 | 14.94 | 221,025 | 27.01 | 475,077 | 58.05 |
| 1840.. | 864,379 | 148,470 | 17.18 | 225,313 | 26.07 | 490,596 | 56.75 |
| 1841.. | 959,773 | 192,270 | 20.03 | 143,037 | 14.90 | 624,466 | 65.07 |
| 1842.. | 1,108,412 | 252,599 | 22.79 | 272,540 | 24.59 | 583,273 | 52.62 |
| 1843.. | 1,203,598 | 285,665 | 22.60 | 267,792 | 21.19 | 710,200 | 56.21 |
| 1844.. | 1,639,350 | 365,911 | 22.33 | 377,002 | 23.12 | 897,537 | 54.45 |
| 1845.. | 2,013,013 | 451,836 | 22.45 | 429,453 | 21.33 | 1,131,724 | 56.22 |
| 1846.. | 2,344,005 | 518,389 | 22.11 | 517,116 | 22.07 | 1,308,500 | 55.82 |
| 1847.. | 2,882,309 | 583,067 | 20.23 | 633,507 | 21.98 | 1,665,735 | 57.79 |
| 1848.. | 3,089,238 | 685,196 | 22.18 | 670,321 | 21.70 | 1,733,721 | 56.12 |
| 1849.. | 3,242,966 | 732,910 | 22.60 | 781,556 | 24.10 | 1,728,500 | 53.30 |
| 1850.. | 3,358,899 | 827,823 | 24.64 | 690,456 | 20.56 | 1,840,620 | 54.80 |
| 1851.. | 4,448,596 | 1,158,486 | 25.98 | 963,228 | 20.18 | 2,328,882 | 52.34 |
| 1852.. | 4,983,471 | 1,284,500 | 25.72 | 1,072,136 | 21.47 | 2,626,835 | 52.81 |
| 1853.. | 5,195,151 | 1,475,732 | 28.41 | 1,054,809 | 20.29 | 2,665,110 | 51.30 |
| 1854.. | 6,002,334 | 1,603,478 | 26.73 | 1,207,186 | 20.13 | 3,191,670 | 53.14 |
| 1855.. | 6,608,567 | 1,771,511 | 26.80 | 1,284,113 | 19.43 | 3,553,943 | 53.77 |
| 1856.. | 6,927,580 | 1,972,581 | 28.47 | 1,351,970 | 19.52 | 3,603,029 | 52.01 |
| 1857.. | 6,644,941 | 1,952,603 | 29.39 | 1,318,541 | 19.84 | 3,373,797 | 50.77 |
| 1858.. | 6,839,969 | 2,186,084 | 31.96 | 1,380,036 | 20.18 | 3,273,245 | 47.86 |
| 1859.. | 7,808,255 | 2,731,236 | 34.98 | 1,628,311 | 20.86 | 3,448,708 | 44.16 |
| 1860.. | 8,513,123 | 2,941,817 | 34.56 | 1,821,674 | 21.40 | 3,749,632 | 44.04 |
| 1861.. | 7,954,264 | 3,055,140 | 38.41 | 1,738,377 | 21.85 | 3,160,747 | 39.74 |
| 1862.. | 7,869,407 | 3,145,770 | 39.97 | 1,351,054 | 17.17 | 3,372,583 | 42.86 |
| 1863.. | 9,566,006 | 3,759,610 | 39.30 | 1,894,713 | 19.80 | 3,911,683 | 40.90 |
| 1864.. | 10,177,475 | 3,960,836 | 38.92 | 2,054,669 | 20.19 | 4,161,970 | 40.89 |
| 1865.. | 9,052,391 | 3,254,519 | 35.72 | 2,040,913 | 21.14 | 4,556,959 | 45.14 |
| 1866.. | 11,736,882 | 4,734,326 | 40.39 | 2,179,064 | 17.15 | 5,788,492 | 45.56 |
| 1867.. | 12,988,725 | 5,325,000 | 40.99 | 2,502,054 | 19.27 | 5,161,611 | 39.74 |
| 1868.. | 13,801,465 | 5,968,146 | 43.25 | 2,502,582 | 18.13 | 5,330,737 | 38.62 |
| 1869.. | 13,866,180 | 6,141,369 | 44.28 | 1,949,673 | 14.06 | 5,775,138 | 41.66 |
| 1870.. | 16,182,191 | 7,974,660 | 49.28 | 3,239,374 | 20.02 | 4,968,157 | 30.70 |
| 1871.. | 15,659,721 | 6,911,242 | 44.02 | 2,235,707 | 14.24 | 6,552,772 | 41.74 |
| 1872.. | 19,669,778 | 9,101,549 | 46.27 | 3,873,339 | 19.70 | 6,694,890 | 34.03 |
| 1873.. | 21,227,952 | 10,309,755 | 48.57 | 3,705,540 | 17.46 | 7,212,657 | 33.97 |
| 1874.. | 20,144,828 | 9,524,878 | 47.18 | 3,773,536 | 18.73 | 6,866,877 | 34.09 |
| 1875.. | 19,712,472 | 10,596,155 | 53.73 | 2,834,605 | 14.38 | 6,281,712 | 31.87 |
| 1876.. | 18,501,011 | 8,424,158 | 45.53 | 3,854,919 | 20.84 | 6,221,934 | 33.63 |
| 1877.. | 20,828,179 | 8,300,377 | 39.85 | 4,332,760 | 20.80 | 8,195,042 | 39.35 |
| 1878.. | 17,605,262 | 8,085,587 | 45.92 | 3,237,449 | 18.40 | 6,282,226 | 35.68 |
| 1879.. | 26,142,689 | 12,586,293 | 48.14 | 4,595,567 | 17.58 | 8,960,829 | 34.28 |
| 1880.. | 23,437,242 | 11,119,279 | 48.72 | 4,462,221 | 19.05 | 7,554,742 | 32.23 |
| 1881.. | 28,500,014 | 13,951,573 | 48.96 | 5,256,266 | 18.58 | 9,292,175 | 32.46 |
| 1882.. | 29,120,696 | 13,971,371 | 47.98 | 5,689,437 | 19.54 | 9,459,288 | 32.48 |
| 1883.. | 31,793,027 | 15,604,492 | 49.08 | 6,113,809 | 19.23 | 10,074,726 | 31.69 |
| 1884.. | 30,718,293 | 15,677,753 | 51.04 | 5,562,226 | 18.11 | 9,478,314 | 30.85 |
| 1885.. | 31,623,530 | 16,236,470 | 51.34 | 5,898,634 | 18.65 | 9,488,426 | 30.01 |
| 1886.. | 32,136,362 | 17,031,826 | 53.00 | 5,723,129 | 17.81 | 9,381,407 | 29.19 |
| 1887.. | 34,641,018 | 19,084,929 | 56.82 | 4,347,061 | 12.55 | 10,609,028 | 30.63 |
| 1888.. | 38,145,718 | 21,852,366 | 57.29 | 5,639,276 | 14.78 | 10,654,116 | 27.93 |
| 1889.. | 35,817,663 | 19,036,835 | 53.15 | 6,294,973 | 17.57 | 10,486,185 | 29.28 |
| 1890.. | 36,615,459 | 19,417,979 | 53.03 | 6,329,655 | 17.29 | 10,867,822 | 29.68 |
| 1891.. | 40,448,336 | 21,325,240 | 52.72 | 6,381,838 | 15.78 | 12,741,258 | 31.50 |
| 1892.. | 41,893,320 | 22,815,460 | 54.46 | 6,451,076 | 15.40 | 12,626,784 | 30.14 |
| 1893.. | 43,089,537 | 23,839,741 | 55.32 | 6,892,352 | 16.00 | 12,357,444 | 28.68 |
| 1894.. | 41,391,200 | 22,650,761 | 54.72 | 6,705,434 | 16.20 | 12,035,005 | 29.08 |
| 1895.. | 46,511,477 | 24,943,421 | 53.63 | 7,298,124 | 15.69 | 14,269,932 | 30.68 |
| 1896.. | 43,177,485 | 23,589,473 | 54.63 | 6,490,441 | 15.03 | 13,097,571 | 30.34 |
| 1897.. | 41,637,864 | 23,207,263 | 55.74 | 6,249,540 | 15.01 | 12,181,061 | 29.25 |
| 1898.. | 41,899,751 | 23,567,767 | 56.25 | 6,253,109 | 14.93 | 12,078,875 | 28.82 |
| 1899.. | 47,665,204 | 26,578,286 | 55.75 | 6,887,909 | 14.44 | 14,199,009 | 29.81 |
| 1900.. | 45,107,484 | 24,686,125 | 54.73 | 6,918,627 | 15.33 | 13,502,732 | 29.94 |
| 1901.. | 53,568,601 | 30,337,036 | 56.63 | 7,211,974 | 13.45 | 16,019,591 | 29.92 |
| 1902.. | 31,200,890 | 19,258,763 | 61.73 | 3,470,736 | 11.12 | 8,471,391 | 27.15 |
| 1903.. | 59,362,831 | 35,723,258 | 60.18 | 1,164,782 | 12.07 | 16,474,790 | 27.75 |
| 1904.. | 57,492,522 | 34,006,009 | 59.15 | 7,107,220 | 12.36 | 16,379,293 | 28.49 |
| 1905.. | 61,410,201 | 35,857,897 | 58.39 | 7,849,205 | 12.78 | 17,703,099 | 28.83 |

The Shantung Railroad, which the Germans have built in China, in 1905 carried 803,527 passengers and 310,482 tons of freight, against 558,868 passengers and 179,270 tons of freight in 1904, when, however, the whole road was open only part of the year. More than half the freight in 1905 was coal, viz., 158,115 kilometric tons, from mines reached by the railroad. The other chief freights were beans, oil, cotton, straw goods and crockery. The gross earnings were $1,912,296 Mexican, equal to one-half that sum in our currency. Less than one-third of the earnings were from passengers. The gross earnings per mile were $7,055 Mexican; the working expenses $3,355, leaving $3,700 net, or $1,850 in our currency. This sufficed for a dividend of 3½ per cent.

## Electric Locomotives for the New York Central.

Last October the first half of the 50,000-mile endurance run of the first high-speed electric locomotive, No. 6,000, built jointly by the General Electric Company and American Locomotive Company, was completed on the test tracks of the New York Central lines in Schenectady. On June 12 this locomotive completed the second half of this exhaustive service test. The maintenance expense per mile for the complete 50,000-mile run amounted to $0.0126. This figure includes all maintenance expense on motors, brake shoes, tires, inspection and other miscellaneous items. Moreover, the operating conditions were much more severe than those to which the thirty-five electric locomotives, which have been ordered, will be subjected. The test locomotive hauled a train averaging from 200 to 400 tons over a six-mile track and high-speed running under these conditions involved higher braking and accelerating duty than in regular operating service. The accompanying illustration shows eight of the thirty-five 100-ton, 2,200 h.p. electric locomotives which the manufacturers have built for the New York Central lines, following the same design as the locomotive No. 6,000, which has made such a satisfactory record. There are in all fourteen machines now complete. Of the eight locomotives shown, Nos. 3,401 and 3,402 have been shipped to New York. The remaining locomotives are well under way at the shops of the General Electric Company and American Locomotive Works, and it is expected that the complete number, thirty-five, will be ready for service in early October.

Eight Electric Locomotives for the New York Central Awaiting Shipment.

## The Air Power Plants for the East River Tunnels of the Pennsylvania Railroad.

In the description of the general features of the East river tunnels of the Pennsylvania Railroad in our issue of July 6, reference was made to the enormous power plant required on each side of the river for supplying compressed air to the tunnel headings. These pneumatic power plants are the largest ever installed for any purpose.

Among the clauses in the specifications for the tunnels relating to the power plants were the following:

"The plant to be installed and operated by the contractor shall be the best of its kind for the work to be done."

"Where work is done in compressed air, it shall be carried on day and night without any interruption or intermission."

The general demands of the power situation were covered in the following six clauses:

The contractor must provide at each shaft an adequate plant, including boilers, air compressors, hydraulic machinery, dynamos and all other necessary plant, with a reasonable duplication to meet unusual and unexpected emergencies.

"The air compressors shall be of sufficient capacity to deliver regularly into each heading at least 300,000 cubic feet of free air per hour at a pressure of 50 lbs. per square inch above the normal air pressure, and a larger amount if found necessary during the progress of the work. The air for the compressors must be drawn from the exterior of the power house and the intake so located as to give pure air. The air shall be cooled, and oil and other impurities removed, as completely as practicable, before delivering it into the headings.

"In order to provide a reasonable margin for repairs and contingencies, a spare compressor and boiler plant shall be provided at each shaft and kept in good condition and repair, ready for immediate use. The capacity of the spare plant shall be 25 per cent. of that required in the preceding paragraph for regular operation.

"Provision must be made for storing in tanks at each boiler house enough feed water for 12 hours supply, unless connections can be made with two independent and sufficient sources of supply.

"The air shall be delivered into each heading through two supply pipes of such capacity that the velocity of the air through them in regular working shall not exceed 40 feet per second. These pipes shall be tapped with regulating valves in each intermediate air chamber in tunnels and sufficient air admitted to ventilate it and to maintain the pressure required. If required by the engineer, air shall be delivered at the shield in each section or compartment thereof where men are employed, and withdrawn therefrom in special exhaust pipes with suitable regulating valves."

It is to be noted that the specifications called for 300,000 cu. ft. of free air per hour, delivered under a pressure of 50 lbs. to each heading, making a total for the East river tunnels of 2,400,000 cu. ft. per hour to be supplied by the two air plants, this being equivalent to an effective net piston displacement in each of the compressors of 4,000 cu. ft. of free air per minute. This enormous volume of air was to be used to keep out the water by counterbalancing the hydraulic head on the outside and also for the ventilation of the headings. While the greater part of the work has been through the soft sand or quicksand of the river bottom, preliminary soundings showed that there would be considerable rock encountered in the tunnels, in the removal of which the rock drill became a necessity. In addition to the low-pressure compressors, therefore, it was necessary to supply a source of high-pressure air for operating these latter machines. The peculiarities of this service will be discussed later.

The magnitude of the work, the difficulties under which it was to be carried on, and the limiting period within which it was to be finished, necessitated the employment of the best engineering skill acquired along all the lines of previous similar experience, and demanded a power equipment larger in capacity than anything heretofore known for similar purposes and embodying many features unique in pneumatic practise. The Manhattan plant, located in New York City at 32d street and First avenue, at the western approach to the East river tunnels, is probably the most complete embodiment of the methods designed to meet the exacting requirements of the specifications. It may therefore serve as a type, not only of the power plants used on this work, but also of the most approved practice in pneumatic power production and distribution, and a detailed description of this installation is therefore here given.

The engineers were confronted in the beginning by the very difficult and discouraging problem of making a power plant which must fulfil certain fixed conditions and fit a given space, instead of following the natural method of selecting a space to meet the requirements of a given power plant. This apology—if it need be so considered—is offered at this point to explain some seeming departures from approved power plant design and arrangement which may appear, in the course of the description, to the practised eye of the constructing engineer. The accompanying plan shows in assembled detail the limitations of space which confronted the designer and the arrangement of machinery and appliances which this space necessitated.

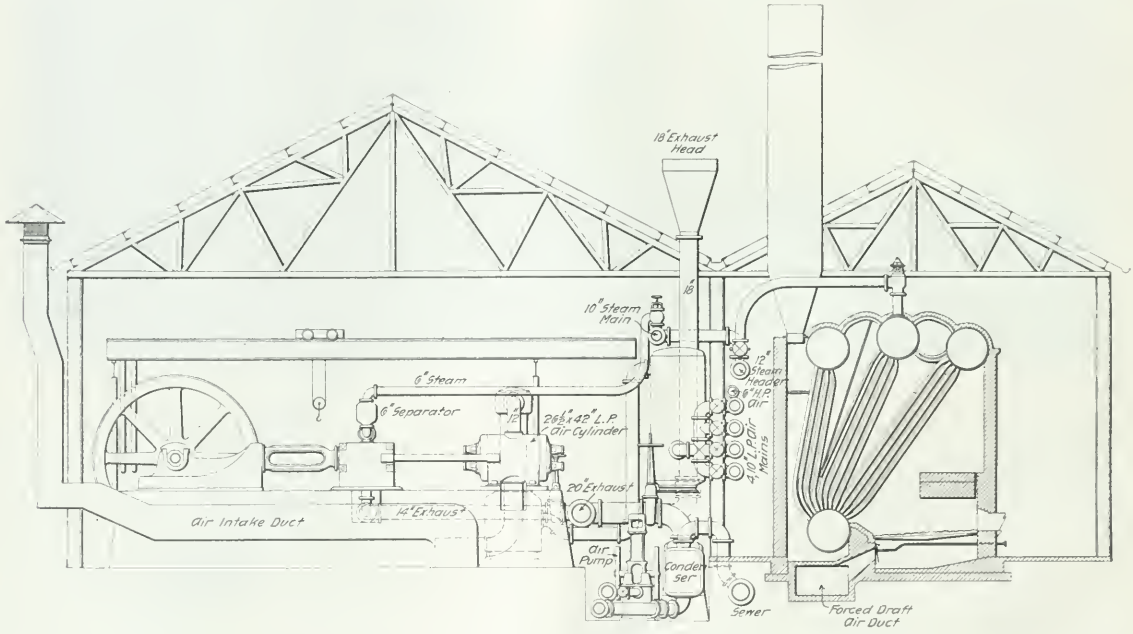
The original boiler equipment of the Manhattan plant included five water-tube boilers of 500 h.p. capacity each, this rating being based upon the accepted value of the boiler horse-power as the capacity for evaporating 34½ lbs. of water per hour from and at 212 degrees Fahr. Each boiler has an approved setting and is equipped with shaking grates and draft appliances designed for burning the smaller sizes of anthracite coal. Each boiler is equipped

with a "non-return emergency stop valve" designed to automatically close should there be a sudden rush of steam backward toward the boiler on which it is mounted, as in the event of a boiler tube bursting. In such cases this valve prevents the discharge of the steam from the other boilers through the steam header to the injured unit. The boilers generate steam at 150 lbs. pressure and were furnished under a guarantee to operate at 50 per cent. overload for a limited period. Forced draft is furnished by two independent steam-driven fans, supplemented by independent steel stacks for each boiler, 54 in. in diameter and 100 ft. high. Each fan has a capacity of 28,000 cu. ft. of air per minute, delivered at $1\frac{1}{2}$ ozs. pressure. One fan, however, is sufficient to furnish the necessary draft, leaving the other as a reserve. The air for the forced draft is carried through a large duct in the hollow bridge wall of each boiler and discharged into the ash-pit through two adjustable draft dampers arranged to give the best possible distribution of air under the grates. Each boiler is also furnished with a feed-water controller, which automatically maintains the water level at a fixed point by means of a float in the water column actuating a valve in the feed connection to the boiler, this in turn regulating the speed of the pump through a pump governor.

Three duplex feed pumps of the outside-packed plunger pattern, brass fitted throughout, and each provided with a pump governor, handle the water supply to the boilers. One of these units is sufficient to supply the plant, leaving two in reserve for emergencies. The feed water is heated in an open feed-water heater of 2,000 h.p. capacity. Exhaust steam enters this heater from the boiler feed pumps, the circulating pumps, the air pumps, the fan engines and other auxiliary machinery. Any heater overflow is carried to the secondary hot well. There is thus no loss of steam or water from the system except a small amount due to leakage.

The main hot well is a tank of heavy steel and will receive all the water of condensation from the condensers. Duplex brass-fitted pumps of ample capacity lift the water of condensation from the main hot well to the main heater, each pump being controlled by a float in the hot well. Three surface condensers, each of a rated capacity of 1,800 h.p., are installed in the position shown on the plan, close to the fire wall between engine and boiler rooms, in a pit below the engine-room floor. Each condenser has an individual air pump driven by a vertical engine, the whole arrangement maintaining in practise a vacuum of 26 in. Either one of the three condensers serves as a reserve unit. Condensing water for the plant is drawn from the East river through an 18-in. water main several hundred feet in length; and provision for handling it was made by installing two centrifugal circulating pumps, each with a capacity of 3,000 gallons per minute and each driven by an independent vertical engine. With condensing water at 70 degrees Fahr., one of these circulating pumps has a capacity ample to supply two condensers running at the rated capacity. In addition to these condenser circulating pumps there is installed a separate steam-driven centrifugal pump with independent engine, having a capacity of 1,000 gallons per minute, which draws cold water from the river through a 10-in. pipe main and circulates it through the jackets and coolers of the compressor units. It will be noted that there is no provision for a reserve unit at this point; but the piping arrangements are such that should this jacket circulating pump be disabled its load can be taken by one of the main condenser circulating pumps.

The steam supply pipes are laid out on a loop system, which makes it impossible for a broken steam header to cripple the plant. The general arrangement of the piping is shown in the plan. Wide-sweep bends unite the boilers and the steam header. The main header has a maximum diameter of 12 in., which diminishes to 10-in. and 8-in. diameters in the farther sections. The arrangement of valves and piping is such that any compressor can be cut out without interfering with the operation of any other machine, while in case of a break in the steam header at any point it can be shut off by means of a valve on either side of it and the steam supply maintained through the two branches of the loop. Pockets provided at proper points receive entrained moisture and condensation, which is removed through a proper system of drip piping. Not only are the main units of the power station connected up on the loop system,

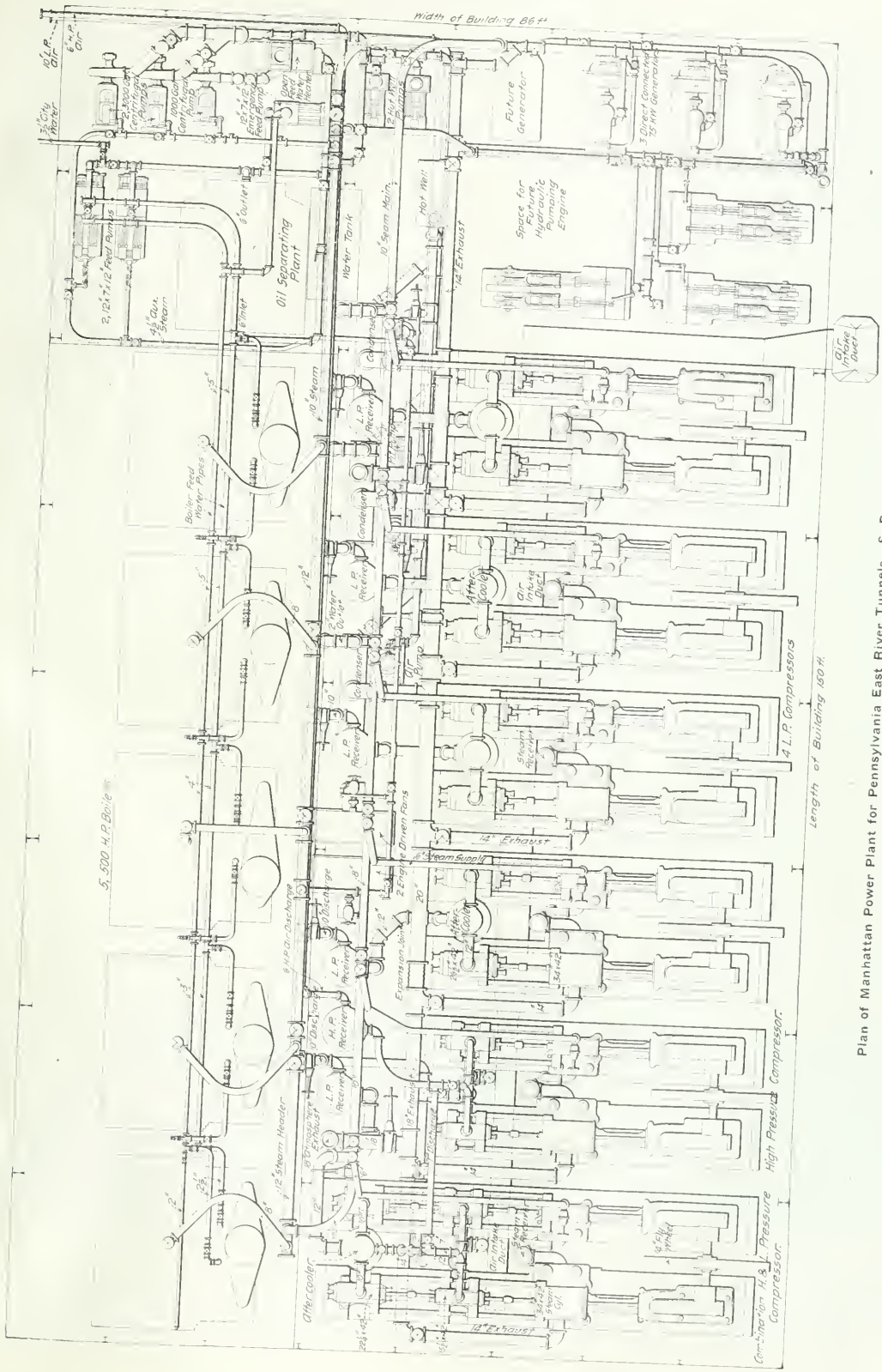



Cross-Section Through Power Plant.

but all auxiliaries also are supplied through duplex pipe systems, this preventing a shut-down due to a broken steam pipe anywhere.

Standard pipe is used throughout, made up with extra heavy fittings and valves, the latter bronze-seated and of gate pattern. All steam piping is covered with a non-conducting material bound with heavy canvas. The supply pipes from the header to all the main units are made up with wide-sweep bends and are of ample cross-section. Strains due to expansion and contraction are properly provided for in the layout of the loop scheme. The main exhaust steam header has a maximum diameter of 20 in., diminishing to 18 and 10 in. in the remoter sections. It receives all the exhaust which is to enter the condensers, and is provided with two automatic atmospheric connections, so that all the machinery can at once exhaust into the atmosphere in case of the simultaneous shutting down of all the condensers. By a proper arrangement of valves and condenser piping any or all of the condensers may be cut out.

The feed-water system is entirely automatic in operation. The boiler feed supply is automatically regulated by a feed-water controller and pump governor. The heater is supplied by means of the hot-well pump under control of a float in the hot well. Fresh water to make up for leakage in the system is supplied to the heater automatically by means of a float-controlled valve in the latter. The piping is so arranged that the boiler feed pumps can be supplied direct from the city mains, and there are also connections for filling




Plan of Manhattan Power Plant for Pennsylvania East River Tunnels—S. Pearson & Son, Contractors.

supply boilers from the city mains without the use of the pumps. There are two independent pipe lines between the pumps and the boilers.

Feed water is supplied to the boilers as follows: The condenser discharge flows directly to the hot well; from the hot well it is elevated by a pump to the heater; from the heater it flows by gravity through the oil separator to the feed-pump suction; from the feed pump it is forced into the boilers.

The power equipment proper for the Manhattan station includes, besides the compressors about to be described, three powerful steam-driven hydraulic machines for furnishing pressure to the hydraulic jacks which force the shields forward in the tunnels. There are in addition four vertical direct-connected electric generating sets furnishing current to light the workings.

*Air Compressors.*—Six compressor units make up the air-power equipment. These were all made by the Ingersoll-Rand Company, of New York, and embody the latest refinements which guarantee the highest economy and reliability in air compression. Before entering into the details of these machines a discussion of the conditions which were to be met may be of interest and of assistance in understanding the somewhat peculiar arrangement of power-producing devices. The pressure requirements of the service were unique and exacting. As stated, the tunnels are being driven by the shield method, with the air pressure inside balancing the water pressure outside. Evidently as the tunnels descended under the river, the pressure due to the head of water above would steadily increase, until the maximum depth was reached, requiring a corresponding increase in the counterbalancing air pressure. Moreover, it was recognized that as the four tunnels progressed, the same rate of advance might not be maintained in all of them, because of the varying materials and conditions encountered, and it was quite possible, therefore, that each heading might require a different and a differently varying pressure. The rock drills and other pneumatic appliances which were to operate behind the shield and in the working chamber of the heading would exhaust into this working pressure; and in order that they might be maintained at their maximum effectiveness a constant effective working pressure had to be maintained upon them, regardless of the varying terminal pressures at which they might exhaust. Briefly summed up, the requirements of the situation were for two sources of air pressure, the pressures differing by a constant value and capable of simultaneously varying between the maximum and minimum; and these were the conditions which necessitated the adoption and arrangement of air compressors.

Four of the compressors are low air presure machines of duplex Corliss type, with cross-compound steam cylinders designed to operate condensing, and simple duplex air cylinders discharging into their individual after-coolers. The steam valve gear is of the Corliss release type with vacuum dash pots; the air valve gear is that known by the makers as the positive pneumatically operated type. The steam cylinders are 16 in. and 34 in. in diameter, respectively, by 42-in. stroke, and the common diameter of the duplex air cylinders is 26¼ in. At the normal rated speed of 100 r.p.m. each of these machines has an actual free air capacity of 5,000 cu. ft. per minute, and is designed to deliver the air at a working pressure ranging from atmosphere to 50 lbs. The machines are so designed, however, that cut-off of maximum economy prevails when an air pressure of 30 lbs. is being delivered; either side of this point the steam economy naturally falling off slowly. The initial steam pressure is 150 lbs. gage, and the engines operate under a 26-in. vacuum. When operating at the above-rated speed under a uniform load of 30 lbs. pressure, with standard steam pressure and vacuum, each compressor develops about 480 i.h.p. The supply of steam to the engine is automatically adjusted to the load upon it, and the air pressure is automatically maintained at the proper value by means of a speed and air-pressure regulator of a type designed especially for difficult service under widely differing loads. While 100 r.p.m. is the rated speed of these compressing units, the specifications required that they could be safely and economically run at a speed of 125 r.p.m. for a period of 24 hours continuously, and this condition has frequently been completely satisfied in practice. The vertical receiver-after cooler for each unit is placed between its air cylinders. Solid concrete foundations support the entire compressor installation.

In addition to these four low-pressure machines there is also installed one high-pressure unit of the same general type; duplex Corliss pattern with steam cylinders cross-compound to operate condensing and simple duplex air cylinders; Corliss release valve gear and vacuum dash pots on the steam end, and positive pneumatically operated valves on air intake and discharge. A combined speed-and-air pressure regulator, of the type already mentioned, automatically regulates the performance of the unit. The high-pressure steam cylinder is 16 in. in diameter, low pressure 34 in. in diameter; the air cylinders are 15½ in. in diameter and the common stroke is 42 in. The normal speed of this compressor is 90 r.p.m., at which it has a piston displacement of 1,568 cu. ft. of free air per minute from atmospheric intake. It is designed to cover a working range of air pressure from 90 to 140 lbs., with intake pressures varying from atmosphere to 50 lbs., and under these conditions the equivalent free air capacity of the machine will vary from 1,568 to 6,899 cu. ft. per minute. The normal rating of the compressor is at a terminal pressure of 120 lbs., compressed from intake pressure of 30 lbs. At this point the machine has a cut-off of maximum economy when operating under a steam pressure of 150 lbs. and a vacuum of 26 inches. This unit also was designed to stand, and has repeatedly stood an overload up to 125 r.p.m. for a continuous period of 24 hours. The drill capacity of this compressor is stated at thirty-six 3½-in. standard Sargeant rock drills when the air is compressed from an initial pressure of 20 to 35 lbs. and with a differential or effective pressure on the drill not exceeding 90 to 100 lbs. gage. The air discharge pipes from the high-pressure cylinders unite in a common branch leading to a high-pressure receiver in the rear of the compressor.

Supplementing the five machines described, and intended to act on occasion as a reserve for either the high or the low-pressure sections of the plant, there is installed a machine classed in the specifications as a "combination high and low-pressure compressor." Its general type is similar to that of the other machines. The steam cylinders, 16 in. and 34 in. in diameter, with a common stroke of 42 in., are cross-compounded and run condensing. They are fitted with Corliss release gear and vacuum dash-pots, and are coupled in tandem to a pair both of high and low-pressure air cylinders, the high-pressure air cylinders being next to and in line with the steam cylinders. The air cylinders are 15½ in. and 22¼ in. in diameter, with a common stroke of 42 in. The design contemplates either running all four air cylinders connected, as a low-pressure machine, or as a high-pressure machine with the larger air cylinder disconnected and only the two 15½-in. cylinders in operation, drawing intake from the low-pressure machines or direct from the atmosphere. When operating as a low-pressure unit at the rated normal speed of 100 r.p.m., this compressor has a total actual capacity of 5,000 cu. ft. of free air per minute from atmospheric intake, and covers a range of terminal pressures from atmosphere to 50 lbs. When operating as a high-pressure unit at the normal rated speed of 90 r.p.m., the machine has a free air capacity of 1,568 cu. ft. per minute, with atmospheric intake and a discharge pressure of 90 lbs.; but it is capable of variation up to a terminal pressure of 140 lbs. from an intake of 50 lbs., at which its equivalent free air capacity is 6,899 cu. ft. per minute. The engine has its cut-off at maximum economy when operating under steam pressure of 150 lbs. and vacuum of 26 in., with air intake of 30 lbs., gage, and discharge pressure of 120 lbs. Under these conditions it develops 430 i.h.p. Like the other compressor units, it can be and has been overloaded for a period of 24 hours up to a speed of 125 r.p.m. A vertical receiver after-cooler, mounted between the low-pressure cylinders, receives their discharge when the machine is run as a low-pressure unit. When run as a high-pressure machine, the discharge is delivered into the high-pressure receiver already noted as connected with the high-pressure unit. It will be observed that there is no provision for after-cooling the high-pressure air, as the moisture is sufficiently removed in the after-coolers of the low-pressure machines from which the high-pressure units draw their intake, and the exhaust from the high-pressure machines used in the heading is cooled in its expansion.

It is to be remembered that the air delivered by the low-pressure compressors comprises the entire atmosphere of the headings in which the men work, and the pressure alone to which they are subjected is sufficiently trying without any additional complications from high temperature, humidity, oil vapor or other impurities, and all possible provision is made for delivering the air as cool and pure as possible.

Cool and clean intake air is supplied to each compressor through an 18-in. branch leading from a large air intake conduit traversing all the foundations and terminating in a 40-in. vertical-hooded and screened pipe outside the building. The after-coolers use salt water for the cooling, and they are therefore fitted with tubes and tube plates of special composition to resist corrosion. Each after-cooler reduces the temperature of the air which it receives from the low-pressure cylinder very nearly to that of the cooling water employed, and for most of the year this air temperature is decidedly below that of the external atmosphere.

There are five vertical steel low-pressure air receivers 54 in. diameter and 12 ft. high, mounted at the rear of the compressors and close to the fire wall, as shown in the plan. The cooled air from the after-coolers enters these low-pressure receivers at the top and is discharged near the bottom. The passage of the air through the receivers is slow, and here all surplus moisture is dropped, the traces of oil also mostly disappearing, drain cocks being provided with each receiver for drawing off the accumulation from time to time. The air discharge is into a four-way fitting of extra heavy tees, elbows and valves, the function of this four-way arrangement appearing later. There is a vertical high-pressure receiver 60 in. diameter and 14 ft. high, located at the rear of the high-pressure unit.

The high-pressure machines draw their intake from the discharge of the low-pressure machines. This system is equivalent

in effect and economy to two-stage compression, while giving a range of capacity under fluctuating pressures and a flexibility under varying service conditions which could not have been secured by an ordinary multi-stage unit. Until water pressure was encountered in the tunnels there was no necessity for an air pressure in front of the shield, and the rock drills were operated under an initial pressure of 90 to 100 lbs. supplied from the high-pressure compressor. As the depth has increased and low air pressure has been demanded in the chamber at the rear of the shield, this low-pressure has been supplied from the low-pressure machines, from which also the high-pressure compressor when in operation draws its intake. Thus, when the depth required a pressure at the face of 10 lbs., this became also the intake pressure of the high-pressure machine, which then had a discharge pressure of 100 lbs., which was equivalent to 90 lbs. effective pressure on the drill. With a tube pressure at 20 lbs., which was then also the intake pressure of the high-pressure machine, the high-pressure delivery became 110 lbs., leaving still an effective differential of 90 lbs., and so on over the full range of chamber pressures from zero to 50 lbs. and of high-pressures from 90 to 140 lbs. gage. With this understanding of the varying pressure requirements, as the work has progressed, and bearing in mind the fact that the varying progress and conditions in the four different headings has introduced other elements of variation, some idea may be formed of the complex demands which were arranged for in providing air power, and the necessity for a great flexibility in the piping system and in the scheme of distribution will be appreciated.

From the after-cooler of each low-pressure compressor a 12-in. pipe leads to the receiver. From each receiver a 10-in. branch discharges through the four-way fitting mentioned above into four 10-in. air mains running the length of the engine-room and leading one to each tunnel. The system of subdivision and control is such that any individual low-pressure compressor may furnish air to any tunnel at any required pressure, while either high-pressure machine may also draw its intake from any low-pressure compressor and deliver it, with the correct differential, to any heading. The high-pressure main from the high-pressure compressors is a 6-in. pipe carried out and branched to each tunnel. The intake connections for the high-pressure and combination compressors are so arranged that these machines can draw their intake from atmosphere, if necessary, while the high-pressure machine also is so piped that it can discharge into the low-pressure mains.

All air cylinders are completely water-jacketed and cooled by a continuous and copious flow of cold water from the river, maintained by the circulating pump already noted. Three separate oiling systems are installed in the plant, these being made necessary by the varying conditions of lubrication. The first supplies engine oil to all journals and oil cups where this grade of lubricant is used. Oil flows by gravity from an elevated tank, passes through the bearings, is caught and cleansed by a filter and is returned to the supply tank by a small oil pump. The second is a forced lubrication system for the air cylinders, in which air-oil, contained in tanks under air pressure from the high and low-pressure receivers, respectively, flows into the high and low-pressure cylinders; a large percentage of this oil is recovered in the drain of the after-coolers and is used for lubricating the rock drills and other air appliances in the headings. The third system is one for lubricating the steam cylinders and is simply a gravity arrangement of piping by which the cylinder oil flows from a tank to the reservoirs of the individual oil pumps fitted to each cylinder. This oil, after passing in the exhaust to the condenser, is removed from the condenser discharge by an elaborate automatic chemical oil separating plant, the location of which is seen on the plans.

*Long Island City Plant.*—The air power plant at the Long Island terminus of the tunnels is located at the foot of Flushing street, Long Island City. In its capacity and in all its essential features this plant is identical with that on the Manhattan side just described. But here again the engineers were confronted by the difficulty of making the plant fit a given space, and the result is a power station differing radically in arrangement from that on the other side of the river, this plant, as a whole, being very long and narrow, while the other is more nearly square. Enough has been said in reference to the Manhattan plant to make it unnecessary to enter into a full description of the Long Island installation. It is identical in capacity and capability with the plant on the New York side.

In the preceding description only the details of the plants as originally installed have been included. Mention should be made of two straight-line, Class A, Ingersoll compressors, 18 by 18¼ by 24-in. in the Manhattan plant. These were used for some of the preliminary shaft or tunnel work and have been retained as possibly serviceable in some emergency.

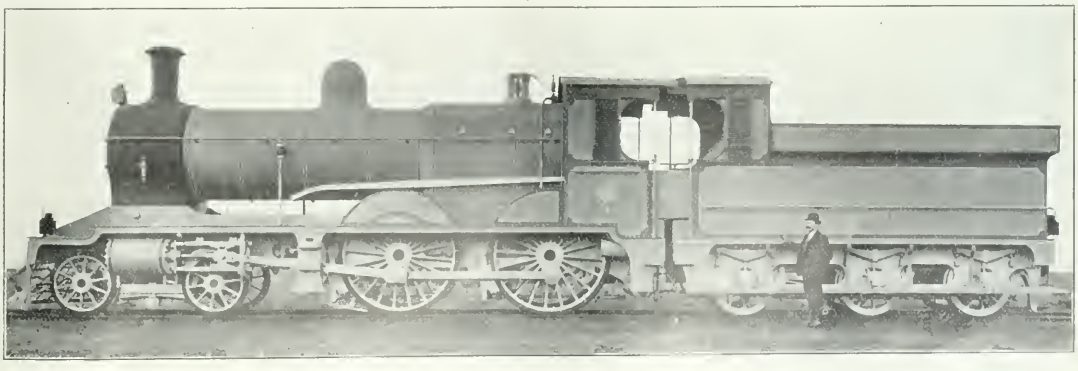
The complete success of the entire plants from the beginning is indicated in the fact that there have been no changes or substitutions in the line of correction or improvement. With the usual allowance for the breaking in of an installation, new in every detail, and some of it novel besides, everything has worked perfectly from the beginning, and all the changes have been in the line of additions and enlargements only. The call for low-pressure air has greatly exceeded all calculations, and accordingly at both the Manhattan plant and that at Long Island City an additional low-pressure compressor has been installed, in each case a precise duplicate of the four original low-pressure machines. At the Manhattan plant, also, the high-pressure cylinders, 15½ in. diameter, of compressor No. 5 have been taken off and cylinders 26¼ in. diameter for low-pressure service have been substituted. An additional boiler also has been added to each plant.

The four power plants employed in driving the tunnels for the Pennsylvania Railroad under the North river and the East river, only the latter of which have been here spoken of in detail, represent in the aggregate the largest installation of air-compressing machinery ever made. In settling the details of these plants the most far-seeing business considerations prevailed. Not a detail was knowingly omitted in design or arrangement which could measurably contribute economy and reliability in operation. Continuous service and a positive practical guarantee against breakdown were absolute essentials, for a sudden failure of air pressure in the working faces would inevitably have resulted in heavy loss of life and property, to say nothing of the loss of time which in this case would be "big money." Never was an air plant called upon for such severe service.

The fulfilment and even the overrunning of all expectations under the strenuous conditions which were anticipated and the unforeseen requirements which have arisen constitute a notable achievement of modern mechanical engineering and is peculiarly gratifying to all who have contributed to its success.

## Locomotive for Imperial Chinese Railways.

Robert Stephenson & Co., Ltd., of Darlington, England, have recently built ten eight-wheeled (4-4-0) locomotives for the Imperial Chinese Railways. Though built in England, the engines bear the marks of American influence in the pilot and the arrangement of the running gear. The cab is arranged with side doors opening outward, for the convenience of the native Chinese firemen that are employed. The engines are fitted with the Westinghouse brake, the pump being fixed to the right hand side of the firebox clear of the reach rod, which, it will be seen, is on the left hand side. The



Eight-Wheel Locomotive for the Imperial Chinese Railways.

engines are intended for service on the 198 miles of road between Shanghai and Nankin, and are interesting as illustrative of the type to be used.

The following are some of the principal dimensions:

| | |
|---|---|
| Cylinders, diameter | 18 in. |
| Piston stroke | 26 " |
| Steam pressure | 180 lbs. |
| Heating surface, tubes | 1,467.39 sq. ft. |
| " " firebox | 162.61 " |
| " " total | 1,630.00 " |
| Grate area | 28.00 " |
| Tubes, No. 188; outside diameter | 2¼ in. |
| " length | 12 ft. 10½ in. |
| Diameter of driving wheels | 79 " |
| Diameter truck wheels | 42 " |
| Tank capacity, water | 3,500 gals. |
| Tank capacity, coal | 7 tons |
| Engine, wheel base | 25 ft. 2 in. |
| Engine rigid wheel base | 8 ft. 3 in. |
| Total wheel base engine and tender | 48 ft. 9 in. |
| Total length of engine and tender over couplers | 57 ft. 3¾ in. |
| Weight of engine | 126,900 lbs. |
| Weight on driving wheels | 83,100 " |
| Tractive power | 16,515 " |

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.09$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.78$$

$$\frac{\text{Tractive effort} \times \text{diam. drivers}}{\text{Heating surface}} = 7.91$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 58.21$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = .10$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 51.00$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 77.85$$

$$\text{Volume of two cylinders} \quad 7.66 \text{ cu. ft.}$$

$$\frac{\text{Heating surface}}{\text{Vol. of two cylinders}} = 212.79$$

$$\frac{\text{Grate area}}{\text{Vol. of two cylinders}} = 3.65$$

## Train Accidents in the United States in June.[1]

rc, 1st, Lake Shore & Michigan Southern, Sandusky, Ohio, westbound fast mail train No. 17 ran into the rear of a preceding freight, making a bad wreck, blocking all the main tracks. The engineman, fireman and three mail clerks were injured. It is said that the mail train disregarded a caution signal or slow order.

bc, 1st, 5 a. m., Southern Railway, Bryan, Ala., butting collision between freight trains 73 and 84; one fireman killed; one engineman and three other trainmen injured, the engineman fatally.

unx, 1st, Northern Alabama, Bear Creek, Ala., a passenger train was derailed and the engine and two cars fell down a high bank. The fireman was killed and three other trainmen were injured.

xc, 2d, Atlantic Coast Line, Newberry, Fla., collision of passenger trains, killing one engineman and injuring one fireman. There was a dense fog at the time.

dn, 2d, 2 p. m., Pennsylvania road, Marion, N. J., the eastbound St. Louis express train, second section, ran upon the draw of the bridge at Hackensack river when the bridge was partly open, the rails being about 3 ft. out of line. The speed of the train at the time was about 35 miles an hour. The engine ran the whole length of the draw span on the sleepers and then fell into the river; the tender and the next three cars, one a dining car, all badly damaged, lodged on the draw. The only person seriously injured was the engineman, who jumped out of the cab and sustained a sprained ankle. The dining car, which was empty, was partly overturned and the trucks of all three cars on the draw were slewed or bunched. The first sleeping car was occupied by only three passengers and the porter, and the second by six passengers and two employees. The draw appears to have been opened after the engine passed the home signal (at clear), which is 1,725 ft. west of the draw. The distant signal is 2,931 ft. farther west. The signals are automatic semaphores, on signal bridges, but controlled by the bridge tender. At the home signal there is a "smash signal," worked manually by a wire from the cabin on the draw, which, when the draw is to be opened, is let down to a position in which it will be struck by the engine if a train passes it. This signal is a big round disk.

2d, Northern Pacific, Laurel, Mont., a mixed train was derailed while running at good speed and a man riding on a platform car was killed. Eight cars were ditched.

bc, 3d, 9 p. m., Chicago & North-Western, California Junction, Ia., butting collision between passenger train No. 6 and an empty engine, badly damaging both engines and four passenger cars. One engineman was killed and one mail clerk injured.

xc, 3d, Cumberland Valley, Chambersburg, Pa., a freight train ran over a misplaced switch and into the rear of a preceding freight, damaging the caboose and several cars. One trainman was killed and two others were injured, one of them fatally.

unx, 3d, Chicago, St. Paul, Minneapolis & Omaha, Superior Junction, Wis., the engine and first car of a passenger train were derailed at a switch; fireman killed, two other trainmen injured.

unx, 4th, Central of Georgia, Walden, Ga., a freight car was derailed and four men stealing a ride were badly injured, one of them fatally.

bc, 5th, Grand Rapids & Indiana, Cadillac, Mich., butting collision between a wrecking train and a work train, wrecking both engines and several cars. Two employees were killed and several others slightly injured.

†rc, 6th, Atlanta, Ga., an excursion train of the Atlanta & West Point, consisting of 16 cars, all filled, approaching the Union Station, was run into at the rear by a passenger train of the Central of Georgia and the rear car of the excursion train was wrecked. One passenger was killed and six seriously injured, two of them probably fatally.

bc, 6th, Colorado Midland, Boyer, Col., butting collision between a passenger train and a freight, making a bad wreck. One engineman and one fireman were killed.

*xc, 7th, Pennsylvania road, Lancaster, Pa., collision between a passenger train and a work train, badly damaging both engines. Two cars of the work train took fire and were burnt up. Three trainmen were injured.

unx, 7th, Illinois Central, Benton, Ill., a mixed train was derailed and the engine fell down a bank, killing the engineman.

xc, 8th, 3 a. m., St. Louis, Iron Mountain & Southern, Mengo, Mo., a northbound passenger train entering a side track was run into by a southbound passenger train, badly damaging several cars. One fireman was killed and 22 passengers were injured.

unx, 8th, Chicago, Rock Island & Pacific, Jennings, Kan., eastbound passenger train No. 6 was derailed and 18 passengers were injured.

unf, 9th, Buffalo, Rochester & Pittsburg, Gayton, N. Y., a freight train was derailed by a tree which had blown down and lodged on the track, and 15 cars were ditched. The fireman was killed and the engineman injured.

unx, 9th, Georgia Railroad, Mesena, Ga., a passenger train was derailed; engineman and fireman killed, five passengers injured.

unx, 10th, Atchison, Topeka & Santa Fe, Gibbs, Mo., a freight train was derailed and several cars were ditched; the conductor was killed.

bc, 11th, Long Island road, Manhassett, N. Y., butting collision between a passenger train and an empty engine; two trainmen injured.

†dn, 11th, Central of N. J., Eatontown, N. J., a northbound passenger train was derailed at a misplaced switch and the engine and two cars were overturned. One passenger was killed and 23 injured, 21 of them only slightly.

xc, 12th, Chesapeake & Ohio, Masseys, Va., a collision between a passenger train and a car of lumber which had escaped control and was running down grade at high speed. The engineman, fireman and two other persons were injured.

eq, 12th, Minneapolis, St. Paul & Sault Ste. Marie, Harvey, N. D., a heavily loaded passenger train was derailed by the breaking of an axle, and the engine was ditched. Several cars were overturned and many passengers were injured, but, according to the reports, nearly all of the injuries were slight.

bc, 13th, Northern Pacific, Trazee, Minn., butting collision between a passenger train and a freight. One person was killed and 16 were injured.

xc, 13th, Seaboard Air Line, Limerick, Ga., collision between a northbound passenger train and a southbound freight; two passengers and two trainmen injured.

bc, 14th, Chicago, Rock Island & Pacific, Marine, Ia., butting collision of fast passenger trains; eight passengers and three trainmen injured.

xc, 14th, Atlantic Coast Line, Yemassee, S. C., collision between a passenger train and a freight; four persons injured.

†14th, Atchison, Topeka & Santa Fe, Point San Pablo, Cal., a train

[1] Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

| | |
|---|---|
| rc | Rear collisions. |
| bc | Butting collisions. |
| xc | Miscellaneous collisions. |
| dr | Derailments; defects of roadway. |
| eq | Derailments; defects of equipment. |
| dn | Derailments; negligence in operating. |
| unf | Derailments; unforeseen obstruction. |
| unx | Derailments; unexplained. |
| o | Miscellaneous accidents. |

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

consisting of two passenger cars and two freight cars carrying workmen to a brickyard was derailed at a defective switch; three workmen were killed and seven or more injured.

unx, 14th, Pennsylvania Lines, Elba, Ohio, a passenger train was derailed and the engine and baggage car fell down a bank. The smoking car was overturned, but all of the occupants escaped with slight injuries. The engineman and fireman were seriously injured.

dn, 15th, Norfolk & Western, Wakefield, Va., eastbound passenger train No. 4 was derailed at a derailing switch approaching a crossing, and the engine and first two cars were wrecked. The fireman and a mail clerk were injured.

rc, 16th, Southern Pacific, Reno, Nev., a freight train ran over a misplaced switch and into the rear of another freight train, damaging several cars. A fireman was killed.

bc, 17th, 11 p. m., Nashville, Chattanooga & St. Louis, Whiteside, Tenn., butting collision between passenger train No. 11 of the Southern Railway and train No. 17 of the Nashville, Chattanooga & St. Louis, wrecking both engines and several freight cars. A tramp was killed and one engineman and one passenger were injured.

*xc, 17th, Cleveland, Cincinnati, Chicago & St. Louis, Mix, Ohio, a freight train broke in two and the rear portion afterward ran into the forward one, damaging several cars and exploding a car of naphtha. The wreck took fire from the naphtha and was burnt up, together with a number of trees on both sides of the road.

bc, 18th, 4 a. m., Baltimore & Ohio, West Wheeling, Ohio, butting collision between a special train, consisting of an engine and one officers' car and a freight train; three trainmen were injured.

bc, 19th, Louisville & Nashville, Middlesboro, Ky., butting collision between passenger train No. 26 and freight train No. 21. Seven passengers and two trainmen were injured.

eq, 19th, Southern Pacific, Reno, Nev., a freight train was derailed by the breaking of a wheel and several cars were piled up in a bad wreck. Four tramps were killed and two others injured.

rc, 20th, Central Vermont, Mansfield, Conn., rear collision of freight trains. One brakeman killed.

20th, Rutland road, East Clarendon, Vt., collision between a passenger train and a carload of wheat which had escaped control while being switched and was running at high speed down grade. The passenger train had been, or nearly, or quite, brought to a stand. The engineman was killed.

xc, 21st, Atlantic Coast Line, Ahoskie, N. C., collision of freight trains, one of which was switching. Two trainmen were killed and the conductor and a trespasser were injured.

unx, 22d, Chicago & North-Western, Peebles, Wis., a work train running backward was derailed and the caboose and a car loaded with rails were wrecked, the rails penetrating the caboose. A number of workmen in the caboose were injured, one of them fatally.

bc, 23d, Seymore, Ala., butting collision between a westbound freight train of the Louisville & Nashville and an eastbound freight train of the Southern Railway on the joint track used by both roads, badly damaging both engines. One engineman was killed and four other trainmen were injured.

24th, Southern Railway, Sayreton, Ala., the tender of the locomotive of a freight train was derailed, and, with the engine and several cars, was wrecked. One brakeman was killed and three other trainmen were injured.

unx, 24th, Atchison, Topeka & Santa Fe, Hardin, Mo., a freight train was derailed and the engine was overturned; fireman killed, engineman injured.

xc, 25th, Lake Shore & Michigan Southern, Adrian, Mich., a passenger train ran over a misplaced switch and into a standing passenger train. Three trainmen and six passengers were injured.

dn, 25th, Atlantic Coast Line, Tampa, Fla., a switching engine moving backward ran off the end of the track at an open draw and fell into Hillsborough river. One trainman went down with the engine and was killed.

unx, 25th, Chicago, Great Western, Gladbrook, Ia., passenger train No. 6 was derailed, and, running across a bridge on the sleepers, was overturned, four passenger cars falling down a bank. Six passengers were injured.

unx, 25th, Norfolk & Western, Limeton, Va., a freight train was derailed and wrecked, and the engineman and fireman were killed.

xc, 26th, 10 p. m., Atlantic Coast Line, Goldsboro, N. C., a car, in bad order, attached to the rear end of a freight train, broke away when the train stopped at the station and ran back down grade some distance into the head of passenger train No. 42. The engineman and fireman were injured.

†eq, 26th, Grand Rapids & Indiana, Long Lake, Mich., a freight car in a mixed train was derailed in consequence of some defect in the truck; one passenger and one trainman injured, the passenger fatally.

unx, 27th, Sierra Railway, Jamestown, Cal., a car in a mixed train was derailed on a curve and was overturned. This car contained dynamite, which exploded, and wrecked not only the cars in the train, but a factory nearby. Window-glass was broken at Milton, about 20 miles away. Two brakemen were killed, one of them being blown to atoms; and the conductor and one passenger were injured.

*xc, 29th, 10 p. m., Atlantic Coast Line, Martin, Fla., a freight train, with one engine at the front and another at the rear, broke in two while ascending a steep grade, and soon afterward two or three of the rear cars were crushed by the pushing engine. Seven loaded cars took fire and were burnt up. The engineman and a flagman were killed and their bodies were nearly destroyed by fire.

unf, 29th, Chicago, Milwaukee & St. Paul, Canton, Ia., a passenger train was derailed at a washout and two trainmen were injured.

xc, 30th, 1 a. m., Chicago, Burlington & Quincy, Ipava, Ia., a northbound passenger train collided with a string of five freight cars which had been blown by a high wind from a siding to the main track. The fireman and several passengers were injured, the fireman fatally.

30th, Delaware, Lackawanna & Western, Chadwicks, N. Y., the rear car of a southbound passenger train was derailed at a switch, and, with the other two cars, was wrecked against freight cars on a side track. Seventeen passengers and one trainman were injured, two of the passengers probably fatally.

unx, 30th, Southern Railway, Oakman, Ala., the engine of a local freight train was derailed, and a brakeman riding in the cab was killed. The fireman was badly scalded.

## Wear of Wheel Tires on Locomotives with Inside and Outside Cylinders.

A very interesting investigation into the effect of cylinder location on the wear of locomotive driving wheel tires has recently been concluded and reported upon in the April issue of the Bulletin of the International Railway Congress by M. O. Busse, Locomotive and Rolling Stock Superintendent for the Danish State Railways. For the purposes of the inquiry two classes of locomotives were chosen, known as classes C and K. They are of the eight-wheeled 4-4-0 type with a leading bogie truck. The two classes are practically identical in all weights and measurements and general design except that class C has inside cylinders while class K has outside, and,

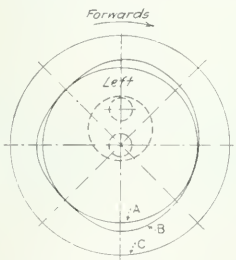


Fig. 1.

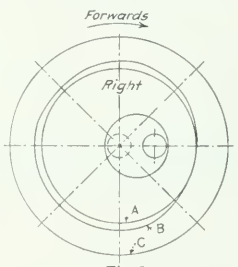


Fig. 2.

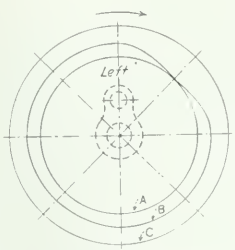


Fig. 3.

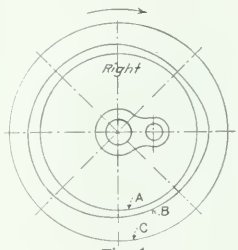


Fig. 4.

*A*—*After being turned up again the first time.*
*B*—*Wear observed at first general overhaul.*
*C*—*When first put to work.*

Wear of Tires on Locomotives.

during the test they were all used in express passenger service. The cylinders are 17 in. in diameter with a piston stroke of 24 in. The total weight on the drivers is 57,320 lbs. The driving wheels are 6 ft. 1½ in. in diameter and the heating surface is 1,049.73 sq. ft. in class C, and 1,017.55 sq. ft. in class K—certainly not difference enough to affect the wear of the tires. The rigid wheel base is 8 ft. 6⅜ in.

The tires of all these locomotives were supplied by Krupp to the same specification. The wear determined by the successive measurements and the means found have served for drawing the illustrations which show how the tires of the left wheels and of the right wheels respectively have become worn to an oval shape. The greatest average wear is 0.20866 and 0.20473 inch for the two types of locomotive respectively. The thickness of the tire was reduced by

wear and by being turned 0.27559 inch in both cases, from this point of view there is thus no difference between the two locomotives.

But matters are very different if the mileage is taken into consideration; for each C locomotive ran 55,951 miles on the average, whereas the K locomotive only averaged about 28,034 miles. That is a difference of about 93 per cent. in favor of the C locomotive. Thus the average mileage per $\frac{1}{16}$ in. of wear is 42,592 in the case of the class C engines and only 22,553 in that of the K class.

According to the regulations of the Danish Railways the tire must be at least 1 $\frac{1}{16}$ in. thick at the time of the last turning. From the data already secured it is estimated that seven turnings can be obtained from which the life of the class C tires will be 447,768 miles and those of class K 232,263 miles.

In discussing the matter of the relation of locomotive repairs to tire wear, an element of Danish practice is brought out that does not necessarily obtain in America. M. Busse says that each time the tires are turned up the locomotive has to be overhauled; consequently, for a given mileage, locomotives K have to be taken to the shops twice as often as locomotives C.

He also claims that the cost of maintenance of the boiler depends chiefly on the mileage, but the cost of repairing the other parts of the locomotive and the tender is nearly the same for a locomotive which has run 29,034 miles since the last general overhaul as for one which has run 55,971 miles. Now as the latter items represent 55 per cent. of the total cost, it is evidently an advantage if the locomotives do a long mileage between repairs.

M. Busse then goes on to cite some of the advantages claimed for the inside cylinders, not the least of which is to the effect that as they have to be taken less frequently to the shops they are consequently more rarely put out of work, and hence the same number of locomotives can deal with more traffic. It follows that locomotives with inside cylinders are much more profitable than locomotives with outside cylinders. The fact absolutely confirms the correctness of the claim with reference to the wear of the tires.

Again, the frame plates with the inside arrangement have lower stresses to withstand, and as the two cylinders cast in one piece form the front cross-stay, it was possible to reduce the weight of the frame materially. The thickness of the plate used for the frame plates has been reduced from 1 $\frac{9}{16}$ to $\frac{21}{32}$ inch, the bottom of the smokebox has been made materially thinner, and it was possible to eliminate part of the cross-stays. In this way the weight has been reduced by about 3,570 lbs. Using a crank axle increases the prime cost of the set of drivers about $950. Otherwise there is hardly any appreciable difference between the cost of building locomotives of the two types, and it may be assumed, other conditions being equal, that a locomotive of the class C will cost about $880 more than one of class K.

The article concludes with a repetition of a previous statement to the effect that the engines with inside cylinders run on the average 93 per cent. further between two general overhauls than those with outside cylinders. Hence, it is argued that this extra cost is well worth incurring. And it is regretted that the advantages of having inside cylinders were not recognized sooner; otherwise a considerable saving in maintenance would have been effected. However, the fact will fortunately lead to the adoption of the four-cylinder system, which makes it possible to have a very powerful locomotive with moderate wear of tires and moderate cost of maintenance.

## The "Hornsby-Akroyd" Kerosene and Fuel Oil Engine.

Like most small and medium-size internal combustion engines, the "Hornsby-Akroyd" operates on the Beau de Rochas or four-stroke cycle, in which the fuel is first aspirated; secondly, compressed; thirdly, exploded, and fourth, expelled from the cylinder. This engine operates on kerosene or fuel oil, and is distinguished from engines operating on gas or volatile fluids, such as gasoline or naphtha by the entire absence of electric batteries and other igniting mechanism. The fuel is gasified in the vaporizer, which is a cast-iron chamber separated from the main cylinder by a narrow neck, as shown in Fig. 1. By the heat of successive explosions this vaporizer is maintained at a dull red heat, sufficient to vaporize the entering oil. The oil is supplied to the vaporizer by a positively driven oil pump, which maintains a pressure in the pipe leading to the vaporizer. A small check-valve is placed in this pipe near the vaporizer, so that the shock of the explosion does not reach the oil pump. If the engine should speed up the governor opens a small by-pass valve, which allows part or all of the oil to return to the tank in the bed-plate of the engine, instead of entering the vaporizer. See Figs. 3 and 4.

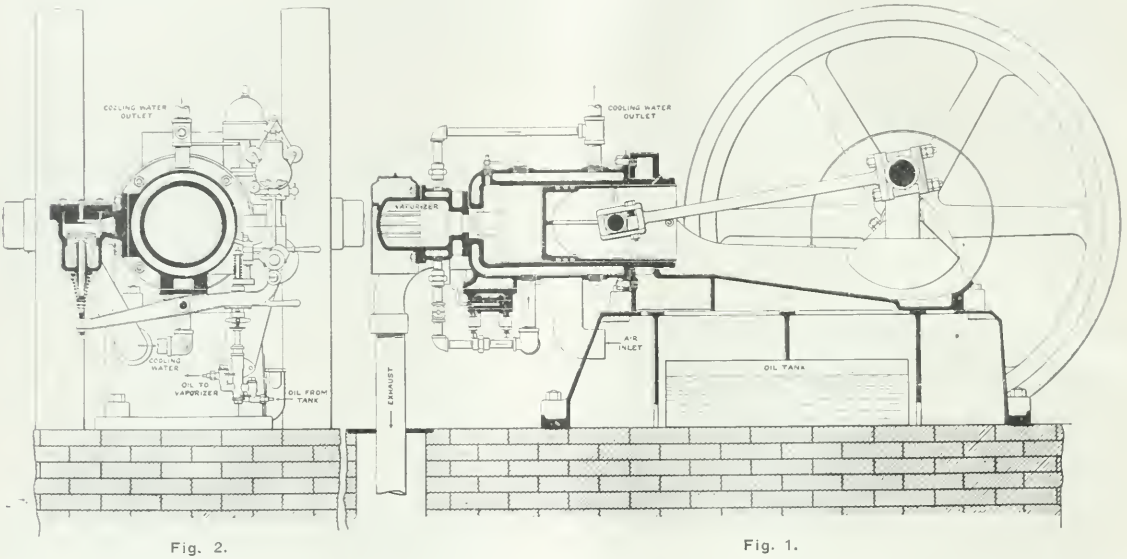



Fig. 2. Fig. 1.

During the time the oil is entering the vaporizer the charge of air is drawn into the main cylinder by the outgoing piston. On its return stroke the piston forces the air into the vaporizer, where it mixes with the vaporized oil, thus forming a combustible charge. The heat of compression, together with that of the vaporizer, is sufficient to ignite the mixture just at the time the piston is passing the inner dead center.

Fig. 3.

The energy produced by this combustion is transferred to the piston and through the connecting rod and crank-shaft to the machinery which the engine drives. On returning the piston expels the burned gases and then commences the cycle over again by sucking in a fresh charge of air while the pump injects a new supply of oil into the vaporizer.

In starting up the engine the vaporizer must be heated by means of a kerosene or gas burner, this operation requiring about 15 or 20 minutes. For the first two or three revolutions compressed air, kept stored for the purpose in a small receiver, is used. The smaller

engines can be started by hand, compressed air being required for the larger sizes only.

As will be seen from the sectional views of the engine (Figs. 1, 2 and 5) the cylinder, air and exhaust valve-box and that part of the vaporizer nearest the cylinder, are all water-cooled. In engines of 100 h.p. and over the piston is also water-cooled, the water being circulated under pressure.

All boiler plants are more or less dangerous and troublesome; for this reason, the internal combustion engine has come into public favor, and this factor taken in combination with their high economy and extreme simplicity is winning for them the first place among all classes of prime movers. We give herewith a record of tests of a

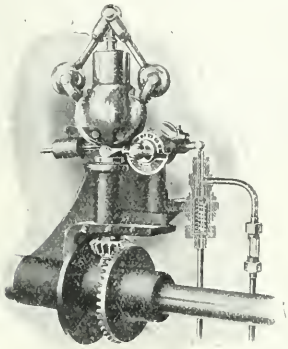


Fig. 4.

25-h.p. "Hornsby-Akroyd" oil engine taken from "Gas and Petroleum Engines" by Robinson:

| | Full | Two-thirds | One-third | No load | Max. load |
|---|---|---|---|---|---|
| Power or load factor | | | | | |
| Duration of trials, hours | 3 | 3 | 2 | 1 | ¼ |
| Revolutions per minute (mean) | 202.6 | 202.4 | 203 | 201.5 | 203 |
| Explosions per minute (mean) | 101.3 | 101.2 | 100 | 100.7 | 101.5 |
| Mean effective pressure (net) lb. per square inch | 45.4 | 31.2 | 18.3 | 6 | .. |
| | 43.4 | | | | |
| Indicated horse-power | 32.3 | 22.4 | 13.1 | 4 28 | .. |
| | 31 | | | | |
| Brake horse-power | 26.74 | 17.96 | 9 | 0 | 39 |
| Mechanical efficiency, per cent | 82.4 | 80 | 69 | .. | .. |
| | 86 | | | | |
| Oil used in engine— | | | | | |
| Per indicated horse-power hr., lb. | 0.61 | 0.74 | 0.91 | 1.34 | .. |
| | 0.63 | | | | |
| Per brake horse-power-hour, lb. | 0.74 | 0.91 | 1.3 | .. | .. |

The low price of suitable oils now on the market in all parts of this country has created a widespread interest and demand for engines capable of utilizing these oils. The "Hornsby-Akroyd" has demonstrated its ability to give with such oils as fuel the same service as a steam engine. Probably the most interesting installation of these or any

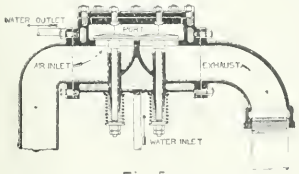



Fig 5.

other oil engines is that now being made for the Baldwin Locomotive Works, Philadelphia, Pa. This installation will develop 4,000 B.h.p., and is divided into 125 and 250 h.p. units. Some of these are direct connected to generators and some to air compressors, while others are used to drive general machinery by belt. In Fig. 6 is shown one of these single cylinder 125-h.p. engines. A twin-cylinder engine is shown in Fig. 7. The following figures on the total cost of operation of a 125-h.p. "Hornsby-Akroyd" oil engine give an idea of the economy to be effected by the use of these engines:

*Actual Cost of Power, Per Brake Horse-power Per Year, Based on 300 Working days of 10 Hours Each.*

| | |
|---|---|
| Fuel or crude oil at 3 cents per gallon | $9.27 |
| Lubricating oil, waste or supplies | 3.30 |
| Attendance | 5.00 |
| Interest on the investment, depreciation, etc., at 12 per cent | 7.80 |
| Total cost, per b.h.p.-year, of 3,000 b.h.p.-hours | $25.37 |

also a comparison of the cost of operation of a 50-h.p. oil engine plant and a 50-h.p. steam plant. These plants are installed at the works of the Luna Lead Co., Deming, N. Mex.

*Cost of Operation.*

Steam.

| | |
|---|---|
| Coal consumption on 1,200 h.p. hours per 24 hours (50 indicated h.p. to produce 40 brake h.p.) at 5 lb. per h.p.hour, 6,000 lb. at $5 per ton | $15.00 |
| Attendance— | |
| 2 engine tenders (12-hour shift) | 8.00 |
| 2 boiler men | 3.00 |
| Oil, waste and supplies other than fuel | .20 |
| Repairs | .20 |
| Interest on power plant at 5 per cent | .30 |
| Cost per 24 hours | $26.70 |

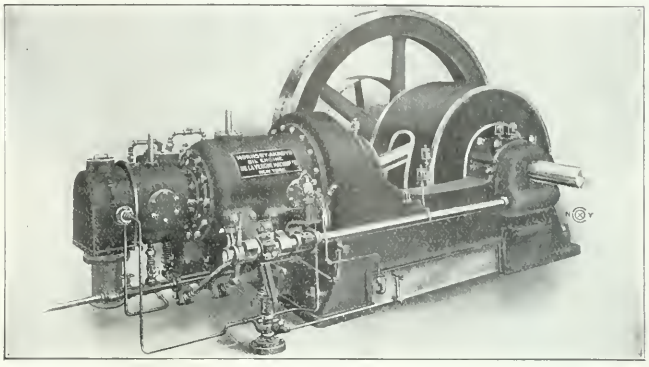


Fig. 6

Crude Oil.

| | |
|---|---|
| Crude oil consumption 106 gallons per 24 hours (actual results) at 2½ cents per gallon (in tank car lots) | $2.65 |
| Attendance— | |
| 2 engine tenders (12-hour shift) | 8.00 |
| 1 helper (1 shift only) | 1.50 |
| Oil, waste and supplies other than fuel | .20 |
| Repairs | .50 |
| Interest on power plant at 5 per cent | .71 |
| Cost per 24 hours | $13.66 |

The saving per day of crude oil over steam is $13.04, amounting in a working year of 350 days to $4,564, which is $1,400 more than the extra cost of the oil-engine plant.

| | |
|---|---|
| Cost of oil engine power per brake horse-power per year of 350 days (24 hours each) | $119.53 |
| Cost of steam power per brake horse power per year of 350 days (24 hours each) | 233.63 |

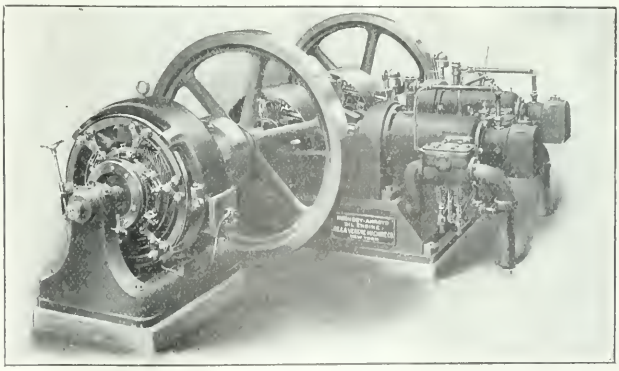


Fig. 7.

This comparison was made by Mr. Wm. Magenau, superintendent of the plant, and appeared in the Mining and Scientific Press of May 26, 1906. From the fact that over 14,000 oil engines of the "Hornsby-Akroyd" type alone are in operation it will be seen that the use of this class of engines is very wide. They are being installed in direct competition with steam engines, which in many cases are discarded in their favor, and are being used in all classes of work, in mines, manufactories, wireless telegraph stations, central stations, lighthouses, pumping plants and in many places where a few years ago only steam engines would have been considered.

The "Hornsby-Akroyd" engines are made and sold by the De Lavergne Refrigerating Company, 138th street, New York.

### Form 31 on the Northern Pacific.

The Northern Pacific method of handling the train order Form 31 differs from the usual practice and Mr. H. A. Dalby, an experienced despatcher, and formerly a despatcher on that road, thinks it far superior. The order is made "complete" immediately on its repetition. The operator prepares three copies of a clearance card (or more if there is more than one engineman on the train), one for the conductor, one for each engineman and one for himself. On it he writes the number of each order to be delivered. As the train approaches or, if stopped at his station, when it reports ready to leave, he calls the despatcher and says (for instance), "Clear 3d 53 on 31 Nos. 18 and 25 and 19 No. 27." The despatcher satisfies himself that these are the proper orders and repeats the same thing to the operator, adding "O. K." and signing the superintendent's initials. This he records in his order book. The operator is then responsible for obtaining the conductor's signature, but it is not sent to the despatcher.

The advantages of this method are that it is not necessary for the operator to hold the conductor in the office while he sends his signature to the despatcher, waiting for the latter to write the conductor's name and the time on each order, then writing "complete" and the time on each copy himself. All this the operator has done beforehand. The despatcher does, of course, look to see that each order is included in the clearance, but he does not make the notations usually required, and thus much time is saved.

A train must not leave a station where "stop" has been displayed without a clearance card showing the form (19 or 31) and numbers of the orders delivered; or, if no orders, showing that there are none. If there are no 31 orders the operator may deliver "19" orders without consulting the despatcher, but if there are any of Form 31 he must check the numbers of all, as indicated in the above example. If the wire is in trouble he may deliver all orders he may have for the train in the usual way, and if there are any on the 31 form, he makes a note of the wire failure, which the conductor will accept in lieu of the despatcher's "O.K." This avoids holding the train to get "complete," which is one of the requirements of the Standard Code, and sometimes a source of delay.

Practically, the conductor's signature is obtained just as surely, as the operator is held rigidly responsible for it, and the record in the despatcher's office is just as complete, his clearance showing the number of every order delivered. Much time is saved in the transaction between the operator and the conductor and also by the despatcher in being relieved of writing the signature and the time of each "complete."

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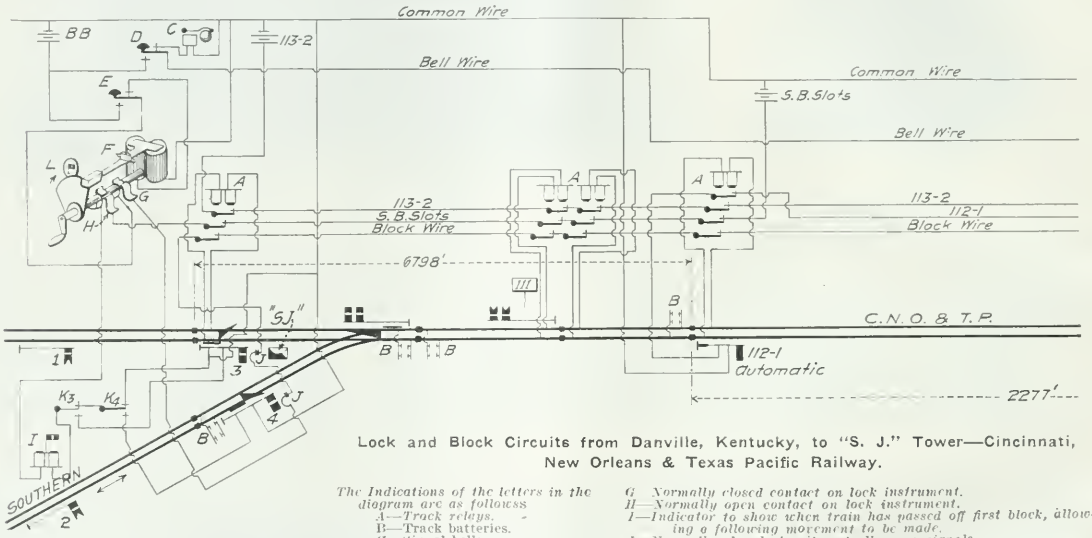
In answer to inquiries in the Swiss Parliament, the authorities said that so far there has been a satisfactory passenger traffic through the Simplon tunnel, due partly to the Milan exhibition. The arrangements for connections with railroads to Mediterranean ports for freight traffic are still incomplete, and of three freight trains daily, provided at first, two had been taken off and the remaining one consisted usually of only two or three cars. Rumors having been published that the parallel tunnel in which the second track is to be laid, had caved in and destroyed the channel which carries off the hot water, assurances are given that though there has been some crumbling of the work, nothing more serious has occurred than to cause an investigation to determine whether this tunnel should not have its masonry lining built at once, instead of waiting until the second track is laid, as was originally intended.

### Combined Manual and Automatic Block Signaling on the C., N. O. & T. P.

Between Danville, Ky., and the junction of the Southern Railway, about 3½ miles north of Danville, the road of the Cincinnati, New Orleans & Texas Pacific, single track, is now signaled by the controlled manual system for opposing trains and by track circuit signals for following trains—that is, for the protection from each other of trains moving in the same direction. For trains starting northward from Danville or southward from the north end of the section ("S J") the signals are semi-automatic, but there is an intermediate signal for northbound trains and another for southbound which are purely automatic. These intermediate signals do not protect a train from other trains moving in the opposite direction, and the practice with them is precisely the same as it would be with automatic signals on a double-track line; that is to say, a train finding a signal standing against it simply comes to a stop and then at once proceeds under control. It does not flag ahead, as is necessary on single track lines which have only automatic signals.




Lock and Block Circuits from Danville, Kentucky, to "S. J." Tower—Cincinnati, New Orleans & Texas Pacific Railway.

*The Indications of the letters in the diagram are as follows:*
*A—Track relays.*
*B—Track batteries.*
*C—Signal bells.*
*D—Bell push-buttons.*
*E—Lock push-buttons.*
*F—Lock instruments.*
*G—Normally closed contact on lock instrument.*
*H—Normally open contact on lock instrument.*
*I—Indicator to show when train has passed off first block, allowing a following movement to be made.*
*J—Normally closed circuit-controllers on signals.*
*K—Two-way, back and front circuit-controllers on signal levers.*
*L—Indicators to show when unlock is received.*
*B B—Lock and bell battery.*

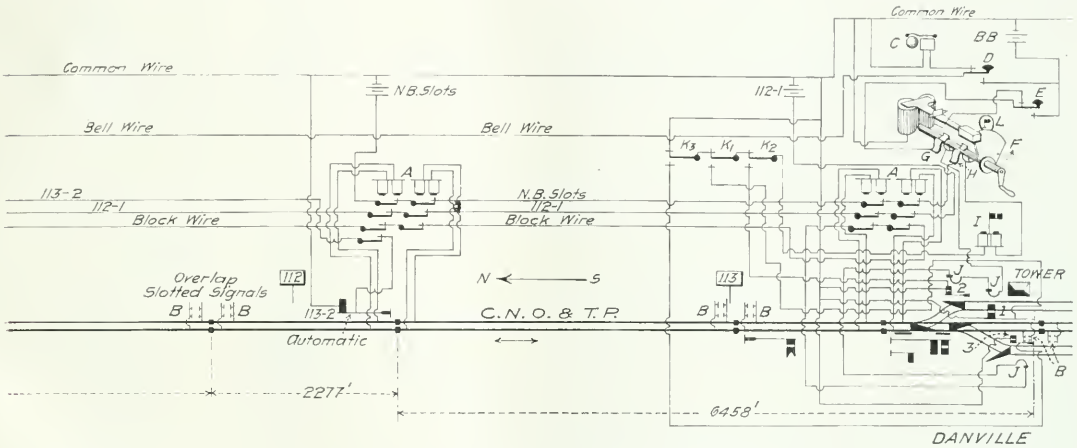
The arrangement of the signals and of the electrical connections is shown in the drawing. The block wire, connecting the two block stations, is controlled by the track relays of all the track sections between the two stations so that neither of the two signalmen can give a clear signal until the whole of the three-mile section is free of trains. All of the signal and lock instruments also control the block wire, so that it is never possible for one station to unlock the other until all apparatus is in normal position.

Either signalman, after having had his signal levers unlocked by the man at the far end of the section, may leave them unlocked as long as he may find it necessary or desirable, and thus may permit any number of trains to follow one another, without further mechanical action on the part of the other signalman. There are two entrances to the block from the north end and three entrances at the south end. After each movement into the block the operator, as soon as the train has passed the tower, signals by bell code to the other operator, telling the nature of the train and to which road it belongs. This signal is repeated. The operator at the exit end of the block then sets his switches properly.

In each tower there is an indicator, (I) which shows the towerman the instant the slotted signal is cleared by the train, so that

he can give a following train a clear signal without delay. The lock instrument (F) used for the "Lock and Block" is similar to that shown in Section No. 11 of the Union Switch & Signal Co.'s catalogue, page 28, No. 6. The unlock having been received, and handle turned, the indicator is held clear mechanically, and this shows the operator that he has possession of the block. All circuits except the track and intermediate for automatic signals are normally open.

To explain the operation of the apparatus more clearly we may follow the movement of a train from "S J" Tower to Danville, with which the procedure would be as follows: "S J" will signal Danville on bell C that he desires the block. If agreeable to Danville, he will answer O. K. on bell C and unlock the lock instrument F at "S J" by pressing lock push button E. On pressing this button the path of Danville's lock current is as follows: From battery through front contact of push button E to normal closed contact G on lock instrument F; thence through three normally closed circuit controllers J on signals Nos. 1, 2 and 3; through contact points on all track relays A between Danville and "S J"; through normally closed circuit controllers J on signals Nos. 3 and 4 at "S J"; through normally closed contact G on lock instrument F at "S J." and through normal closed back contact on push button E, thus




Lock and Block on the Cincinnati, New Orleans & Texas Pacific.—Continuation of drawing on preceding page.

charging the coils on lock instrument F, unlocking F; and thence back to the common return wire. When lock instrument F at "S J" is unlocked, indicator L will show clear and "S J" will turn the lever on the lock instrument. This opens the block wire at G and closes the southbound slots circuit through contact H. If the movement is of a Southern train, "S J" will pull lever No. 4. The lifting of the latch of this lever shunts the slot circuit (through K4) into the slots on signal No. 4. After signal No. 4 is cleared, distant signal No. 2 can be cleared. As soon as the train has passed into the block, "S J" signals Danville this fact on bell C and Danville answers that he understands.

If, now, a train appears at "S J" on the CNO&TP "S J" will reverse his levers Nos. 2 and 4, and set the switches for the CNO&TP train, leaving his lock instrument reversed and thus holding possession of the block. As soon as the Southern train has cleared the overlap of the slotted signal, which is in the center of the block, "S J's" indicator 1 on the slot battery will clear, so that when the latch of the lever for signal No. 3 is lifted it will shunt the battery into the slot on signal No. 3, through circuit closer K3; so that the signal can be cleared, allowing the CNO&TP train to proceed. When this train passes "S J" the towerman will signal this fact to Danville. This procedure can be kept up indefinitely, as long as the train movements continue in same direction. If, in the example above, the Southern train is not clear of the block at Danville when the CNO&TP train reaches signal No. 112-1, the engineman will stop the train, wait one minute and proceed under control to Danville.

The block signals at each end of the block are absolute signals and a following train is not allowed to pass them until the train ahead has passed the center of block, whereas the automatic signals are "permissive" signals, or, as they are styled, "one minute blocks." The intermediate signals are so located, taking into consideration the grade, that for a movement in either direction, if a second train enters the block immediately after the first train has passed the overlap, the first train will go far enough to restore the intermediate signal to clear before the second train has reached it. Distant signals are not provided for the intermediate signals, but each is so controlled that it has an overlap of 2,277 ft.

## Illinois Central Operating Officers' Meeting.

A meeting of the general and division operating officers of the Illinois Central was held in Chicago last week. This is the second such meeting that has been held, the first occurring two years ago. It is the intention to hold them annually in future. There were about 100 in attendance, representing the traffic, accounting and operating departments, the latter including the machinery and engineering departments. The meeting lasted throughout the week; that is, from Monday to Friday inclusive. It was presided over by General Manager Rawn, and addresses were made by the general officers of the different departments represented. Operating questions of interest to each of the departments were discussed.

The next important topic considered was the monthly allotment of expenditures and the daily check of expenses in the maintenance of way and machinery departments. This practice was inaugurated two years ago by General Manager Rawn, and has proved most satisfactory and successful. It is said that at the present time the expenses average within 2 per cent. of the allotment. By means of the daily check it is known each day what the previous day's expenses have been.

A number of other interesting topics were considered. For the machinery department, thorough discussion was given to the matter of more uniform inspection of locomotives at all division points, and also to the light weighing and re-stenciling of freight equipment. A method was outlined for periodical weighing and stenciling of these cars, each six months when possible, but not to exceed one year.

Loss and damage to freight was fully discussed and a method outlined for arriving more closely at the causes responsible for such claims and the remedies therefor. Another subject was the uniform system of settlement of switching accounts and for checking switching performances at the different points of the system.

## Canadian Railroad Notes.

OTTAWA, July 23.—Applications of the Erie & Ontario Power Company for the approval of the lines it purposes building in the Niagara district have been laid before the Minister of Railways for approval but were held over until the company states how much water it wishes to utilize.

As securities have been issued upon the Canadian Northern's terminal lands at Winnipeg, it is impossible for the National Transcontinental Railway Commission to acquire a satisfactory title to this property, which it is desired to utilize for the Grand Trunk Pacific. An agreement has been reached whereby the Winnipeg terminals will be owned jointly by the government and by the Canadian Northern, and will be used jointly by the latter and by the new transcontinental road.

Contracts were recently let for the new $300,000 Grand Trunk building at Montreal. It is to be ten stories high. The first two stories will be of gray sandstone and the others of semi-glazed terra cotta. The two first floors will be occupied by the company's express business.

There are numerous reports that the Canadian Northern

has bought the Qu'Appelle, Long Lake & Saskatchewan road, giving it access to Regina and shutting the Canadian Pacific out of Prince Albert.

Negotiations are proceeding between the Grand Trunk Pacific and Rhodes, Curry & Co., of Amherst, N. S., for 2,500 cars for the new transcontinental railroad.

The Railway Commissioners have issued an order in response to the representatives of Chatham, Windsor and Walkerton manufacturers that railroads operating from Ontario points to the seaboard shall within 90 days submit a new schedule of rates for export and to eastern points. The complainants allege that higher rates are charged them than those in force from Detroit and other Michigan cities. J. A. M.

## Lowering the New Haven's Tracks at Mount Vernon.

One of the many problems encountered by the New Haven road, in changing its motive power from steam to electricity, between Woodlawn and Stamford, was the question of minimum overhead clearance. With the exception of four bridges at Mt. Vernon, there was nothing between these points that had a less clearance than 17 ft., consequently 17 ft. was fixed as the minimum, and it was decided to get this at the Mt. Vernon bridges by either raising the bridges or lowering the track. The clearances here varied from 14.7 ft. to 15.2 ft., so that it was necessary to gain from 2.3 ft. to 1.8 ft. On account of grades and excessive damage to adjoining property, raising the bridges was out of the question and the plan of lowering tracks was adopted. The bridges were Third, Fourth and Sixth avenues and South street, three of these bridges being adjacent to the passenger station and the fourth (South street) one-half mile west.

There are four tracks under all the bridges, laid mostly through a rock cut with high-retaining walls on each side. Traffic was turned upon two tracks at a time, and the third track used as a working track, while the fourth was being lowered. All tracks were stone ballasted, so that this had to be removed before excavating could be started. As there was only a maximum depth of two feet of rock to come out drill holes were put on two-foot centers and a channeling machine run along the face of retaining walls. Where the grade was lowered the side retaining walls were underpinned with concrete to protect the bottom of the foundations from frost. Even where the walls rested on rock it was found necessary to remove more or less rotten rock under the walls and replace it with concrete, facing a little up the side to give a finished appearance.

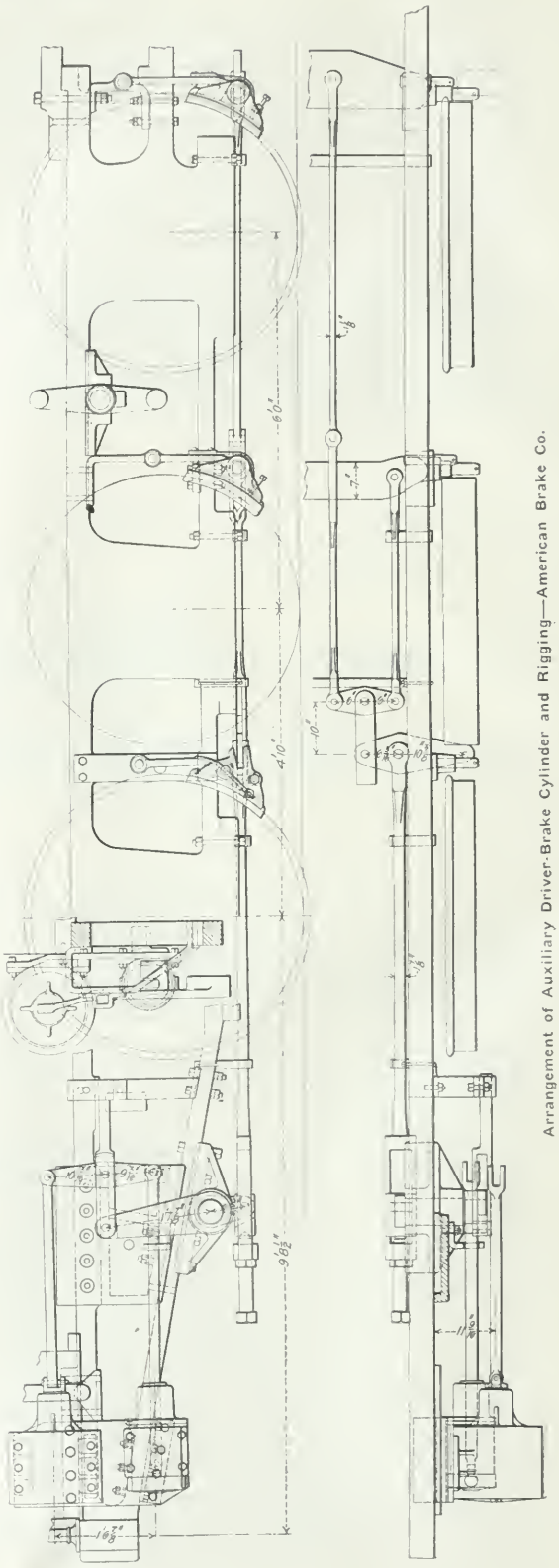
At the passenger station there were 2,500 sq. yds. of granolithic platform torn out and rebuilt to meet the new grade besides lowering 100 ft. of both the east and west bound platform cover sheds. A two-foot overflow sewer was built for 1,000 ft. to take care of water in freshet time. This water has in the past been more or less troublesome to the tracks, so with a depression of 2 ft. more some provision had to be made to take care of it.

Although the yardage was small, still considering all the difficulties met with, the work has been one of the most successfully carried out by the New Haven road in some time. The contract called for its completion in ninety days. The work was started in the middle of March and was finished in contract time by Lathrop & Shea, General Contractors, under the supervision of Mr. F. H. Ellsworth, Division Engineer.

## An Auxiliary Driver Brake Cylinder.

In our issue for Oct. 6, 1905, there was shown an auxiliary driver brake cylinder in use on the San Antonio & Aransas Pass Ry. It is intended to be operated by steam and to be used as an emergency device in case of an air pump failure or to hold the brake on while recharging. It consists simply of a cylinder placed tandem with the ordinary brake cylinder.

Another device to accomplish the same purpose has been brought out by the American Brake Co. In this the two cylinders, one for air and the other for steam, are placed one above the other and have their piston rods attached to the opposite ends of the same equalizing lever whose arms are proportioned to the cylinder diameters and pressures used in them respectively. The intermediate connection of this lever is coupled to the end of the brake lever. The result is that whether one or both of these cylinders are thrown into action at the same time, the pressure put upon the shoes is no greater than it would be if but one were in use. The main change involved is the change of leverage of the brake rigging, or a modification of the brake-cylinder diameters; for, with the equalizing lever, the pull upon the upper end of the brake-lever is twice what it would be if the connection were direct from the piston rod. With this exception the foundation rigging remains unchanged, and the leverage and connections to the wheels are of the standard type, as shown by the illustration.



Arrangement of Auxiliary Driver-Brake Cylinder and Rigging—American Brake Co.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 5. FRIDAY, AUGUST 3, 1906.


The Pennsylvania Railroad on Tuesday made the announcement that, beginning September 1st, 1,000-mile tickets, good over the lines east of Pittsburg and Erie and valid for the transportation of the bearer, will be put on sale. More than this, the maximum one-way fare on all the eastern lines will be reduced to 2½ cents, though on account of the large amount of preparation necessary, this change will have to be postponed until November 1st, or later. This is a notable move in the direction of lower passenger fares, in particular because the Pennsylvania has for some time been the only large system in the part of the country where passenger traffic is densest which has maintained fares at a level practically corresponding with the charges made by many roads in the West. Given the right, under its charter, to maintain a charge of 3 cents a mile for through passengers and 3½ cents for local passengers, the company has, in general, withstood any reduction below those levels. The only mileage book sold has been the interchangeable mileage book good over the Pennsylvania and six other railroads, with its annoying restrictions of a $10 extra payment at the time of purchase and the necessity of signing a mileage slip for each conductor in charge of the train on a journey, in order to safeguard its non-transferable character. These interchangeable mileage tickets, however, are to be continued on sale provided the other railroads interested have no objection. In this way the interchangeable mileage ticket will be left to fulfill what in reality was always its greatest usefulness, that is, making it possible for commercial travelers and others who constantly use a number of different railroads in the same general territory to buy a form of transportation which would at the same time secure a saving in the rate and be good on a number of different roads. For the large numbers of other people who have desired to travel over the Pennsylvania alone enough to use a mileage book, the restrictions thrown about the interchangeable book, which was the only one available, have always been inconvenient and annoying. The decisive character of the Pennsylvania's reduction is perhaps evidenced more by the transferable feature of the new ticket than by the reduction in one-way fares, for unless the railroad is more successful than most other roads in finding a way to prevent the dealing in portions of mileage books, the fact that it will be accepted on presentation by any one will probably result in having a very small proportion of the travel pay over 2 cents a mile. The reduction may seem surprising in view of the figures of the last annual report, which show that on one 800-mile division the passenger business appears to be carried on at an absolute loss. There is, however, scarcely anything more certain than that, except perhaps at the start, the road will not lose by the reduction. As the *Railroad Gazette* has often stated editorially, it is most desirable that fares should be as low and as simple as possible. Such action not only brings about an increase of travel which, in every important case which has been brought to our notice, soon makes up for the lowering of the rate received; but, what is of the largest value to a railroad company, even though not reducible to dollars and cents, is that low and simple fares engender a spirit of confidence and good feeling toward the railroad company on the part of the traveler—which means, pretty generally, on the part of the communities through which the road runs, on whose public opinion the railroad is in the last analysis so entirely dependent.

In connection with the reduction of fares on the Pennsylvania, and in particular as corroborating our opinion that passenger fares should be as low and as simple as possible, the comment of President Mellen, of the New York, New Haven & Hartford on the early results of the reduction of passenger rates made on that road, is of interest:

> "The results of our reduction of tariffs to the maximum basis of two cents a mile have, so far as returns are available, proved satisfactory, in that they have increased business sufficiently to make the reduction not a serious loss to us.
>
> "We are hoping by the reduction to largely eliminate the use of the mileage book, which we have always felt was a rank piece of discrimination. We have never understood how it was justifiable that a man with $20 in his pocket should travel cheaper than a man who could only raise $5, and one of our hopes in making the reduction was that we could bring our services more nearly within the reach of all the public and at a common rate, and we are watching this feature of the results with the greatest possible interest.
>
> "We believe our tariffs should be arranged so that every one can travel either five miles or fifty miles at the same rate of fare per mile, and it is our hope that in time the public will appreciate that all classes of transportation should be sold without discrimination in rate, and if such should be the case the general rate could undoubtedly be made even considerably less than two cents a mile to every one without serious loss to the railroad."

## THE ILLINOIS CENTRAL CONTROL.

It has been announced that at a meeting of the board of directors of the Illinois Central Railroad held last week, an agreement was reached whereby there will be no contest for control of the road at the annual election in October, between President Stuyvesant Fish on the one hand and Mr. E. H. Harriman, a director of the Illinois Central, and President of the Union Pacific, on the other. As it has never been directly admitted by either of the interested parties that any such contest between them was under way,

they naturally have neither of them verified the announcement of a truce or cessation of hostilities. There have, however, been differences between the two men, and there is little doubt that these have been, at least for the present, laid aside. Besides all other evidences that a settlement has been reached, the laying to rest by the newspapers of a subject which has been so rich in "headliners" is strong circumstantial evidence of the fact.

In 1900 a company organized in 1896 by interests identified with the Illinois Central Railroad began business as the Railroad Securities Company. This company now owns something over $10,000,000 Illinois Central stock. Mr. Harriman is its President and Mr. Fish its Vice-President. Its board of seven directors includes two Harrimans, the Director of Purchases of the Harriman System, and the successor to a Harriman banker who withdrew at the time the members of the firm of Kuhn, Loeb & Company resigned all their railroad directorships. In a word, the Illinois Central stock held by the Railroad Securities Company is controlled personally by the President of the Union Pacific. Practically, the object of the company has turned out to be to make it possible, by issuing low interest bearing bonds against the stock held, to enable its owners to carry their Illinois Central holdings at small expense. Moreover, this company, in which the two railroad presidents were originally associated on friendly terms, has turned out to be a chief weapon in the hands of Mr. Harriman for opposing Mr. Fish's administration. The developments of the life insurance disclosures of last year are supposed to have widened the breach between the two men, though it is probable that they both have kept their railroad and insurance interests pretty well distinct. There is no doubt, however, that matters were coming more and more to an open rupture between the two interests up to the announced settlement of the differences last week.

A glance at the railroad map of the United States west and south of Chicago shows very clearly one reason why the Illinois Central should be desired by the head of the Harriman lines. The Union Pacific controls the dominating route between the Missouri river at Omaha and the Pacific ports of San Francisco and Portland, its eastern terminus is Omaha. The Southern Pacific has a through route from New Orleans west through the southern tier of states, California and Oregon also to San Francisco and Portland, but has no connection at the east with the Union Pacific. The two roads thus form at present an irregular rectangle including two-thirds of the territory west and south of Chicago, but a rectangle entirely open at its eastern end and with a 500-mile gap on its northeastern corner. The Illinois Central owns a line from Omaha to Chicago and an unexcelled line from Chicago to New Orleans. Thus by its acquisition the Harriman rectangle would at a stroke be completed, the Union Pacific brought into Chicago, and the loose ends of the system brought together by a powerful connection. That in this case it would be the policy of the Union Pacific to abrogate its present existing traffic arrangements at Omaha with the various lines which now connect it with Chicago is not probable, for such action could hardly fail to result in immediately deciding the North-Western, the Burlington, and the Great Western to build or gain other through connections to the Pacific; but, at least, control of the Illinois Central would always make such action potentially possible and would be a great factor of strength by bringing the Harriman lines into Chicago over their own rails. The great value of the Illinois Central, however, would lie in the fact that it is the dominating line from Chicago to the Gulf and controls to a very marked degree the traffic between Chicago and New Orleans. It has the best natural situation. Its entire road between Lake Michigan and the Gulf is already either double tracked or, over alternate routes, has two or more tracks between those points. The Illinois Central's traffic strength and long record of conservatism and successful management have given it, too, a financial credit which would be of great value, particularly to Mr. Harriman, whose principle is to establish a high order of credit for his railroads before attempting to make large returns to his stockholders in dividends.

Another reason why he must desire to exercise control over its policy is because the Illinois Central has made arrangements with other railroads, competitors not of itself but of the Harriman lines, by which these roads secure entrance into New Orleans and a share in the traffic of that constantly growing Gulf port. The particular instance of this which affects the Harriman lines most keenly is the granting of trackage rights by the Illinois Central between Baton Rouge and New Orleans to a road called the Colorado Southern, New Orleans & Pacific, which is controlled by the Rock Island-Frisco interests, and is building a line from Baton Rouge westward through Louisiana and eastern Texas to Houston, parallel to the Southern Pacific's New Orleans-Houston through line. This is to be the eastern connection for another new line paralleling a long-established Harriman property—the Houston & Texas Central. This, the Rock Island-Frisco and Colorado & Southern interests jointly, through the Trinity & Brazos Valley, are building south from Fort Worth into Houston. It is a line which will bring the Chicago, Rock Island & Pacific, St. Louis & San Francisco, and Colorado & Southern roads into Houston and Galveston, thus at once paralleling the Houston & Texas Central and cutting it off from the interchange traffic received at or near the present southern termini of those roads. On completion of these two new lines the Rock Island Company will control roads into Houston, Galveston and New Orleans, whereas at present, with the exception of the Frisco over New Orleans & North-eastern trackage rights into New Orleans, no Rock Island line reaches the Gulf. Thus the Illinois Central, by granting trackage rights necessary to the success of the new projects, has indirectly had a large share in bringing about the paralleling of two important Harriman lines. As long as it remains independent, there is always a likelihood that by means of similar arrangements other new competition affecting Harriman lines will be made possible. This is by no means Mr. Harriman's idea of territorial control, which in his own peculiar territory has resulted so far in making himself practically supreme, both actually and potentially.

Mr. Harriman's attempts to gain control have been watched with great interest by the large number of Illinois Central stockholders. The Illinois Central is, corporately speaking, an old-fashioned property. The ownership of the company is widely distributed, much of it among holders of small amounts of stock, who hold it as an investment solely. In particular, one great indirect strength of the company has lain in the ownership of many blocks of its stock by residents of the places along its lines. Such ownership has been directly recognized by the company by retaining the now unusual privilege of giving all stockholders a pass over the lines during the week of the annual meeting of the company, a privilege of which advantage is always quite generally taken. As a result, the stockholders' meetings of the road are more largely attended and the managers and stockholders are brought more closely together than on any other large railroad. The management has been thoroughly conservative—too conservative, Mr. Harriman probably thinks. Satisfactory dividends have been paid to the stockholders, and the physical condition of the property has been steadily and largely improved. The characteristic feature is that the interests of all the stockholders have been the foremost consideration. The profit, combined with the safety of their investment, has been the one main object. What have come to be the immense resources of the company have not been used to make the road a holding company for an extended system of other lines, although there have been innumerable chances so to do. The result has been no tremendous expansion of mileage and control, but great increases in earnings, gross and net, and in the value of the company's shares which has made them among the most popular of railroad investments. To the holders of stock bought with these characteristics uppermost in mind, the possible advent of a strange control has not been received with enthusiasm. While Mr. Harriman's immense ability as a railroad manager, and his tremendous power throughout the West is clearly recognized, the average stockholder of the Illinois Central has been by no means sure that this ability and power would be devoted to the building up primarily of the Illinois Central; in fact, the probability has seemed to be that the present strength and resources of the most successful north and south line would be used for strengthening the power of the Union Pacific, Mr. Harriman's premier railroad, rather than to the benefit of its own stockholders. It seemed not unlikely that the Illinois Central stockholders would be offered a guarantee by the Union Pacific of six or seven per cent. on their stock, under which arrangement all additional profits from operation of the road would accrue to the Union Pacific itself. Even though such a guarantee would probably raise the market value of Illinois Central shares, the average stockholder would much prefer to have a share in the development of the Illinois Central itself under the quiet and conservative management of President Fish than be assured of the Union Pacific guarantee. The dividend record—or, rather, lack of it—of the Southern Pacific is another factor tending to a preference against Harriman control. This road, on which it is estimated over $150,000,000 has been spent in the past six years, has not as yet made any return whatever to its common stockholders. Although there is no doubt that this policy is resulting in the complete remaking of the road, and will be ultimately of immense advantage to its shareholders, it is hard for the

holder of Southern Pacific common stock to avoid the feeling that he has already contributed far more than his share to the process of reconstruction, and that the devoting of such large sums to the improvement of the road without any return to himself, savors of management for interests other than those of the stockholders at large. In a word, the typical Illinois Central stockholder would rather have the road remain under the present management and as an independent system, even with the possibility of immediate smaller returns to himself, than to have it fall into hands which would make it only a part of a much larger and much more spectacular group.

At any rate, it seems probable that for a year at least, and probably longer, the present executive of the Illinois Central will remain in power. That this means, however, the final abandonment of an effort on the part of the Harriman interests to gain control of the road is by no means certain. It can never fail to be a tempting acquisition as long as the Union Pacific terminates at Omaha and the Southern Pacific at New Orleans. It is probable that the further efforts made for its acquisition will depend on developments during the next few years in the territory between Chicago and Omaha on the north and New Orleans and Galveston on the south, particularly in regard to the success of the Rock Island's new lines paralleling Harriman properties. It is, however, reasonably certain that any attempt on Mr. Harriman's part to secure control will always be opposed by a large body of small stockholders whose proxies may perhaps not be sufficient in themselves to hold the balance of power, but whose moral support is of no small value to a management. This moral support will long be at the command of President Fish.

## THE HEPBURN LAW—A BRIEF REVIEW.

Whether the Hepburn railroad rate law will work for good or evil on the transportation and commercial interests of the United States is a question to which a complete and definite answer cannot be made with confidence at this time, but on the whole there does not seem to be serious ground for belief that its operation will be harmful if it is administered with intelligence and if it is construed by the courts in accordance with the general understanding as to the intentions of Congress.

One thing which is certainly not to be regretted is that the enactment of this law ought to keep the railroad question out of national politics for some years to come, permitting the roads to devote their energies to the development of their lines and the improvement of their service, with reasonable assurance that revolutionary and destructive national legislation is not to be feared. The very unanimity of its enactment ought to insure its permanency. The Republicans are committed to it because they were in complete control of Congress, and Democrats cannot attack it because it had practically unanimous Democratic support.

The law as passed is a complete compliance with the recommendations of President Roosevelt, going even farther than he advised on some points. On the other hand, it does not go as far as was advocated by the extremists, in that it does not permit the fixing of absolute or minimum rates by the Interstate Commerce Commission, and in that it keeps the doors of the courts open for the review of orders issued by the Commission, and does not make the commerce of the country the football of partisan politics by giving a political commission unrestricted and autocratic power over the rates at which it shall be carried.

When carefully analyzed, it will be found that the new law makes surprisingly few fundamental changes in the act of 1887, as supplemented by the Elkins act, and that, in the main, it is confined to legislation intended to facilitate the carrying out of the intention of Congress in framing the original act. It lays down no new rule for determining the legality of a rate, and any rate that was lawful under the old law is now a lawful rate under the new law. Congress has simply endeavored to make more speedy and certain the correction of a rate found to be unlawful, either considered by itself or with relation to other rates, within the limitations that the act of 1887 dealt with the relation of rates.

It has been popularly believed that the Interstate Commerce Commission was powerless to compel the reduction of a rate found to be unreasonably high, but this is not true. The old law gave to the Commission full authority to condemn an unreasonable rate and to order its reduction, but not to fix the amount of the reduction. It has been objected that this left the door open to the possibility of mere technical compliance with the law, and that it would require an indefinite number of successive orders to bring about a substantial reduction. In the entire history of the law, however, there has not been a single case of such trifling with the Commission, and the power has existed in the courts to compel a specific reduction. The only change now made is that of empowering the Commission to fix the exact reduction to be made by prescribing a maximum rate to replace that condemned. The Commission is also empowered to prescribe changes in regulations and practices affecting rates when such regulations or practices are found to be unjust or unreasonable or otherwise unlawful. This provision of the law goes as far as it is possible to go if the Commission is not to be given power to prescribe absolute or both maximum and minimum rates, and thus to determine the relative advantages to be enjoyed by competing communities.

A most important change in the law is the provision that orders of the Commission shall take effect at such time, not exceeding thirty days, and shall remain in effect for such period, not exceeding two years, as shall be prescribed by the Commission. This provision will have the effect of giving a lawful order of the Commission the force of a statute, and the burden of proof will rest on the carrier attacking its lawfulness. Heretofore the burden of proof has rested on the Commission to establish the lawfulness of any order not complied with by a carrier. This change and the provision of heavy penalties for disregarding an order—the penalties running from the date fixed for it to become effective—made it necessary for the protection of the carriers that the courts should be allowed to exercise their usual power of granting preliminary injunctions suspending the operation of an order pending its judicial review. The provision that such injunction may be granted only on hearing after not less than five days' notice is not a restriction on the ultimate right of the court to grant a preliminary injunction and is not unreasonable, as it is not to be supposed that the Commission will fix the date for the taking effect of the order so as not to allow time for the notice and hearing.

The Hepburn law makes no change in principle in the provision for the filing and posting of schedules of charges. It was the intention of the original law to require such filing and posting so as to place all shippers similarly situated on an absolutely equal footing.

The new law undertakes to insure this more certainly by requiring the roads to state separately all charges of every kind and everything in any way affecting the value of the service. This is expected to be of special value in checking any tendency to undue allowances to terminal roads, elevators, private cars, etc. Carriers participating in through rates, other than the carrier filing the schedule, are only required to file such evidence of their concurrence as the Commission may require, and the provision for the filing of "the separately established rates, fares and charges applied to through transportation" where no joint rate has been established authorizes the filing of "proportional tariffs" giving rates to be applied locally on traffic originating or destined beyond the points between which the tariff applies.

The new law attempts to confer on the Interstate Commerce Commission authority to establish through routes, to fix maximum joint rates and to prescribe the terms and conditions under which such through routes shall be operated, but this power can only be exercised when the carriers have failed to establish such routes and when no reasonable or satisfactory through rate exists. The language, "this provision shall apply when one of the connecting carriers is a water line," was evidently intended by Congress to mean that it should apply in such cases as well as when all were rail lines, but it has been suggested that a strict construction would make it apply only when one was a water line. This entire provision is one of very doubtful constitutionality, and whether it will be effective or not will depend upon the decision of the courts on the constitutional question.

The wisdom of the extension of the time required for notice of any intended increase or decrease in rates to thirty days, subject to the power of the Commission to suspend the requirement of notice altogether or to allow changes on shorter notice, will depend upon the wisdom with which the Commission exercises the discretion conferred upon it. The object of Congress was to prevent the issuance of "midnight tariffs," but a rigid adherence by the Commission to a requirement of thirty days' notice would be disastrous and would doubtless tend to petrify all rates to a greater or less extent and to prevent reductions that would otherwise be made. The course of wisdom on the part of the Commission will be to insist upon the thirty days when there is reason to suspect that a change on shorter notice would result in discrimination, and to allow the utmost liberty as to reductions and advances in other cases. There is little doubt that the Commission will exercise its authority to suspend the requirement for the publication of rates altogether on export traffic, where it can be shown that such publi-

tion would tend to give an advantage to foreign competitors or to subject American exporters to hardships.

A provision of the new law, the constitutionality of which will probably be tested, is that relating to through bills of lading, which seeks to make the initial carrier of goods shipped over a through route the absolute insurer of the goods from loss or damage resulting from any cause whatsoever except an act of God or the public enemy. No contract or agreement waiving this liability is to be valid, and the initial carrier is given the right to recover from the carrier on whose line the loss or damage occurred. This provision was inserted in the law at the instance of bankers who seek to have bills of lading made negotiable papers, as good for collateral as a government bond when issued by a solvent road. Practically it presents several difficulties. One that will occur at once to any traffic man is the impossibility of determining in many instances on which one of several lines the loss or damage complained of occurred, and in such cases it would seem that the initial carrier alone could be held responsible. Another difficulty is that it must have a decided tendency to keep up and even to advance freight charges on articles liable to damage in transit. If the initial carrier is to act as an underwriter it must regard part of its charge as an insurance premium, and the shipper must insure his goods and pay the premium whether he wishes to do so or not. It will also compel the roads to take steps to assure themselves that the goods shipped are of the character and value stated by the shipper, and, in many cases, the roads will be compelled, in self-protection, to require the adoption of certain prescribed methods of packing, and this will be another item of additional expense to shippers. On the whole, this provision of the law does not promise to give much satisfaction either to the carrier or to the shipper.

A provision of great importance to many roads, if it is found to be constitutional, is that which forbids a railroad company on and after May 1, 1908, to transport, except for its own use in its business as a common carrier, any commodity, except timber and its manufactured products, that has been produced by the railroad company or under its authority, or that is owned wholly or in part by it. The intent of this provision is to prevent discrimination by a road in favor of its own shipments. Had it become effective at once it would doubtless have demoralized some lines of business—notably that of producing and marketing anthracite—but the time allowed will probably enable adjustments to be made that will obviate serious confusion in business. It seems probable that this provision, if it is sustained by the courts, will tend to retard development in some sections where it will be difficult to secure the simultaneous construction of railroads and launching of industries unless both can be under a common management.

The new law gives to the Commission very broad discretionary powers to control the character of statistical reports made by carriers, and to prescribe the forms of any and all accounts, records and memoranda to be kept by them, and requires all such accounts, records and memoranda to be kept open to inspection at all times. The purpose of Congress in this was to facilitate securing evidence of rebates and discriminations. There can be no reasonable objection to this if the discretion given the Commission shall be wisely exercised, but if it is exercised unwisely it may impose on the roads great embarrassment and much unnecessary expense.

Not least important are the amendments to the Elkins act made by the new law. Preserving the provision making the published rate the lawful rate, and subjecting the road departing from it, and the shipper soliciting or accepting a rebate, concession or discrimination to a fine of not less than $1,000 nor more than $20,000, the Hepburn law restores the penalty of imprisonment and extends it so as to cover the person or the representative of a corporation soliciting or receiving a rebate or discrimination, as well as the officer or agent of the carrier granting it. Another provision that ought to be very effective in putting a stop to attempts to extort rebates and discriminatory favors from carriers is that making the receivers liable to a fine of three times the value of the favor received. As the railroads have declared that they would favor any legislation that would tend to lessen the evil of rebating in its various forms, this feature of the law ought to be satisfactory to carriers and public alike.

Against the anti-pass provision of the new law no reasonable objection can be urged. It will cut off passes from most of those not fairly entitled to free transportation, while they will still be available for officers and employees and others properly entitled to them.

The new law brings within its scope pipe lines used for the interstate transportation of oil, express companies and sleeping car companies, and extends the provisions of the original interstate commerce law and of the Elkins law over them, the only exception being the limitation to railroads of the provision prohibiting a road from transporting any commodity produced or owned by it or in which it may have a direct or indirect interest when not intended for its own use.

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Municipal ownership of street railroads has within the last year made great progress in New York City, if one were to judge by the speeches of certain politicians and the utterances of Mr. Hearst's newspaper; but on July 25 the agitators of this question in Brooklyn Borough were suddenly awakened by a call to consider facts instead of words—that is to say, the act of the directors of the Brooklyn Rapid Transit Company, who on the day before had decided to abandon all plans for the extension of their lines into the undeveloped parts of the borough. This decision was due to the policy of obstruction persistently followed by city officials, mainly Mr. Coler, president of the borough. Mr. E. W. Winter, president of the company, speaking regarding the radical position taken by the directors, which will greatly affect the real estate market in many districts, said:

"While at the same time endeavoring to get rights for considerable new construction, the energies of the company, during the three years last past have been chiefly devoted to the work of putting the existing property into first-class condition by reconstruction and procurement of certain essentials to efficient operation, such as cars, power houses, sub-stations, shops, etc., which it was seriously lacking.

"The next general move of importance would naturally be the development of new territory. It has been the expectation and desire of the company to take this up with the present season and push the construction of lines with as much energy as has been given to the other work referred to. How this movement has been defeated and the supplying of transportation facilities to outlying districts made still more remote by the interposition of one obstruction after another, is a matter of public knowledge.

"The Brooklyn Rapid Transit Company is beyond danger of financial reverses arising out of a killing policy manifested through the refusal to grant privileges or the imposition of such terms and conditions as necessarily preclude their acceptance. It already has enough lines through sections rapidly developing, but as yet enjoying relatively light traffic, to add largely as time passes to its gross and net earnings, and it will devote itself to building up and caring for the business of the system as it now stands. The policy of the company in pushing work of internal improvements will continue."

Mr. Coler was elected last autumn by voters who wished to "get even" with the Brooklyn Rapid Transit Company. These voters now reap the result of electing a man whose plan of procedure is so indefinite, or impracticable, or devoid of respectable and intelligent support that his only resource is obstruction. Mr. Winter has concluded, evidently, to meet the "M. O." party with its own weapon—obstruction.

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The Interstate Commerce Commission evidently intends to take the occasion of the passage of the amendments to the law concerning the filing and posting of tariffs, not only to properly enforce the new provisions but to reform those features of the practice in this matter which are not affected by the change—and which have long needed improvement. To this end the commission on July 25 issued what amounted to an invitation to the railroads to join in a conference concerning what ought to be done. The invitation, after quoting those amendments to Section 6 which have been adopted this year and which take effect August 28, goes on as follows:

It is manifest that existing schedules must be changed or amended to bring them into full compliance with the provisions of law above set forth. These changes or amendments can be made most satisfactorily, and at the same time with greater uniformity, through the prompt action and co-operation of all carriers subject to the law, and to that end such carriers, through special committees or their representatives in traffic associations, are requested to immediately confer and thereupon propose to the Commission such methods of procedure respecting the changes necessary to be made in tariff construction, including the simplification of present rules and regulations and of exceptions to the application of specified rates, the definite statement of joint routes upon which through rates are to apply, and appropriate means of certainly indicating evidence of concurrence in joint through rates both to the Commission and to the public, while at the same time providing for plainly showing upon suitable schedules the services and the various charges required by the law to be published and filed.

The Commission is of the opinion that this duty should rest primarily with the carriers themselves, in view of their liability to forfeiture and penalties in cases of failure to comply with the mandatory requirements of the sixth section. The Commission will, however, cordially co-operate with representatives of the carriers, and will freely discuss with them all pertinent questions which in this connection may arise, reserving always its right to make at such times as may appear necessary any general or special order or orders within the scope of its authority. Methods so proposed by carriers should embrace those designed to effectuate immediate substantial compliance with the amended law as well as those intended to be permanently applicable.

Several conferences have been held at Washington this week, representatives being present from both western and southern railroads. One of the railroad men present gave the following outline of the requests which they will present to the commission:

First. That a reasonable extension of time be given them to prepare and publish and file with the Commission their new tariff schedule under the law, and that the book containing the rates might be left with each station agent, instead of being posted at the station.

Second. That the requirement of a notice of thirty days in a change of a

rate or rates be eliminated, particularly as to import and export traffic.

Third. That the railroads be relieved from the publication of terminal rates at points of destination and allowed to publish them only at the point where the charges originate. This would make no difference in the rates themselves, and it would be a matter of convenience to the roads.

With tariffs in use everywhere which fill a book of three or four hundred pages, it is plain that the last part of the first request ought to be granted, in some way or other. The "posted" books in the waiting rooms of country stations have been one of the unpleasant disfigurements of such rooms for the last 19 years. The difficulty about announcing export freight rates, which have always been changed with nearly every change in the tides, remains as troublesome as ever. It is to be hoped that the commission will devise some way to put the railroads on their good behavior. With fair and open treatment of all shippers the question of publication becomes of minor importance. Without fair treatment of shippers by the railroads at all times the commission may well assume that the public will approve the most drastic enforcement of the letter of the law. The third request refers, we suppose, to switching charges, demurrage, elevator charges, etc. Concerning these there is ample room for modifying the letter of the statute, to the relief of the railroads and the convenience of the shippers. There will be comparatively little trouble in publishing these items when everybody becomes willing to publish them.

The chief of the Japanese Railroad Commission, Ichyj Yamanougi, reports to Kanetake Onra, the Minister of Transportation, that at the end of the fiscal year 1904-05 there were 5,599½ miles of railroad in Japan, of which 2,080 miles were state railroads, while the other 3,519 miles belonged to 39 different companies. Of this mileage, however, 996 miles were not yet in operation. The average cost per mile had been $41,912. The rolling stock consisted of 1,644 locomotives, 5,242 passenger cars and 24,408 freight cars. The statistics of operation show that the train service was equivalent on the average to just 10 trains each way daily over the whole mileage, with an average of 15 cars per train. The traffic amounted to 631 passengers and 349 tons of freight each way daily. (In the United States the corresponding average density of traffic was 143 passengers and 1,136 tons of freight each way daily.) The average trainload in Japan was 63 passengers and 34½ tons of freight. Passenger and freight train mileage are not given separately in the abstract before us; and a very large part of the trains carry both passengers and freight. The figures, however, show that the passenger trains are much better filled than here, where the average passenger train load was (1903-04) 46 persons; but the average freight train load 308 tons. The average length of journey in Japan was 205⅝ miles; the average haul of freight, 61½ miles. More than 95 per cent. of the passengers traveled third class, 4½ per cent. second class, and only five-sixteenths of 1 per cent. first class.

The earnings from passengers averaged 0.69 cent per mile; the earnings per ton of freight, 1.03 cents per mile. At these rates the gross earnings of the Japanese railroads averaged $6,279 per mile; 45 per cent. of this was absorbed by the working expenses, leaving $3,440 per mile of net earnings, which compares very favorably with the $2,998 of net earnings per mile in this country in the previous year.

A recent newspaper statement, to the effect that the Pennsylvania Railroad has abandoned the plan of paying freight house men for their work by the tons handled, appears to have been the product solely of someone's imagination. At any rate, the agent at a prominent station not far from Pittsburg informs us not only that the plan is still in full force at his station but that the men are eminently satisfied with it. The agent believes that they could not be induced by any reasonable hour-rate to give up the piece work plan. Moreover, the plan is highly satisfactory from the standpoint of the employer, as the same work can be done more promptly than when done by the old plan, and with a reduction of 25 per cent. or more in the number of men.

## NEW PUBLICATIONS.

*Record of Recent Construction. No. 56.* Baldwin Locomotive Works, Philadelphia, Pa.; 30 pages; 6x9 in.; 18 engravings.

This last issue of the series of Recent Construction gives a brief and exceedingly interesting sketch of the development and growth of the motive power upon the Atchison, Topeka & Santa Fe, and although the story relates to this one road the general outline of the progress made in design and the increase of weights, holds for every road in the country. Starting in 1875, the first engines were eight-wheelers (4-4-0), with 16-in. by 24-in. cylinders, and a total weight of 67,000 lbs. Three years later engines of the same type were given 17 in. by 24 in. cylinders and a weight of 73,000 lbs. At the same time an exceedingly large consolidation locomotive, for the time, was built for a branch line, with cylinders 20 in. by 26 in., carrying a steam pressure of 130 lbs. and weighing 115,000 lbs. In this way the capacity and weight of the engines were increased until in 1902 a tandem decapod (2-10-0) was brought out, having 19 in. and 32 in. by 32 in. cylinders and a weight of 267,800 lbs., with a steam pressure of 225 lbs. These are figures of growth with which all railroad men are familiar, and like most familiar things it is interesting to have them presented in such convenient and readable form.

# CONTRIBUTIONS

### Hollow Staybolts.

Cuyahoga Falls, Ohio, July 26, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the report on flexible staybolts, read at the Master Mechanics' Convention at Atlantic City, there were a few references to hollow staybolts which merit attention. This report covered a single type of bolt: evidence had been sought on that type alone, and any reference to other types on which evidence had not been obtained was certainly irrelevant, unfair and uncalled for.

This report was not written, and I think not read, by the good men whose names are joined to it, and as any erroneous or malicious statement is against the public interest, permit me in justice to the makers of hollow staybolts and to the railroads of this country, to call attention to some of the statements of the writer of the report, a recent graduate of Cornell, and compare them with the cold facts of actual experience and the record of actual service.

He says: "As the use of the telltale hole is a disputed practice, its action not being accepted as positive, and as it adds to the expense of application and maintenance, it is not to be recommended." I agree with the writer in that statement only, and let me say that while waiting for a train at Sunbury, Pa., I went into the shops there and was shown about a dozen bolts which had been taken out of an engine a few days before; they were broken, and steam had failed to indicate failure, because the telltale holes were filled, in part, with dirt so hard that it felt like metal when I tried the holes. I have seen many other cases like this in different parts of the country, but I have never seen a hollow staybolt which was closed by dirt or sediment.

He speaks of the claims made for hollow staybolts, viz.: better combustion and absolute indication of failure of the stay, and casts them aside with the remark that these claims are "not proven." Our young friend certainly shows hardihood, and thrusts his "not proven" against *prima facie* facts in science and the cold stern facts of actual service, not service of a few years, but the service of from 10 to 25 years.

Quite recently the firebox of a switching engine on the Lake Shore & Michigan Southern was removed. It was built in Schenectady in 1892. Mr. Fred Lippert, a fellow student of Cornell, with the writer of the report, examined the hollow bolts with which it was stayed, and "found the holes in all the bolts free from sediment, scale or dirt"—14 years' proof that the hollow bolts were absolutely reliable detectors. This engine carried 150 lbs. pressure.

Every student of combustion knows that it is desirable to admit air in well distributed quantities among the gases. When we do this the gas is burned, when we do not do so the gas becomes black smoke and the heat is lost.

Before the hollow staybolts were perfected for use, about 18 years ago, there had been installations of hollow material for the purpose of bettering combustion. I have seen within a year some of the old engines that received those installations to better combustion. Their service is indicated in the following table:

*Southern Railway.* Engine 1884, built in 1881 with hollow staybolts on each side of the firebox.

*Boston & Maine.* Two engines in 1883, one in 1888 with hollow staybolts on each side of the firebox.

*Pittsburg, Shawmut & Northern.* Four engines built in 1890, stayed with Falls hollow staybolt iron and in service ever since.

*Long Island Railroad.* Ten engines stayed, over ten years ago with hollow staybolt iron, in service since, without change until 1905, when a new firebox was installed.

*Texas & Pacific.* Has been saving money in bettered combustion by air through hollow staybolts for over ten years.

*International & Great Northern.* Has been saving money in bettered combustion by air through hollow staybolts since 1892.

The Canadian Pacific, and other railroads, east, west, north and south, and in foreign countries, have had experiences which refute the "not proven" of the writer of the report.

And now, as all other bolts are solid and he does not approve of the telltale hole (or do it—where, except in the hollow staybolt, can he get a bolt of any description that will "absolutely indicate failure," and what bolt save the hollow staybolt, can be utilized to better combustion?

The man who tears down a useful article should have something better to take its place; if not, he is an enemy to progress. But the writer of that report has found nothing better to take the place of the hollow staybolt. A careful reading of his own report

will show that as an alternative deductions and his own evidence proves his conclusions inconsistent and erroneous.

I saw in the testing room of one of the large railroads in the South, samples of broken solid staybolts, which had been coated with impurities from the water, preventing the conduction of the heat from the bolt to the water. The ends of the bolts when coated had commenced to burn, and the burning had continued along the line of the fibers until the steam pressure between the inner and outer sheets pressed the inner sheet out over the bolt heads. The bolts for about half their length were reduced in diameter, the threads were gone, and the diameter was smallest just inside the inner sheet; a part of the coating had dropped off the other half of the bolt, allowing the water to get to it, and that half of the bolt with its threads was uninjured. Those were dangerous conditions, which could not have occurred if the hollow staybolt had been in use, owing to the passage of air through them.

The outlay by railroads for weekly or monthly tests with a hammer to discover by sound the broken staybolts is large and an uncertain, costly way to discover breakages. Telltale holes add more to the cost of examination. The drilling of telltale holes in the ends is a disputed good, and, in my opinion, it is a substantial evil, whereas there is a warning at either end of every hollow staybolt in the firebox to report breakages when breakages occur, without the touch of a hammer or the cost of a cent, and without risk of a lawsuit, such as related as follows:

"We had an explosion."

"What," I said, "was the cause?"

"Oh, the witnesses swore the examination was imperfect."

"What examination?"

"An examination of the staybolts."

"Was the explosion caused by a broken staybolt?"

"Yes."

"And what was the result of the suit?"

"Oh, there was a verdict against us for $10,000."

"And what was the brand of the iron in the staybolts?"

"It was the —— iron."

"What an awful price," I said, "to pay for —— iron."

In contrast to that experience, I was in conversation at the convention with a Superintendent of Motive Power, having 350 to 400 locomotives, a constant user of hollow staybolts for over 10 years. He said he had no anxieties about breaking staybolts, for when they broke they made the breakage known. No examinations were necessary, for the holes are always open, and he said he was able to keep 97 per cent. of his engines in service. His savings in respect to examinations alone amounted to $25 to $35 a day.

That man had no fear of having to pay $10,000 for damages by reason of explosions. He had no grief to trouble his thoughts about a widow and fatherless children with their breadwinner sacrificed to "imperfect examinations." He did not depend on fallible man, he depended on the hole through the center of the bolt.

JOHN LIVINGSTONE.

## Brown's Discipline on the Rock Island.

The Chicago, Rock Island & Pacific Railroad has adopted discipline by record, taking the place of discipline by suspension, effective July 15. The new rule applies to all transportation service employees, and all will be considered as starting with a clear record as far as the new form of discipline is concerned. As heretofore, employees will be subject to immediate dismissal for disloyalty, dishonesty, desertion, intemperance, insubordination, wilful neglect, immorality, violation of rules whereby property belonging to the company is endangered or destroyed, making false reports, or concealing facts under investigation. Credits will be entered on employees' records for notably excellent conduct, deeds of heroism, conspicuous loyalty and marked ability, or good judgment in handling emergencies.

The following rules will govern debits and credits:

Each person receiving 65 demerits will be dismissed from the service of the company [but not until after the case is reviewed by the General Superintendent].

No suspension will be made for less than five days nor for more than 30.

Reprimands and suspensions on the records of employees may be canceled as follows:

Reprimands will be canceled by three months' perfect record.

A suspension of 10 days will be canceled by four months' perfect record.

Eight months' perfect record will cancel a 20 days' suspension, and one year's perfect record will cancel a 30 days' suspension.

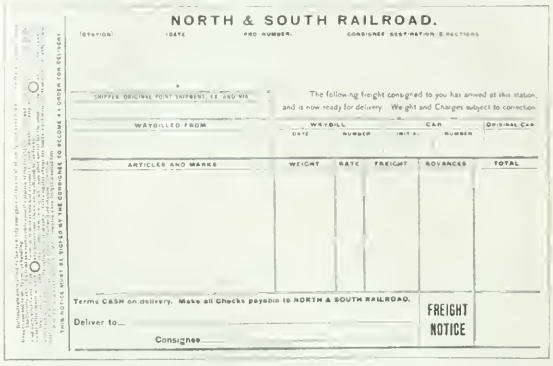
Credits for perfect records will not be entered unless debit marks exist on the record of the employee.

Credits for extraordinary records will be given at all times, regardless of the record of the employee, and such credits accumulated in advance will lessen the punishment in case an offense is committed.

## Hutchins' Freight Arrival Record Forms.

Mr. F. Lincoln Hutchins, of the Boston & Maine, after careful experiments with different forms, has devised a set of five blanks for dealing with "freight received," all to be filled at one writing (with carbon sheets), which has proved more economical and satisfactory than anything of the kind that we recall, and the blanks, which have been in use at Warren Bridge Station, Boston, since November last, are to be used throughout the Boston & Maine system. Mr. Hutchins describes the scheme as follows:

All papers necessary for the handling of freight and collecting the revenue thereon should be made at the originating point at the




same time and with the way-bill, but until the railroads are ready to adopt this most logical and economical method, improvements are in order on the existing methods.

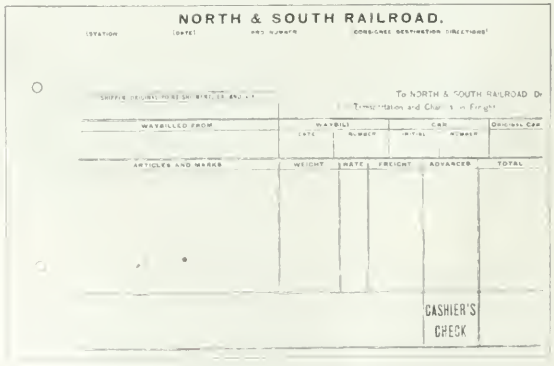
The forms shown herewith embody an attempt to improve on the usual methods at the destination station. They comprise the following:

1. The freight arrival notice.
2. The cashier's memorandum check.
3. The freight bill.
4. The delivery receipt.
5. The check out slip.

They are to be of different colors, so as to be readily distinguished, and may be blocked in the usual manner with fifty sets in a block, or each set separately held together by glue; or they may be wire stitched. The forms are to be 8½ in. long by 5½ in. wide,* printed to register accurately and punched at the left margin for filing. Those parts of the wording which it is most necessary to have conveniently located, the name of the consignee, for example, are put far enough to the right to avoid being interfered with by the binding at the left. The number, important in sorting and filing, is kept far from the corner, so as not to be in danger of being torn off.

All the forms being filled in with one operation upon a typewriter there is absolute identity and perfect legibility with all five.

The arrival notice is ready for immediate distribution without duplication of work. It will be found to be more economical than the postal card form.




The cashier is provided with papers most favorable to quick handling. He is safeguarded against illegibility or change of figures.

A plain and easily handled sheet is provided by which to tally consignments out of the car.

The cost of making and handling the several papers is reduced materially.

*Copyright, 1906, by F. Lincoln Hutchins.

*The facsimiles shown here are reduced a little more than one half.

The arrangement of the spaces to be filled is such that the movements of the machine are minimized. It will be noticed that the name of the station (which in the case of large stations may be printed in), the date, the progressive number, and the name of the consignee, occupy but one line. The billing reference and car numbers occupy another line, only one inch below, so that but two movements of the feed roll are required from the insertion down to the space for articles and charges. For instance, take a shipment from New York City to Albany, N. Y., for Knickerbocker & Co. On the first line we have:

| | | |
|---|---|---|
| Albany, April 10, 1906. | 12,765 | Knickerbocker & Co. |

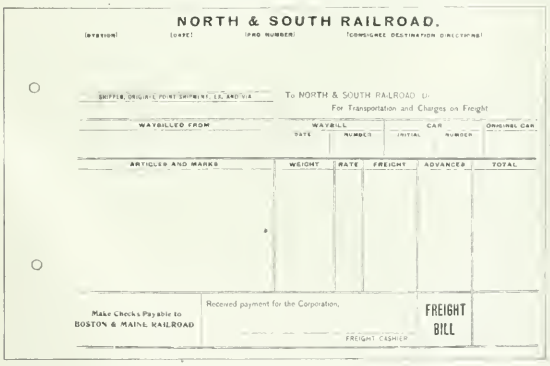
and upon the line below:

| | | |
|---|---|---|
| New York City, April 9. | 86 | N. Y. C., 12,767. |

It is only the exceptional voucher that requires the shipper's name, original point of shipment, Ex., or via; and only in cases of freight "to order," or to points beyond, that destination and directions are necessary. In such cases there is ample room on the blank for the desired information.

The five forms, having been filled in simultaneously by using interleaved carbon sheets, are easily handled. The arrival notice and check-out slips having been detached, the rest of the papers go to the cashier without delay. The check-out slips, alphabetically arranged and placed in holders, go immediately to the checkman, while the arrival notices, checked with the train or location lists, to assure arrival and placing, are distributed by mail or messenger.

The check-out slip serves several useful ends. Being made at the same time as the freight bill it should be ready to use before the outturn of the car could be in demand; it saves the time and work of copying the waybills on tally sheets with the chance of errors, and it is a more legible record in more convenient form for the checkman's use, and as it is identical with the delivery receipt, it promotes correct delivery. After serving all purposes of checking out of the freight and making exception papers, it may be




bound up in progressive number order and become the freight received record book, without further duplicating of the work. It has the advantage of identity with the freight bill, the notice and the receipt, and bears the full checking record.

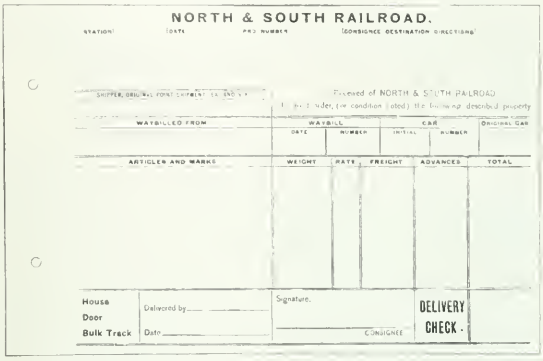
This method makes it possible to do away with the expensive and unsatisfactory "blind check." Theoretically, the blind check is the only method of securing a correct record of goods received, but its unreliability is such as to make it unsafe to issue exception reports upon it, and it is the universal custom, when the billing and the checking do not agree, to recheck the freight, a troublesome and expensive process, which generally results in proving the billing right and the checking wrong. It often happens that the freight cannot be rechecked. Then, for safety, the report is issued, but only to have it proved to be in error. The work is worse than useless, as it impairs confidence in future reports. The blind check is troublesome at transfer points, because it is absolutely necessary to know the routing and other particulars carried by the billing in order to handle the freight with despatch.

It is not always possible to allow the checker the use of the original waybill, and even where this can be done the bills are not so easily handled, nor is the checking record so easily made and kept, as with the uniform sized check-out slip, for the checkman, taking the convenient holder, with its alphabetically arranged slips, has a compact, handy and serviceable means for the correct and expeditious checking of his freight. He will check each item, note all discrepancies and any unusual condition upon the face of the slip and send it to the office, where the required exception reports will be made. The slips will be accumulated on temporary files until ready to be arranged in order and bound as the freight received record. This not only saves the waste of rewriting all the received business, but makes that record include the checking facts.

At points handling both local and transfer business it may be best to make single check-out slips for the through billing in order to have uniform papers for the checker's use and to secure a permanent record of the checking of the passing business.

While the forms are preferably filled in by typewriter, they are adaptable to the pencil. Pencils can be used whenever the business does not warrant the use of a typewriter, or where the rush of business exhausts the capacity of the machines in use.

The typewriter used should be of the kind known as visible writers so that no time be lost in moving to the exact spaces to be filled. It should have the improved form of figures so that even a light impression would produce figures that could not be mistaken for others, as may happen in the use of the ordinary characters, and it should be mechanically constructed to stand the hard

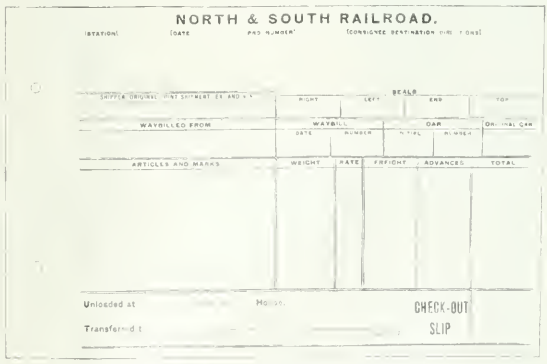



usage that such work will entail. The "Oliver" has given satisfaction.

At stations with a large volume of business the progressive numbering should be subdivided so as to separate the business into its natural divisions. This can be quickly and effectively done, either by prefixing a letter or devoting a separate series of numbers to each class. For example, "A" may designate a certain division of the local business, or all the business from that section could be numbered in series from 1 to 5,000; B, C, D, etc., or separate series of numbers might be the other divisions. "M" might designate certain line business by a certain junction, or this business could be numbered between 40,000 and 50,000, and so on to the end of the needs.

Such separation automatically brings together the records of each class of business and thus facilitates reference and comparisons. The accumulation of the check-out slips and binding them in strict progressive order secures separate received books for each class of business. By entering the numbers on schedules the cashier is charged with each class of business, while his entering the payment in similar order makes checking easy, and comparison by totals possible. Separating the accounts allows more freedom in working without interference with one another by the clerks who are constantly consulting them.

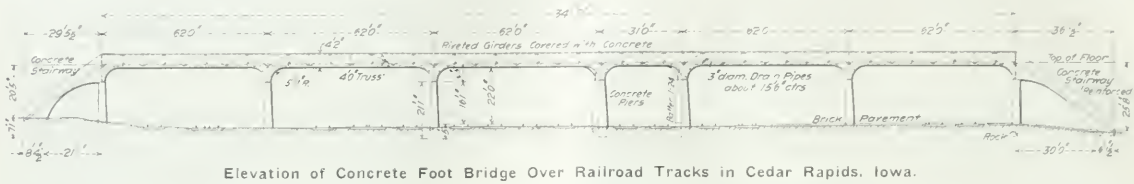
The use of this method at Warren bridge not only has demonstrated its economy and advantage, but has reduced the cost of the clerical work fully fifty per cent. With purely local bills a type-




writer operator has made 72 vouchers in an hour, and 50 an hour for seven and a half hours. With all kinds, taking everything as it comes, the average speed is about 40 vouchers an hour. With a pencil the best speed is about 25 an hour. With two machines about 800 vouchers are now made daily.

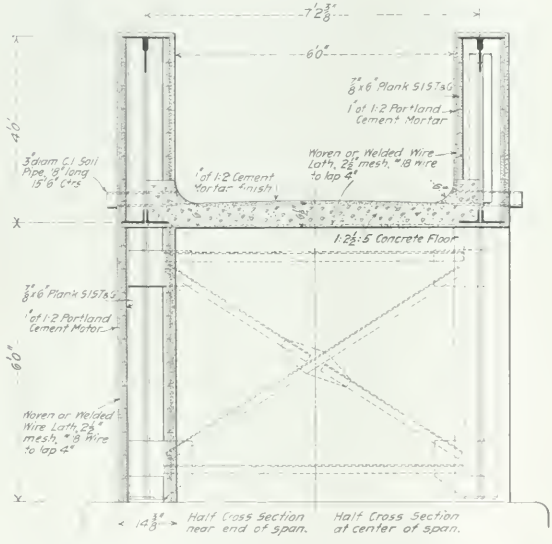
## A Novel Foot Bridge.

The city of Cedar Rapids, Iowa, recently closed by ordinance (Cover) one of its crossing of the tracks of the Chicago & North-Western, the Rock Island and the Chicago, Milwaukee & St. Paul Railroads which are side by side at this point. The same ordinance required the roads to build, in lieu of the regular crossing, an overhead foot bridge, the crossing being adjacent to the plant of the American Cereal Company and therefore requiring provision for pedestrian traffic. Mr. J. W. Schaub, Consulting Engineer, Chicago, was commissioned by the roads to design the bridge, let the contract and supervise its erection. The structure which he designed has some novel features and the plans are illustrated here with. Mr. Schaub desired to avoid the usual steel, wooden-floor affair because of its maintenance costs. On the other hand, conditions would not permit the construction of a reinforced concrete bridge, so the design here illustrated was adopted.




Elevation of Concrete Foot Bridge Over Railroad Tracks in Cedar Rapids, Iowa.

It is a riveted steel girder bridge with concrete piers, reinforced concrete floor and stairways and a concrete protective covering for the steel work. It is 341 ft. long, c. to c. of end piers, and 7 ft. $2\frac{3}{8}$ in. c. to c. of trusses, the walk being 6 ft. wide in the clear. It is made up of five spans 62 ft. between pier centers, one 31 ft. span between piers 4 and 5, and the reinforced concrete stairways before mentioned. Details of the steel work are not shown, there being nothing of special interest about it except that it is to be erected without falsework or field riveting, turned bolts being used in the latter case instead. Also it is to be a continuous structure, no expansion joints being provided.


7'2 3/8"
60"
7/8"x6" Plank S1S T&G
1" of 1:2 Portland Cement Mortar
3" diam. C.I. Soil Pipe, 3" long 15'6" Ctrs
1" of 1:2 Cement Mortar Finish
Woven or Welded Wire Lath, 2½" mesh, #18 wire to lap 4"
1:2½:5 Concrete Floor
1" of 1:2 Portland Cement Mortar
Woven or Welded Wire Lath, 2½" mesh, #18 wire to lap 4"
14 3/8"
Half Cross Section near end of span.
Half Cross Section at center of span.

Cross Sections of Foot Bridge.

The protection for the steelwork is shown in detail in the cross sections. The girders are boxed in with $\frac{7}{8}$-in. x 6-in. tongued-and-grooved material, sized one side, nailed to vertical pieces driven between the girder flanges. Wire lath is secured to this boxing, with V lath beneath to space it away from the surface of the wood in order to enable the concrete completely to surround the metal and thereby assure absolute protection to it. The surface is then plastered with 1 in. of 1:2 cement mortar, applied sufficiently dry to remain in place. The surface is afterward to be washed with two coats of grout to fill the pores and render the concrete practically impervious to gases, moisture, etc. Before covering, the steelwork is to be painted with two coats of "Nobrac."

The concrete floor is $6\frac{1}{2}$ in. thick at the center and has a side drop of $\frac{1}{2}$ in. for drainage, which is carried through the walls by 3-in. cast-iron pipe spaced approximately 15 ft. 6 in. on centers. To build the floor, the forms will be hung from the steel work and no obstruction will therefore be offered to the tracks below. The floor is supported on the girder flanges and is reinforced at the bottom against surface cracks with wire lath. Also it will be observed that the lath on the inner walls extends down through the floor. In erection, the floor form-supports will extend outside of the girders far enough to carry a footway to enable the workmen to plaster the outside walls at the same time as the floor is being built. The inner walls are plastered after the floor is completed, the plaster coating extending down over the floor to form a finish uniform with the sides. There are no expansion joints in the concrete work, which is monolithic throughout the 341 ft. length of the structure.

The stairways are reinforced concrete, each being a monolith. Reinforcement is provided by $\frac{3}{4}$-in. and $\frac{7}{8}$-in. rods. The former are disposed transversely through every fourth step and have their ends turned up 4 in. to enable them to support the $\frac{7}{8}$-in. longitudinal rods during erection. The latter, five in each stringer, are made up two different lengths, spliced, the splices breaking joints as shown in the drawings. Insurance against surface cracks is provided by expanded metal and by wire cloth, as indicated. At the top the stringers rest on pilasters formed on the end piers, and each stringer is anchored to the steel work by two $\frac{3}{4}$-in. 3-ft. bolts, as shown. A V joint is provided at juncture of stringer and bridge wall, these being the only expansion joints in the structure. The treads are given a granitoid finish. The cost of the structure will be approximately $7,500, and it is to be finished in the fall.

## Statistics of Five Electric Railroad Systems in Massachusetts.

The following tables are taken from an article by Howard S. Knowlton, in the July number of *The Engineering Magazine*, entitled "A Study of Electric Railway Operating Cost and Revenue." Of the five companies whose statistics are presented four are the representative urban street railway systems of Boston, Worcester, Springfield and Pittsfield, Mass., and the fifth, included for purposes of contrast, the interurban line between Boston and Worcester. The Boston Elevated Railway Company's system is one of the largest in the world and is essentially urban. On Sept. 30, 1905, the company operated 398 miles of main track. The Worcester Consolidated Street Railway on the same date operated 139 miles of main track. Some part of this milcage is rural as the system operates in some 17 other cities and towns within Worcester County. The Springfield Street Railway operates 87 miles and is both urban and suburban in character. The Pittsfield Street Railway operates 27 miles of track and its territory consists of the urban center and outlying radial village or rural sections. The Boston & Worcester Street Railway is probably the most representative high-speed interurban line in New England. It connects the two cities named in its title by an air line route and has but two branch lines of any consequence. It operates 74 miles of main track. In the case of this road per capita statistics are omitted for the reason that if the total population of the terminal cities were included, the tributary population would be much too large, but if these figures were excluded, the tributary population would be too small.

The first table shows the volume of traffic (transfer traffic excluded) and the car mileage of each road in the year ended Sept. 30, 1905, as follows:

| | Boston. | Worcester. | Springfield | Pittsfield | B. & W. |
|---|---|---|---|---|---|
| Revenue passengers.. | 216,941,776 | 27,722,407 | 20,063,967 | 3,245,241 | 9,110,182 |
| Car miles | 48,069,404 | 5,079,865 | 4,806,891 | 687,299 | 1,820,575 |
| Tributary population, est | 972,000 | 245,000 | 129,000 | 31,700 | ..... |
| Do., per mile of track.. | 2,440 | 1,770 | 1,485 | 1,188 | ..... |
| Rev. passgrs., per mile.. | 620,175 | 199,831 | 230,920 | 121,512 | 123,746 |
| Rides per capita | 224 | 113 | 155 | 102 | ..... |
| Rev. passgr. per car mile | 5.13 | 5.47 | 4.16 | 4.73 | 5.0 |
| Employees per mile track | 18.8 | 5.4 | 5.75 | 3.97 | 3.1 |

The second table shows the principal financial items of earnings and expenses per car mile:

| | | Boston. | Worcester. | Springfield. | Pittsfield. | B. & W. |
|---|---|---|---|---|---|---|
| Gross earnings | Per car mile | 26.4 cts. | 27.1 cts | 21.1 cts. | 23.5 cts. | 24.7 cts |
| Operating expenses.. | " " | 17.9 " | 16.1 " | 15.0 " | 16.7 " | 12.6 " |
| Net earnings | " " | 8.5 " | 11.0 " | 6.1 " | 6.8 " | 12.1 " |
| Wages | " " | 8.0 " | 5.1 " | 5.5 " | 5.0 " | 3.9 " |
| Motive power | " " | 1.8 " | 3.1 " | 2.8 " | 3.1 " | 3.3 " |
| Car equipment repairs | " " | 0.7 " | 0.8 " | 1.2 " | 2.6 " | 1.0 " |
| Maint. of way | " " | 1.6 " | 0.5 " | 1.3 " | 1.0 " | 0.5 " |
| Maint. of line | " " | 0.3 " | 0.2 " | 0.3 " | " " | 0.1 " |
| Legal expenses | " " | 0.6 " | " " | 0.1 " | 0.2 " | ..... |
| Insurance | " " | 0.3 " | 0.4 " | 0.1 " | 0.1 " | 0.4 " |
| Taxes | " " | 2.1 " | 2.1 " | 1.6 " | 1.3 " | 1.8 " |
| Dividends | " " | 4.1 " | 3.8 " | 3.2 " | 2.2 " | 5.6 " |

## The Panama Railroad.*

The discovery of gold in California marks the real beginning of the history of the Panama Railroad. It was in this period that it grasped the key to the Pacific, the key that it still holds. In 1849 surveys were begun. A charter was granted to the company by the New York Legislature, and in 1850 the first ground was broken.

The struggles of Chief Engineer Totten and his devoted assistants seem more like labors in a pitiless nightmare than in a world of actual deeds. In May, 1850, 50 men landed on the marshy mangrove thicket which constituted Manzanillo Island, and began clearing. Through weary months they fought the morass and the jungle of the low coastal reaches. Totten and Baldwin took charge of the work alternately as their fever permitted. Standing waist high in the dank ooze from which steamed unceasingly the noxious miasma, veiled against intolerable insects, and drenched with tropic downpours, these steadfast scouts of Empire still persisted. More men were brought, fell sick and died, or returned to their homes; but at last, in the face of the most obdurate natural obstacles the Atlantic section of the railroad was forced through the swamp to the foothills of Gatun. Thence the construction was somewhat easier and on July 6, 1852, the line was laid to the proposed Chagres crossing at Barbacoas, the crux of the undertaking. The company, which had been doing its own construction, attempted the bridge here and failed. The contractor who next undertook the work went under before the first piers had been erected. Under a new president the company once more began its own construction with Benjamin Bates as superintendent. He erected a falsework almost as extensive as the proposed bridge, was successful, and the Chagres was crossed. Feverishly now, the railroad was pushed, lashed by the desire to participate in the golden harvest. The corners of the earth were ransacked for laborers. They came from Erin and from India. The Hawaiian Islands supplied their quota. Blacks from Jamaica were brought in every schooner. Coolies were shipped like cattle. Each day the line crept farther across the Isthmus. In January, 1854, the summit of Culebra was reached from the Atlantic side. From the other direction the line was penetrating the less formidable jungle of the Pacific slope. Jan. 6, 1855, at midnight the two ends met and next day George Totten stood at the throttle as the first locomotive crossed the Isthmus. The fight was won. After enormous difficulties, and at a cost of $8,000,000, twice its estimate, a line of rails had been carried across the 47 miles between Panama and the new city of Aspinwall. A grim legend declared that for every rail a life had been paid, but the railroad was an accomplished fact.

Trade came in an ever swelling stream. Between 1855 and 1865, $700,000,000 in specie and 300,000 bags of mail crossed without the loss of a letter or a dollar of money. Though the California business slackened with the exhaustion of the alluvial gold deposits, the trade with Central and South America increased by leaps and bounds. Receipts of freight had increased from $354,000 in 1857, to $2,738,000 in 1867 and to $3,000,000 in 1870. A new line of Central American steamers had been put on between Acapulco and Panama by the railroad company, and this, too, was bringing in a large revenue. In all the world it would have been hard to find a more prosperous enterprise.

Such was the prospect, when, in 1871, Alden B. Stockwell came into control of the Pacific Mail Steamship Line. While steward on a steamer this soldier of fortune had attracted the attention of a wealthy heiress, whom he followed to Paris and married. A few years later he was Commodore Stockwell, successor to Russell Sage as president and autocrat of the great Pacific Mail Steamship Company. He grasped control of the Pacific Mail at a time when its ownership was in feeble hands, and added to it the small Pacific line of the Panama Railroad. The sea link was then his. He reached out for the Panama Railroad, mortgaging, to secure its stock, the Howe Sewing Machine Company, his wife's dowry. He then had the land link. With nine directors in each company, he dictated the far-reaching contract by which the Panama Railroad pledged itself never in the future to interest itself in Pacific steamship business. But Stockwell was not a force to endure. His speculation and subsidy campaigns in Congress dissipated the strength that was needed to fight adversaries whose existence depended upon keeping the free seas a desert to competing ships. Startled by numerous rumors, the directors met secretly in March, 1875, to investigate the state of the company. They found that in his wider scheme Stockwell had lost control of the units. Jay Gould and the transcontinental roads had overborne him.

On April 4, 1876, the board of directors of the Panama Railroad met in New York to determine vital matters of policy. The material condition of the company was the worst since the railroad had been completed. The well-kept wharves left by the old management had fallen into decay. The seasoned superintendents had given place to raw and cheap men, who were not equal to the exacting duties. For a perilously long time no new rails had been laid, no bridges repaired; again and again freight rates on local traffic had been advanced in direct violation of the fundamental concession from New Granada. The outcome of the meeting was a formal offer made by the railroad to the Pacific Mail, of a joint rate, if it would elect a governing board not interested in the transcontinental railroads. From the critical directors' meeting called to consider this offer, Jay Gould and Sydney Dillon, still minority holders, absented themselves. The others, seeing the company threatened at either terminal, wavered for a while and finally voted to cast their lot with the Panama. Remorselessly the overland interests pursued their ends until in July, 1876, they had arranged a *modus vivendi* between their own transcontinental lines and the steamship company. By this first agreement, space on each of the Pacific Mail vessels was leased jointly by the Union Pacific and Central Pacific Railroads and $5 was paid for every overland passenger. The condition attached was that the steamer line should make such prices on freights that high-class trade would be thrown to the railroads, that they should not fill to full capacity, and should run but a limited number of ships. An assured revenue of $90,000 per month was the bait and one year only the duration of the agreement. So the first of the Pacific Mail compacts in restraint of trade was begun. Next year the subsidy was raised to $100,000 per month and the transcontinental interests were firmly in the saddle.

In 1878, wittingly or unwittingly, the Panama Railroad was betrayed to them. In a 15-year contract with the Pacific Mail Steamship Company the Panama Railroad surrendered the exclusive right to issue through bills of lading across the Isthmus. Thus at length the circle toward which the overland railroads had been working was completed. They dominated the Pacific Mail, fixing its rates and regulating the carriage of freight and passengers; the Pacific Mail, in its turn, held the Panama Railroad in the grip of an exclusive contract. With the completion of the Central and Southern Pacific Railroads by private and commendable enterprise spending lavishly the proceeds of government guaranteed or subsidized securities, there had come a crucial situation. The Panama route in its fullest bloom of prosperity was on one side, on the other side was a highly capitalized, hastily built, overland railroad, running across a sparsely settled continent, where the real support of local business had to wait a generation of immigration. The railroad had to depend for earnings on westbound through business. The eastbound earnings came in a higher proportion from passengers. To pay the expenses of operation, maintenance and interest on bonds, to create the credit needed for branches and extensions fully to occupy their territory, the trancontinental railroads had to have and hold a remunerative business.

In 1879 began the colossal tragedy of the French. The railroad company, whose line paralleled for nearly the whole distance the proposed canal channel, and whose consent by the terms of the original concession from New Granada had to be secured before a canal could be built, was in an extraordinary position of vantage. For the latter months of 1880 the French were obliged to transport their supplies at regular local railroad rates. This proved so ruinous that they determined to buy the railroad at any cost. The price was adjusted to their necessity. For 68,534 out of 70,000 shares the French company agreed to pay $18,094,000 in yearly installments with 6 per cent. interest. This represented $250 a share, far above normal value. The old directors were to control the road until the whole sum was paid. In addition cash assets were retained by the former owners, amounting to about $1,700,000, much of which had come from the French in the previous year. All told, therefore, the vendors realized $20,000,000, or $282 on each share. A dividend of 52¼ per cent. is shown by the records to have been declared in 1881.

In 1885 began the pinch. That stream of fairy gold poured into the coffers of the canal company, inexhaustible as it had seemed, was shrinking alarmingly. The railroad began to fall upon evil days, and its rolling stock and roadbed were again allowed to deteriorate. Its earning power declined; there was no surplus for dividends; everything was slipping. In 1887 the crisis came. A reorganization followed, in the canal company and the railroad. In 1889 came the final collapse of the canal company. Work had been begun on a canal to be completed in eight years at a cost of $127,600,000. When the receiver assumed the wreck of the bankrupt company, two-fifths of the work had been done, ten years had elapsed and $253,000,000 had been spent.

The ordeal through which the railroad had come crippled it beyond repair for some time to come. It was in disorganization and decay. The single-track line, 47 miles long, had fallen to the last stages of dilapidation: 24 road engines, all obsolete, less than half in good repair; 19 passenger cars; a miscellany of freight cars and switch engines; various wooden buildings; much jungle real estate and some wooden wharves at Colon completed the assets. The grip of the transcontinental roads was relentlessly exercised through the main feeder, the Pacific Mail, whose subsidy from the overland roads had amounted, in 1894, to over $18,000,000. The sum

*From an article by Lindon Bates, Jr., in *The World To-Day*.

paid by the steamship company to the Panama Railroad was roughly $12,000,000, from 1887 to 1893. From all the coast north of Panama, the Pacific Mail and the overland railroads adjusted the amount of traffic to be allowed. They arranged the Central American tariffs so that it was as cheap to carry coffee around through the straits of Magellan. They fixed American rates so that the transcontinental lines, favored already in the elements of time and insurance, could secure practically all the freight. From San Francisco to New York the fare was $90. From San Francisco to Panama, half way, the fare was $100. In order to prevent economically-minded persons from buying a ticket to New York and saving 10 per cent. of the fare to Panama, the company checked all baggage through to New York and would not give it up at any point between. Often vessels made their trip with unfilled holds at a time when freight traffic overland was at its highest. Ship after ship passed the port of San Diego. Not one would stop to take a pound of freight, all must go to the railroad terminus. The Pacific Mail brought to the Isthmian railroad no more in some years than 13,000 tons of San Francisco freight. Coffee was shipped to New York via San Francisco, New Orleans and the Morgan line, going several thousand miles out of the direct route in order to divert freight to the Southern Pacific.

The Panama Railroad stockholders could not but realize the value of the birthright they had sold in their time of need in 1893. On the expiration of the 15-year contract they attempted to break away from the restricting alliance by announcing themselves ready to make arrangements with any responsible steamer lines. But the forces opposed were of the strongest. Application was made to the Attorney-General in New York State by the transcontinental interests to force a receivership and disfranchise the stock on the ground that French control was contrary to the charter. An attempt to arrange a contract with the Chilian Steamship Line for the carriage of South American freight was held up by an injunction for three years on the basis of the old agreement of the railroad not to interest itself in Pacific business. The attempt to free the trade of the North Pacific was fought with all the power of a monopoly intrenched in vested trade interests and the possession of docks and terminal rights in every port along the coast. The fight for freedom was lost.

The officers of the railroad in 1895 signed another exclusive pooling contract with the Pacific Mail and handed the line back into bondage. The situation was cemented in the exclusive pooling contract deeding to the Pacific Mail the whole North Pacific. The freedom of the south seas was also bartered, and two foreign companies were given the right to fix initial rates here. In 1900 a half-hearted attempt was made to break loose and adopt an open-door policy. But again other interests were too strong. In 1902, with an exclusive Pacific Mail contract, the latest pool was entered into. This was the railroad situation when the sentiment in the United States, in favor of a Nicaragua Canal, began to be swung toward Panama.

On Nov. 6, 1902, the United States recognized the independence of the Panama Republic. On May 4, 1904, the possessions of the New Panama Canal Company were formally transferred to the United States. The price was $40,000,000 to the French company (of which $6,800,000 was allotted as the pro rata value of the railroad) and $10,000,000 to the Republic of Panama. It may seem ungenerous at this time to count the cost, but it is nevertheless interesting to figure the capital represented by the government investment and assumed obligations. First, there is the original price of the property; $6,800,000 was the portion of the sum paid the French which was assigned to the railroad stock, or deducting the value of the steamers, $6,532,581; $84,300 was paid for the purchase at par of other shares, and for the final 270 shares $72,120 was paid. Also there were outstanding 4½ per cent. bonds and other obligations which, figured at the usual government interest rate of 2 per cent., make the investment of the United States in the railroad proper $23,276,001.

The obvious step in defense of American commerce was to abolish the freight pools with the Pacific Mail and the South American lines, if, indeed, they did not become null and void through their violation of federal law, immediately on assumption of sovereignty by the United States. Was this done? A letter notifying the Pacific Mail of the intention to abrogate the contract was not sent until the American Commission had been in possession for seven full months and the formal abrogation did not take place for over a year after the government took control. And how much does this abrogation, so tardily executed, effect? The pooled percentage is still shared between the government railroad and the steamship companies. The initial carrier yet fixes the rates so that the whole North Pacific is still tributary to the Pacific Mail. Was the man who wrote the sophistic provision that similar terms would be granted to any other regular lines and so eliminated the great competition-makers of the sea, the ocean tramps, quite unacquainted with the utter unlikelihood of a regular line's undertaking to wrest a share in Pacific commerce from a line intrenched in every port and backed by the whole power of the Union Pacific system? Whether so or not, the naked fact remains that the United States government, far from releasing the shackles of the Panama route, continues in pooling contract with the Harriman system.

So much for the North. With the South Pacific situation there has been not even a pretense of changing the *status quo*. Instance upon instance of extortion and discrimination accomplished by the railroad's arrangements with the South American lines has been presented to the government. It was further shown that the foreign companies to whom the government has given, in a nicely expressed language of the last report of the Isthmian Canal Commission, "full authority to fix competitive rates low enough at points of origin to secure business, an agreed percentage of such through rates to accrue to this company," do in the present, as they regularly have in the past, discriminate against America in favor of Europe.

Take some of the instances cited by the representatives of South American governments in their appeal to Secretary Taft:

Nitrate of Chili cannot be brought via Panama. The combined tariff rates between the railroad company and the trust of the steamers of the southern Pacific coast fix a freight of 47 shillings sterling a ton. That same nitrate reaches New York by steamers via Magellan, paying 23 shillings a ton.

Peruvian sugar pays by the Isthmus, 30 shillings sterling a ton, and 23 shillings sterling a ton via Magellan.

The cocoa of Guayaquil, via Panama, pays to Europe from 52 to 58 shillings sterling a ton, and for New York, 65 to 68 shillings sterling a ton.

Coffee is exported from Central America to Europe, via Magellan, cheaper than by way of Panama.

The metals of Bolivar, especially tin, cannot be brought to the United States via Panama.

Frequently the case arises that products from South American coasts are imported into the United States, after being trans-shipped either to Liverpool, Havre, or Hamburg, because of the lower freight rates for Europe as against the United States.

It may be interesting in this connection to consider an interview with the chairman of the Isthmian Canal Commission reported a week after this memorial was presented. Mr. Shonts said:

"Nothing will be done that will disturb the balance of the transcontinental rates. The Panama Canal Commission will not do anything that will affect the stock of lines owned by American citizens."

This is no petty matter that can be let take care of itself. By the Panama purchase the United States entered upon its first practical experiment in the ownership of railroads. At a time when Congress is being offered the alternative of government rate-making, or government ownership for the protection of American freedom of commerce, this latest chapter of the Panama Railroad's history is of peculiar interest. The United States has become possessed of a commercial route in working order. Its 47 miles of permanent way offer no difficulties whatever compared to that of managing such a system as a trunk line. The material obstacles hampering the test are small. It is to be hoped, and may certainly be expected, that this administration, appreciating the true situation, will make the end of the Panama Railroad career as honorable and creditable as was its beginning.

## Heavy Switching Locomotive for the Pittsburg & Lake Erie.

The American Locomotive Co. has recently built an exceedingly heavy six-wheel (0-6-0) switching locomotive at the Pittsburg Works for the Pittsburg & Lake Erie. The notable feature of the engine is its size, since it is the heaviest of its type that has, thus far, been built, outranking in this respect the B6 Pennsylvania locomotive built at Altoona in 1904, which was at the time the heaviest locomotive of its class in the world. This last heavy switcher has been built to push heavy trains over the hump in the Pittsburg yard and has, therefore, been given a total weight and tractive power equal to that of the driver weight and power of the regular road consolidation locomotives so that it will be able to handle any train that is brought into the yard. Tests have shown that it can do the work of two ordinary switchers, thus greatly increasing the rapidity of work in the classification yards. Its total weight is 176,500 lbs., or an average wheel load of 29,416 lbs., which is above that of any engine of its class.

In order to carry this heavy load on each axle and still keep the journal pressure per sq. in. down to the usual limits, the driving boxes are given a length of 13 in. and the axles a diameter of 10½ in. The main reason for the use of this excessive weight on six wheels instead of eight or more was to keep the wheel base within the shortest possible limits, and this has thus been brought down to 12 ft.

The idea of this is that better results can thus be obtained on frogs, switches and curves with less danger of derailment than would be possible where a longer wheel base and more wheels are used.

As already stated there is little of novelty in the details of the engine. The firebox is carried on expansion pads instead of the buckle plates that have become the common practice of the builders. The use of side grating in the ashpan is a peculiarity, not common, but still no novelty, and the same statement holds regarding the placing of the eccentrics on the intermediate, instead of the main axle.

Six-Wheel Switching Locomotive for the Pittsburg & Lake Erie; Built by the American Locomotive Company.

The performance of this engine should be watched with a great deal of interest, not only to see whether it fulfills the expectations regarding freedom from derailments, but also as to its effect upon the track. It seems to be pretty well proven that a weight of 20,000 lbs. on a wheel will produce a very slight permanent set in the surface of the rail, and if this engine is used over any limited section of track in a way that it obtains a comparatively high mileage at a given point, the relative rate of rail wear, as compared with other places where a lighter wheel load is used, will be of value. It will also be worth while to note the effect of the inevitable pounding of so great a weight on frogs and crossings; matters that can only be determined by trial and observation.

The following are some of the principal dimensions of this engine:

| | |
|---|---|
| Cylinder, diameter | 21 in. |
| Piston stroke | 30 " |
| Tractive power | 44,100 lbs. |
| Wheel base, engine | 12 ft. |
| Wheel base, engine and tender | 46 ft. 2¼ in. |
| Weight | 176,500 lbs. |
| Heating surface, tubes | 2,906 sq. ft. |
| " " firebox | 206 " |
| " " total | 3,112 " |
| Grate area | 33.3 " |
| Axle journals, diameter | 10½ in. |
| Axle journals, length | 13 " |
| Boiler diameter | 80 " |
| Steam pressure | 200 lbs. |
| Firebox, length | 120 in. |
| " width | 40 " |
| " thickness crown sheet | 7-16 " |
| " thickness tube sheet | ½ " |
| " thickness sides and back | ⅜ " |
| " water space, front | 4½ " |
| " water space, sides and back | 4 " |
| Tubes, number | 430 |
| " diameter | 2 in. |
| " length | 13 ft. |
| Smokestack, diameter | 17½ in. |
| Tank, capacity, water | 7,000 gals. |
| Tank capacity, coal | 10 tons |
| Wheels, diameter | 51 in. |

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.00$$

$$\frac{\text{Tractive effort} \times \text{diam. drivers}}{\text{Heating surface}} = 7.74$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 93.5$$

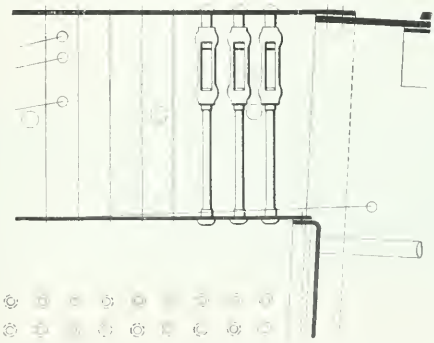
$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = .071$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 56.7$$

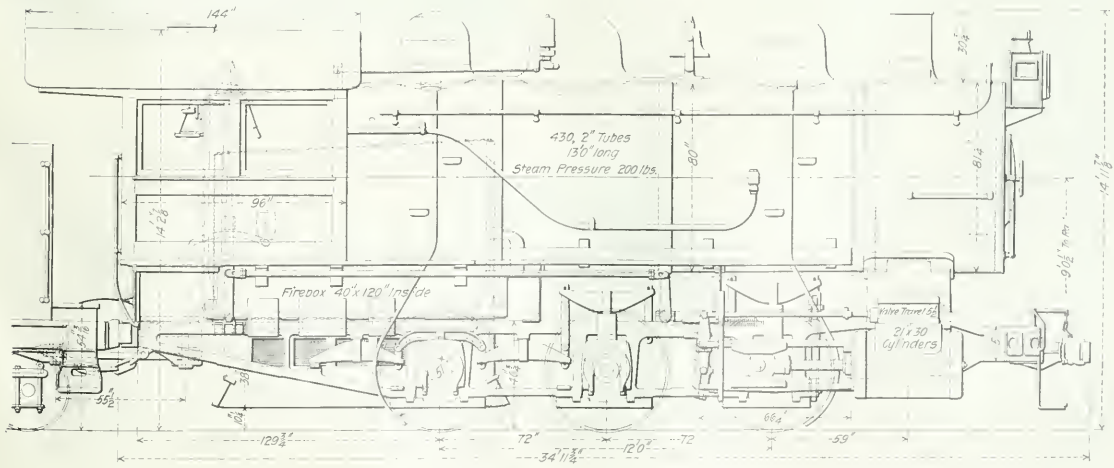
$$\text{Vol. of two cylinders} = 12.02 \text{ cu.ft.}$$

$$\frac{\text{Heating surface}}{\text{Vol. of two cylinders}} = 241.76$$

$$\frac{\text{Grate area}}{\text{Vol. of two cylinders}} = 2.77$$



Method of Staying Front End of Six-Wheel Switching Locomotive for the Pittsburg & Lake Erie.




Side Elevation of Six-Wheel Switching Locomotive for the Pittsburg & Lake Erie.

## Progress of the Washington Union Station.

The New Union Station of the Baltimore & Ohio and the Pennsylvania Railroad at Washington, D. C., has been described in the *Railroad Gazette*, Dec. 4, 1903; Jan. 15, 1904; June 3, 1904, and Nov. 11, 1904. Rapid progress is being made on the building and approaches, as will be seen from the accompanying illustrations from photographs of the work taken June 18, 1906.

To simplify the work of construction the entire layout was divided into three separate parts or divisions: the terminal depot building, the north approach and the south approach. To avoid confusion with the operating departments of the Baltimore & Ohio and Pennsylvania Railroads, upon whose respective territories much of the work had to be done, the construction of the north approach and the depot building was assigned to the Baltimore & Ohio Railroad, while the south approach and a portion of the Magruder connection was assigned to the Pennsylvania Railroad.

The north approach embraces the train yard of 33 tracks, power plant, express building, coach yard having a capacity of about 750 cars, engine and repair yards with the necessary engine house and shop facilities, together with the Metropolitan and Washington branch connections for the Baltimore & Ohio and a portion of the Magruder connection of the P., B. & W. The south approach embraces the girder-covered work under the plaza, the tunnel under Capitol Hill and the connection with the P., B. & W. on Virginia avenue.

The concrete foundations of the depot building, which, over the greater portion, are about 45 ft. high, are finished and material for filling around and between them has nearly all been delivered, the fill over a considerable area reaching a depth of 35 ft. above the original surface of the ground. The granite and brick work of the east end of the building is about 90 per cent. completed, and practically all steel work in this structure being largely ball-bearing, it can only be placed as the progress of the masonry permits. There will be about 7,500 tons of steel in the building, about 90 per cent. of which is on the ground and about 75 per cent. in place, the concourse trusses, having a span of 130 ft., being all in place. In general, it may be stated that about 60 per cent. of the work on the station building is now completed.

The masonry walls forming the limits of the terminal station and north approach are all completed with the exception of short gaps near I street, through which the trains of the Baltimore & Ohio are handled. All material required to fill this space to the track levels, except in I street, has been delivered, and upon a portion of this space tracks are now being laid. A system of terra cotta conduits for the accommodation of all electric wires within the city limits is being installed, the work at this time being about 60 per cent. completed.

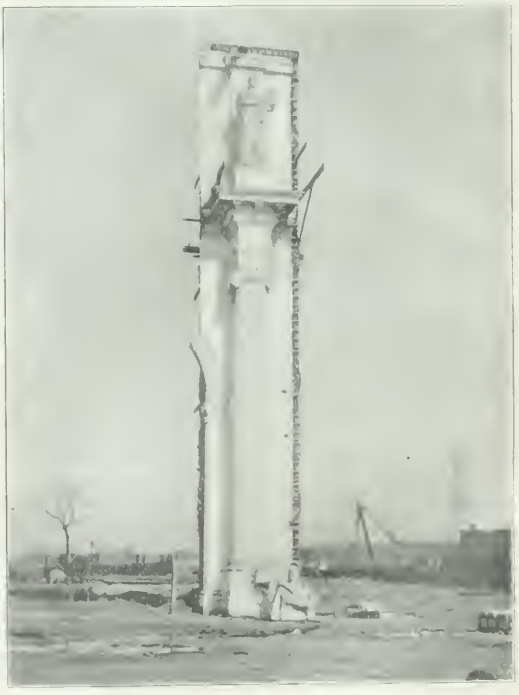
Bridges of concrete-steel construction have been erected over H, K, L and M streets and Florida avenue, consisting of I-beams encased in concrete. Upon the top of this construction is placed a layer of waterproofing material which is protected by a layer of reinforced concrete 5 in. thick. The supports for these structures are the abutments and two lines of columns dividing the bridges into three spans of 27 ft. 6 in., 25 ft. and 27 ft. 6 in., respectively, making a total span or opening of 80 ft. The spaces covered by these bridges range from 135 ft. at Florida avenue to 790 ft. at H street. The track superstructure, consisting of ballast, ties and rail, rests directly upon the floors thus formed. By this method a continuous roadbed is furnished and a water-tight roof is formed over the streets so bridged. The total area bridged in this manner is about 132,000 sq. ft., equivalent to about three acres, the superstructure alone representing an expenditure of about $400,000.

The grading for the coach and engine yards is about 90 per cent. completed. About 50 per cent. of the tracks in the coach yard proper have been laid and ballasted. The tracks on the Washington branch connection of the Baltimore & Ohio are nearly completed between Langdon and New York avenue, and seven tracks on the approach between Florida avenue and L street are laid and ballasted. The site for engine houses and shops has been prepared and bids are being asked for the construction of such buildings as will be required for the accommodation and care of the rolling stock of all roads entering Washington. These will consist of two half-circle 25-stall engine houses 95 ft. between walls, machine and blacksmith shop 80 ft. x 145 ft., oil house 30 ft. x 90 ft., store room 66 ft. x 115 ft., coaling station and sand house 24 ft. x 236 ft., two double-track depressed ashpits 250 ft. long, casting platforms 185 ft. and 330 ft., enginemen's building 60 ft. x 116 ft., cleaners' building 50 ft. x 300 ft., power houses, etc.

Uniform and satisfactory progress has been made in the construction of the south approach, a large percentage of which is tunnel and girder covered work. There are 525 ft. of girder covered work which was built in open cut. Of the tunnel work, 2,480 ft. was drifted; the balance, 600 ft. at the north end and 950 ft. at the south end, was constructed in open cut. As no shafts were allowed the drift tunneling was done from the south end. At this point all excavation was loaded on standard gage cars to be removed by the railroad. Here was located the plant for mixing concrete and handling the other materials entering into the permanent construction. This plant, including the motive power for conveying the concrete to the work, was operated by electricity. The shovel used in excavating the material removed in building the tunnel was operated by compressed air. By the use of these appliances all smoke and gases were avoided, allowing the workmen to labor under the most favorable conditions without adding materially to the cost of construction. The remainder of this work consists of cut and embankment with bridges over the intersecting streets. At the present rate of progress this work will be completed ready for use by the end of the year, though it has not been definitely decided when it will be put in service.

The quantity of material entering into such a piece of construction and the excavated material moved from one portion of the work to another is enormous. The filling, for example, within the limits of the terminal occupation amounts to about 900,000 cu. yds. To fill the plaza and raise adjacent streets to the new grade about 1,000,000 cu. yds. of material will be required. The total amount of material to be moved to prepare the site for the coach, engine and shop yards will be about 2½ million cu. yds.

The head house, 220 ft. x 620 ft., will cover over 140,000 sq. ft.,



Plaster Model of Main Entrance Column.

or 3¼ acres, while the concourse, 130 ft. x 760 ft., covers an area of about 2¼ acres. The general waiting room, 130 ft. x 220 ft., will cover two-thirds acre, in itself larger than the average city depot. In addition to this room there are the usual other rooms, dining room, lunch room, ladies' room, ticket office, toilet rooms and baggage rooms.

The space which will be occupied by the roundhouse, shops and engine yard will approximate 55 acres; the space covered by the coach yard proper, 60 acres; the approach between the coach and train yards, five acres; the train yard, which will occupy the space between the north line of the concourse and L street, 31 acres; the space occupied by the station and a portion of the plaza, between the north line of the concourse and the north side of Massachusetts avenue, nine acres, making a total of 160 acres to be occupied by the terminal improvements in Washington.

On the terminal depot site there have been delivered to date about 40,000 cu. yds. of crushed stone, 50,000 bbls. of Portland cement, 20,000 cu. yds. of sand, 50 carloads of limeoid, 7,000 tons of structural steel, 426 cars of granite, 900 cu. yds. of ashlar, 234 cars of fireproofing material, 49 cars of ornamental terra cotta, and 7,000,000 bricks.

The following quantities are involved in the work done on the

Skeleton Steel Work Over Main Concourse of Washington Union Station.

north approach to date: One hundred and thirty thousand cu. yds. of masonry has been built; 2,460,000 cu. yds. of material has been excavated in the coach, engine and shop yards and deposited in the plaza, between and about the walls, around the foundations of the station and in waste or spoil banks; 170,000 cu. yds. of material has been excavated in the preparation of foundations for masonry walls, piers, etc.; 12,000 sq. yds. of waterproofing has been applied to the backs of abutments, retaining walls, etc.; 1,500 tons of cast-iron pipe has been used in connection with drainage; 16,360 lineal feet of piles have been driven; 6,415 tons of steelwork for bridges has been delivered, about 90 per cent. of which has been erected. About 6,000 tons of 85-lb. steel rail, with the necessary fastenings, has been delivered, about 50 per cent. of which is in place; 400 sets of switches and 350 frogs, 45 of which are of Manard and manganese construction, have been furnished; 10 No. 10 slip switches and 15 No. 8 slip switches, all having end frogs of Manard construction, have been delivered, practically all of which are in place. The following materials have been used in connection with the concrete-steel bridges over the various streets: Twelve thousand cu. yds. of concrete; 15,000 sq. yds. of waterproofing; 14,000 sq. yds. of electrically welded wire netting; 18,000 lineal feet of $\frac{7}{8}$-in. rods for reinforced concrete; 13,000 sq. yds. of $\frac{3}{8}$-in. reinforcing rods, placed 6-in. centers. In the electric conduit system about 135,000 duct feet have been put in place.

In the construction of the First street tunnel the following materials have been used: Fifty-two thousand cu. yds. of crushed stone and gravel; 29,000 cu. yds. of sand and 60,000 bbls. of Portland cement in making concrete for the side walls and haunches of the tunnel; 8,000 cu. yds. of ashlar in the construction of the center wall and portal; 8,000,000 brick in the arches; 5,760,000 ft. board measure of timber was used in supporting the overlying material during the construction of the arches, while in the drift tunnel 92,400 cu. yds. of earth was removed. In the side walls and column foundations of the girder covered work about 4,500 cu. yds. of ashlar, 8,000 cu. yds. of sand, 18,000 cu. yds of crushed stone, and 22,000 bbls. of Portland cement were used, while the roof construction required the use of 1,048 tons of structural steel. The excavation for the open-cut work at each end of the drift tunnel was confined very largely to that removed in the preparation of foundations, as much of the actual work was built above ground and afterward covered over.

There are several points worthy of special note in connection with this construction: First, the construction of two tunnels, side by side, separated by a dividing wall but 4 ft. in thickness. The work on one tunnel, embracing a side wall and the middle wall with connecting arch, was carried on somewhat in advance of the other, after the custom in building single tunnels; the construction of the other side wall with its connecting arch then followed, completing the two-track tunnel. Second, the enormous amount of timber used in supporting the overlying material during the construction of the masonry.

The crown-bar system of timbering was first employed in the removal of the earth from the space in which the arch was to be built. Segmental timbers were then placed inside the crown-bars to strengthen the work. The completed tunnel will have, therefore, outside of the masonry, timber aggregating about 2 ft. in thickness. All cavities outside of the arch are being filled with earth.

The transportation of the various materials entering into a work of this magnitude is a greater problem than might at first be considered. There has been delivered in connection with the general terminal improvements at Washington to date approximately the following: Fireproofing material, 235 cars; stone ballast and screenings, 11,250; sand, 3,000; cement, 1,370; cinders, 5,000; brick, 1,160; structural steel for building, 380; structural steel for bridges and girder covered way, 300; granite, 425; new rail, 210; old rail, 65; frogs and switches, 105; track fastenings, 100; limoid, 50; terra cotta conduit, 25; ornamental terra cotta, 50; terra cotta pipe, 11; cross and switch ties, 530; waterproofing material, 33; ashlar, 1,900; contractors' plant, 175; coal, 800; lumber for open-cut and driven tunnel, 580; cast-iron pipe, 75; signal bridges, five; bumping posts, three, making a total of about 28,000 cars.

Arrangements are now being made for providing temporary quarters in the extreme east end of the station building, in which it is proposed to handle the passenger business of the Baltimore & Ohio. This is made necessary by the fact that space at present occupied by the Baltimore & Ohio tracks and station is considerably below grade, and will have to be filled. For this filling there has been retained sufficient material on the site of the coach yard, which cannot be delivered until the tracks are removed. To facilitate the completion of the grading in the coach yard, it will be necessary to arrange these temporary quarters.

East End of Station Showing Progress of Masonry Walls.

West Half of Main Floor Showing Progress of Fireproofing.

## Special Valve Gears for Locomotives.*

BY C. J. MELLIN.

As several gears in use on locomotives are derivations from others not suitable for locomotives, it may in a few cases be of advantage to go back to the origin from which they are developed and refer to others as comparisons in being applicable, but not possessing sufficient advantages for acquiring any extended adoption.

*Gooch Valve Motion.*—Among the latter class may be mentioned the Gooch, or stationary link motion, which might be said to be the opposite of Stephenson motion, in that the valve rod or link block is raised and lowered in reversing the engine, instead of the link in the latter. It is operated with two eccentrics set in the same relation to the crank as in Stephenson's gear, and the link is curved to a radius equal to the length of the valve rod or radius bar and turned with its convex side to the axle as shown in Fig. 1. This motion gives a constant lead and has otherwise no advantage over the Stephenson gear, except, possibly, that the link block and the radius bar are lighter to lift in reversing than the link; but it presents an objectionable feature in that the sweep of the radius bar in its raising and lowering is obstructed by the front driving axle when the main connection is made to the second or third pair of wheels, and is probably the principal reason why the Gooch gear has been in little use and is now practically abandoned altogether in locomotive service.

*Allan Valve Motion.*—The Allan motion (Fig. 2) may be said to be a combination of the Stephenson and Gooch gear, as the link

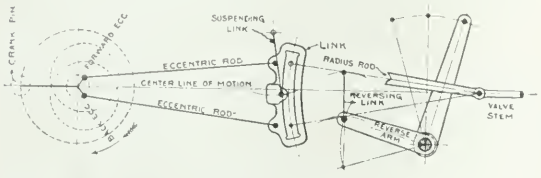



Fig. 1—Gooch Valve Motion.

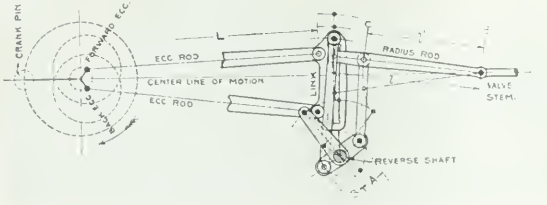



Fig. 2—Allan Valve Motion.

and valve rod are both moved in opposite directions, so that the angularities and distances in either direction are reduced to one-half of those in either of the other motions under comparison with an increase of lead, amounting to about one-half of that obtained by the Stephenson gear in linking up the engine. For this reason the Allan gear has been the favorite valve motion in continental Europe for a generation or more.

With properly selected length of lifting arms of the reverse shaft the link is made straight instead of curved as in the previous cases, which, in manufacturing in former days, was of no little importance in its favor. We see also from Fig. 2 that the lifting arms are placed on opposite sides of the reversing shafts, necessitated by the required opposite vertical motion of the link and valve rod in changing the cut-off or reversing the engine and thereby practically balancing each other and holding the reversing shaft in an approximate equilibrium at any position of the reversing lever.

These are all properties of considerable advantage over either the Stephenson or Gooch gears and deserve therefore a closer description.

From Fig. 2 we see that it is operated by two eccentrics and rods connected to the link in the ordinary way, one for the forward and the other for the backward motion of the engine, with open rods as in the case of Stephenson motion both for outside and inside admission valves, so that the lead is always increasing in linking up the engine. The reversing shaft can be located above or below the link as is found most convenient without in any perceptible way affecting the distribution of the steam. The proportions of the lengths of the rods and lifting arms are very important, in order that there may be a complete compensation for the gain of horizontal length by one rod to the loss by the others in change of angularity of the rods in linking up or down. These proportions can hardly be found by trial, but must be carefully figured out, and are found by the following formula:

$$\frac{A}{B} = \frac{l^1}{L}\left(1 + \sqrt{1 + \frac{L}{l}}\right)$$

L = length of the eccentric rod.
l = length of the radius rod.
$l^1$ = distance c-d in the figure.
A = length of radius rod lift arm.
B = link lift arm.
l-1 = A + B.

Although the Allan motion is the most correct one in existence

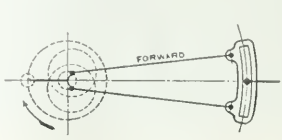



Fig. 3—Direct Motion Open Rods.

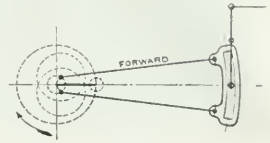



Fig. 4—Indirect Motion Open Rods.

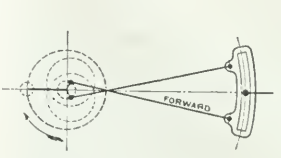



Fig. 5—Direct Motion Crossed Rods.

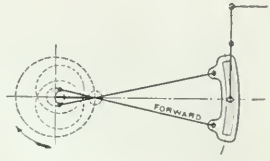



Fig. 6—Indirect Motion Crossed Rods.

it has never gotten any foothold in America, probably for the reason that it has to some extent the same objectionable feature as the Gooch in regard to the front driving axle, which, however, is not serious, as the short vertical sweep of the valve rod admits of a bend or a yoke for straddling same. As this motion is located inside the frames and occupies about the same place and is of the same weight as the Stephenson gear, on modern engines it would be heavy and cumbersome to apply, so its introduction at this time is hardly to be looked for. These conditions have also made themselves manifest in Europe, and the Allan gear, in spite of its excellent qualities, is fast disappearing from modern locomotives, being displaced by the more advantageous construction and application of the Walschaert motion, which will be referred to later.

The Stephenson, Gooch and Allan motions can be classified as one system, in that they are all based on the two eccentrics, set in symmetrical relation to the line of motion, one governing the forward but in the Allan and Stephenson it is important that the rods are always open, so that there is no reduction of lead in linking up.

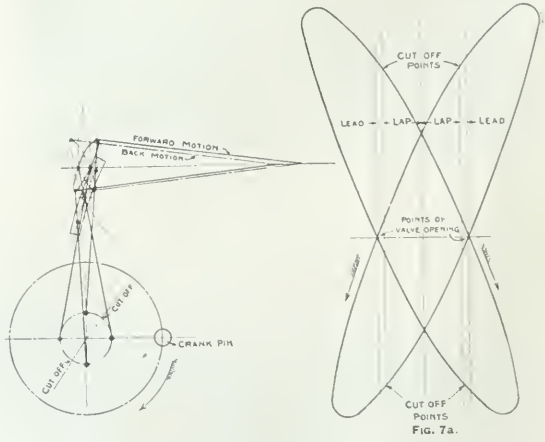



Fig. 7a.

Fig. 7—Original Hackworth Valve Gear.

as crossed rods will reduce the port opening at the earlier cut-off and cause an unfavorable wire-drawing of the steam.

The expression "open rods" has therefore its definition, in that it gives an increase of lead and crossed rods a reduced lead in linking up the engine, but it may not be out of place in this connection to also define their relative positions to the crank under the various conditions of direct and indirect motions and outside and inside and the other the backward movement of the engine, differing prin-

*A paper read before the American Railway Master Mechanics' Association at Atlantic City, June, 1906.

cipally only in the matter of lead. In the Gooch gear, with its constant lead, it makes little difference if the rods are crossed or open, steam admission valves. Therefore, in a valve gear having direct motion and outside admission valve, the eccentrics at the beginning of the forward stroke will be placed between the link and the center of the axle and the crank will be on the opposite side of the axle. If in this position the upper eccentric be connected to the upper link pin and the lower eccentric to the lower link pin, we will have open rods as shown in Fig. 3 represented with Stephenson link. In a

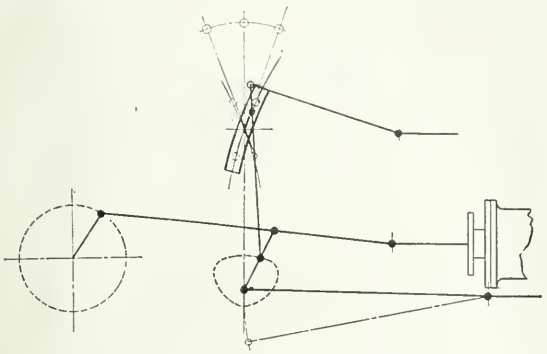


Fig. 8—Hackworth Valve Gear.

valve gear with indirect motion, the eccentrics will be placed between the link and center of the axle and the crank on its center on the same side of the axle. If in this position the upper eccentric be connected to the upper link pin and the lower eccentric connected to the lower link pin, we will have open rods as shown in Fig. 4. If in same positions the upper eccentric be connected to the lower link pin and the lower eccentric to the upper link pin we will have crossed rods as per Figs. 5 and 6, respectively. With inside admission valve we will have the crank and eccentric positions shown in Fig. 3 for indirect motion and in Fig. 4 for direct motion, and in both cases we have open rods, and in Fig. 5 indirect and in Fig. 6 direct motion, with cross rods. By this it is seen that the valve events are the same for outside admission and direct motion as they are with inside admission and indirect motion, and vice versa.

*Hackworth Valve Motion.*—There are various kinds of valve motions that are driven with a single eccentric, among which the oldest, probably, is that of John Wesley Hackworth, which was designed some time between 1840 and 1850, and while this type in its original form (shown in Fig. 7) is not suitable for locomotives, it is referred to as the starting point for a number of modifications, of which a few will be presented in the line of its evolution to fairly

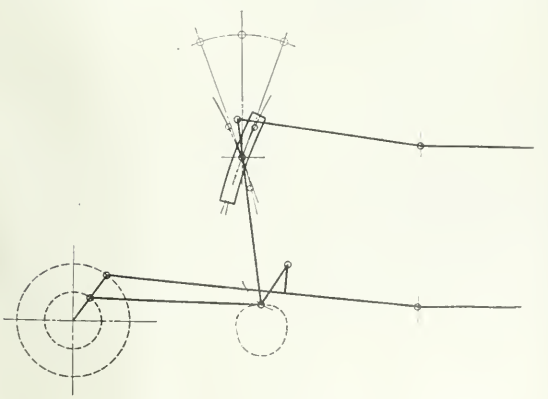


Fig. 9—Joy Valve Gear.

good valve motions for locomotives under various names of so-called "radial" gears.

The eccentric in this design can be placed either on the same center line as the crank or directly opposite, depending upon whether the valve rod connection is made between the eccentric and the link block or whether the link block is located between the valve rod connection and the eccentric. The link is occasionally made straight for very long valve rods, but is more correctly curved to a radius of the length of the rod and is pivoted on its center, while the block slides from one end of the link to the other and back at every revolution of the crank. The link fulcrum is the reversing shaft by which the link is turned to any desirable angle that will give the required throw and cut-off of the valve, and the lap and lead motion is obtained by the lever action of the eccentric arm which, therefore, gives a constant lead, whereas the opening motion of the valve is imparted by the regular inclination of the link, and the combined paths of the valve rod pin are represented in Fig. 7a in enlarged scale.

In 1859 Hackworth introduced a swinging lever instead of the link, which at that time did not seem to be brought into use, as the required length of an arm to carry same was impracticable. Mr. Brown, who has made many valuable improvements in the development of this gear, introduced a counter-swinging link, by which any radius could be obtained, but the arrangement was rather complicated and has apparently never reached any extended use until again improved upon by Klug, in 1878, and Marshall, in 1880, by practically reinventing the Hackworth construction of 1859, and the gear in that form has since been known mostly as the Marshall gear, and has to a great extent been in use on marine engines and auxiliary machinery on board ships.

Another form designed by Hackworth is shown in Fig. 8, where he attaches the eccentric rod or combination lever to a point near the middle of the connecting rod by means of an intermittent hanger, having one end connected to a return crank on the main pin to obtain a shorter longitudinal motion of the combination lever than that of the stroke of the engine, the reversing shaft being located above the center of the connection in the same way as in his previous design above the engine shaft. This was further modified by Brown, in 1878, by introducing a system of levers to reduce the swing of the combination lever, instead of the return crank.

*Joy Modification.*—In 1879 Mr. Joy applied this gear with a slight modification to a locomotive engine, and it is therefore generally known as Joy's gear. It is largely used in Russia and to some extent in several other countries without having gained any predominating use over the Allan motion, which, as said before, until a few years ago was the general favorite in continental Europe. Fig. 9 shows the Joy gear in a general way, and it is probably the highest development of the Hackworth motion adaptable to locomotives and gives a very good steam distribution when properly fitted up, but the effect on the movement of the valve by the vertical play of the main axle on a rough track is not entirely eliminated.

In this arrangement, as well as in the original, and, in fact, in all modifications of the Hackworth gear, the link block or combination lever fulcrum can be guided by a curved frame ("link" as it has been called on account of its similarity to the ordinary reversing links), or by a swinging link and arm of approximately the same length as the radius bar where such a construction is applicable.

No principle of valve motions has been so fascinating and subject to so many varieties of construction as that of Hackworth, and a score or more inventors have, with comparatively small modifications, found them meritorious enough to connect them with their names.

*Walschaert Valve Motion.*—The most suitable form of radial gear for locomotives is unquestionably the one invented by the Belgian engineer, Egide Walschaert, in 1844, and applied to locomotives a few years later, which is shown in Figs. 10, 10a and 11, but it was not properly understood or appreciated during the first twenty years following its invention, and has ever since then made slow headway until a few years ago, when it took quite a sudden move forward and is at present the dominating valve gear throughout the continent of Europe, and is rapidly gaining ground in this country, where, only within the last two years, it has been applied to engines for regular road service, although it has been in use in sundry cases, principally small engines. This gear may be said to be based on a fundamental principle of its own, but has also been subject to a few modifications without any special improvement over its original form.

The motion of the valve is derived from two sources—namely, the main crank by connection to the crosshead, and from an eccentric placed approximately at right angles to the main crank. The crosshead connection imparts the motion of lap and lead at the extremities of the stroke of the piston, at which moment the link is in its central position. Therefore, in the mid-gear with the reverse lever in its center notch this will be all the motion imparted to a radius equal to the length of the radius bar. By moving the reverse lever forward the eccentric motion is brought into combination with the motion from the crosshead, producing a valve opening for the forward motion of the engine, and by moving the reverse lever backward the link block is brought to the opposite side of the link fulcrum, resulting in a valve opening governing the backward motion of the engine, in effect similar to that of the Stephenson motion. The action of this one eccentric is therefore the same as if it was two eccentrics, one for forward and one for backward motion, placed diametrically opposite each other, and the angle of advance in the Stephenson motion is taken care of by the main crank in the crosshead connection. The latter motion being constant, it follows that the lead remains constant at all points of cut-off.

The proportions of the various parts of the Walschaert gear can-

not be determined experimentally, nor should any change in setting the valves be made unless the effect of the change is known in advance. It is therefore important that the different parts should be made and set correctly from the beginning, and there will then be no need for changes when the original dimensions are maintained. The difference in this gear for outside and inside admission valves must be considered in setting the eccentric crank and as the forward motion of the engine should preferably be taken from the lower end of the link when the eccentric crank will *follow* the main crank for *inside* admission valve (see Figs. 10 and 10a), and *lead* the main crank for *outside* admission valve. (See Fig. 11). The connecting point of the radius bar to the combination lever is *above* that of the valve for stem connection for *inside* admission and *below* the valve stem connection for *outside* admission valves. (See Figs. 10, 10a and 11). The desired maximum cut-off, lead and valve travel determines the size of the lap, and thereby the lap and lead motion ob-

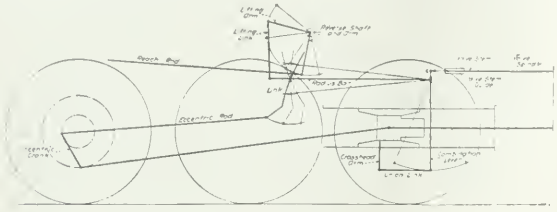


Fig. 10.

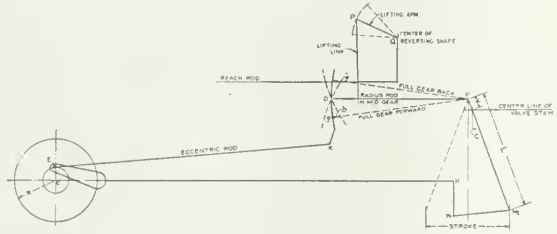



Fig. 10a.

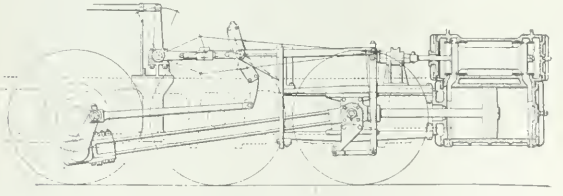


Fig. 11.

tained by the corresponding proportioning of the combination lever, and is found in the following formula:

R: C = L: V.

R = radius of the main crank.
C = lap and lead (one side).
L = distance between radius bar and crosshead connection (from F to M, Fig. 10a) on the combination lever.
V = distance between the radius bar and valve stem connections.

The length of the combination lever must be taken to suit the conditions under consideration in each case, so that the angle through which it oscillates will not exceed 60 deg., but less is preferable. The required horizontal movement or travel of the connecting point F of the radius bar to the combination lever for a given maximum valve travel must now be ascertained and is found by the following formula, in which R and C are the same as above, namely:

R = radius of main crank.
C = lap and lead.
a = half of the travel of the valve.
b = half the travel of point F.

$$b = \frac{R\sqrt{a^2 - C^2}}{R + C}$$ for outside admission, and

$$b = \frac{R\sqrt{a^2 - C^2}}{R - C}$$ for inside admission valve.

These may also be laid out graphically as per Fig. 12 for outside and Fig. 13 for inside admission valves by drawing a circle with S as a center and a as radius (shown dotted in the figures). Lay out crank radius R to the left from S = Sd and the lap and lead dimension C = Se on same side of S for inside admission (Fig. 13), and on opposite side of S for outside admission (Fig. 12). Draw ef and Sh perpendicular to Sd, when f becomes the intersecting point between the valve travel circle and the line ef. Draw the line df, and where this intersects the line Sh, which point we will call h (found by extending df in Fig. 13); Sh is then the desired dimension b in the formula, or one-half the required movement of point F, the total of which is represented by the full-drawn circle in the figures.

This is a most important function of the gear upon which prac-

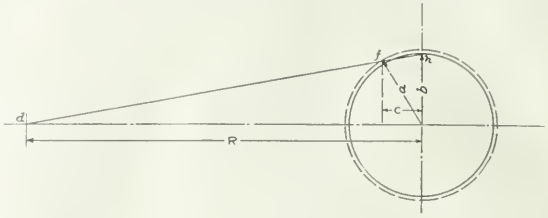



Fig. 12.

tically all the others depend, and is rather complicated to find by plotting. With a correct suspension of the link block it will have the same horizontal movement as the point F, and by limiting the angle of the swing of the link to 45 deg. as a maximum we get the rise or depression of the link block on either side of the link fulcrum the distance $Og = \frac{b^*}{\tan. d}$, (Fig. 10a) where O is the link fulcrum, d = one-half of the swing of the link in degrees, and b = half the travel of point f in the previus formula.

The vertical location of the link fulcrum O should be, when practicable, on a line drawn through point F parallel with the valve stem, and the eccentric rod connecting pin K to the link should be as nearly as practicable on the same level as the main axle in order to minimize the effect of the vertical play of the axle on the valve events, but on large engines it may be found necessary to lower fulcrum O and raise connection K to avoid excessive throw of the eccentric crank.

In locating the longitudinal position of the link fulcrum consideration must be given to the lengths of the eccentric and radius bars so that both may be of approximately the same length. When these lengths fall below three and one-half times the total vertical sweep

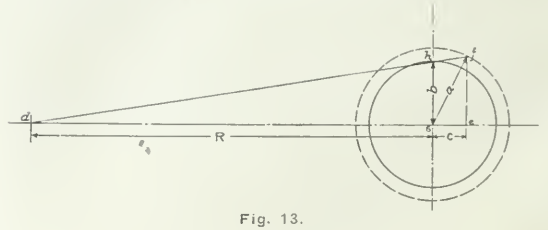



Fig. 13.

Fig. 14.

of the link block the radius bar should be favored in preference to the eccentric rod. The exact position of the eccentric crank must be plotted as well as the longitudinal location of point K. The former must bear such relation to the main crank that it brings the link in its middle position, when the main crank is on either of its dead centers and the connecting point K must be so located that it swings the link in the required angle *d* on either side of the middle position of the link; that is, in other words, the point K should be

*As no suspension gives a perfectly equal drop of the block in both link positions this formula is only approximate.

so located on the curve it must follow with fulcrum O as a center that its deviation from the tangent of the eccentric rod to this curve is such that it, as near as practicable, compensates for the irregularities brought about by the angularities of the main and eccentric rods which in ordinary cases brings it from 2 in. to 5 in. in the rear of the tangent to the link drawn through the fulcrum O.

The locus of the suspension point of the radius bar lifting link must also be plotted so that the link block is at the same point of the link in its extreme positions at all cut-offs. This locus is a curve

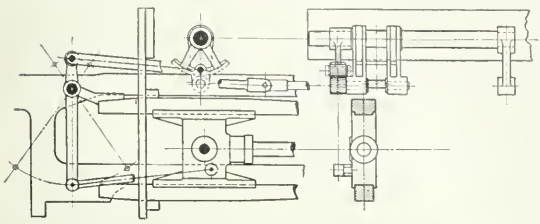


Fig. 15—Allfree Valve Gear.

with its center in the vicinity of the point F when in its mid-gear position. It would be impracticable, however, to have a lift-arm of this length, and a curve of smaller radius must be substituted and so applied that it intersects with the former curve at points giving the least possible distortion to the motion favoring the position of the link block in which it is mostly used in service.

The sliding lifter shown in Fig. 10 meets these conditions better than any other method of suspension, but, due to wheel arrangements of various designs of engines, this is not always applicable, but must be substituted by swinging lifters as per Figs. 10a and 11, which, when properly plotted, gives for all practicable purposes equally good results.

The vertical height of lower connection *m* of the combination lever in relation to the crosshead connection has a slight influence on the port opening, and should, therefore, in the center position of the lever, be about in the same level as the crosshead connecting point *n* (see Fig. 11).

In Fig. 14 is the motion of the valve graphically represented by

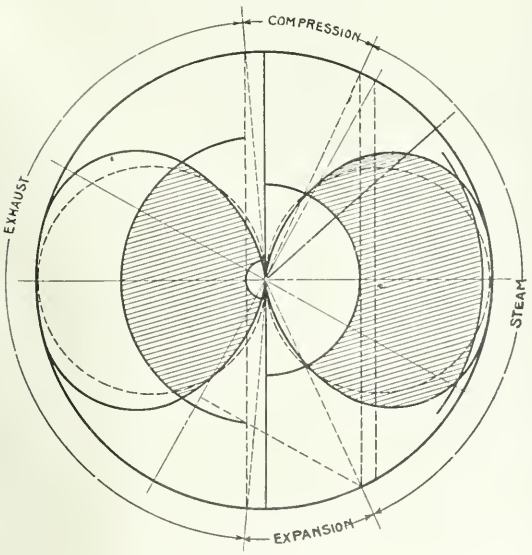



Fig. 16—Zeuner Diagram Applied to Allfree Valve Motion Attachment.

the Long diagram at different cut-offs where the horizontal lines represent the port opening edges in the cylinder face and the curves of the steam inlet edges of the valve, showing the opening and cut-off points where the latter intersect the former and the port openings at the various points of the stroke are measured by the height of these curves over and under the opening edges of the ports at both ends of the valve, respectively.

It will be noticed that these ellipses are slightly flattened on one side, which is caused by the slower lineal motion imparted to the valve relative to the angular motion when the eccentric passes its back center, compared with that of the front center, due to the angularity of the eccentric rod, and is more marked the shorter the rod. Fully symmetrical ellipses are not obtainable, as this would require the eccentric and main rods to be of infinite length, but this angularity, however, is of but little detriment to the distribution of the steam as long as the relations between the lengths of the eccentric rod and the throw of the eccentric is not less than the given limitations, and is present in all kinds of continuous valve motions derived from uniformly rotating cranks or eccentrics.

*General Notes for Adjusting Walschaert Gear.*—1. Ascertain by the following method the position of the eccentric crank: Mark the position of the link relative to its middle position on both of the dead centers of the main crank. If the position of the link is the same in both cases the eccentric crank position is correct, if not the eccentric crank should be lifted until this occurs or as near so as possible.

2. After the eccentric crank has been correctly set the eccentric rod should be lengthened or shortened as may be required to bring the link in its middle position, so that the link block can be moved from its extreme forward to its extreme backward position without imparting any motion to the valve. It may be noted that the link position may be observed by the usual tram marks on the valve stem, or direct by marks on the link pin as may be found most convenient with the link blocks in full gear, preferably ahead.

3. The difference between the two positions of the valve on the forward and back centers of the engine is the lap and lead doubled; it is the same in any position of the link block and cannot be changed by changing the leverage relations of the combination lever.

4. The tram marks of the opening moments at both ends of the

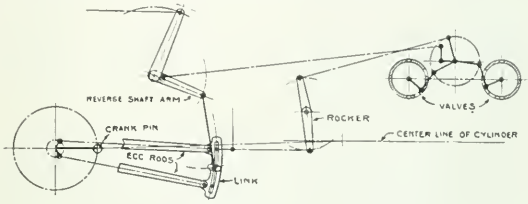



Fig. 17—Young's Rotary Valve Motion.

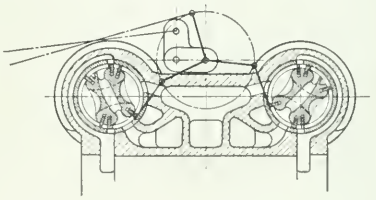


Fig. 18—Section Through Valves and Cylinders.

valve should be marked on the valve stem and the latter lengthened or shortened until equal leads at both ends are obtained.

5. Within certain limits this lengthening or shortening may be made on the radius bar, if it should prove more convenient, but it is desirable that its length should be so nearly equal to the radius of the link that no apparent change in the lead should occur in moving the link blocks as stated in note No. 2.

6. The lead may be increased by reducing the lap and the cut-off points will then be slightly advanced. Increasing the lap produces the opposite effect on the cut-off and reduces the lead the same amount. With good judgment these quantities may be varied to offset the irregularities inherent in transforming rotary into lineal motions.

7. The valve events are to a great extent dependent on the location of the suspension point of lifter of the rear end of the radius bar, when swinging lifter is used, which requires that this point should be properly laid out by careful plotting, or, if convenient, it is preferably determined by a model, as irregularities due to incorrect locus of this point cannot be corrected by the other parts of the gear without more or less distortion of same. When this point is so fixed that a change of same is impracticable it may be better, however, to modify other elements if thereby the motion in general can be improved.

The chief point of difference between the Walschaert and Stephenson gear, when both are in proper condition, is, as previously stated, that the former gives to the valve a constant lead at all cut-offs, whereas the latter produces an increase of lead by linking up the engine and becomes excessive at short cut-offs. This very point has been the subject for much controversy, and has probably done more than anything else to retard the progress of the use of Walschaert gear; as it has been argued that in full gear, when the speed generally is slow, only small lead is needed, but at higher speed more lead is required, which is accomplished by the Stephenson motion.

though this admittedly becomes excessive at early cut-offs, causing considerable compression and preadmission detrimental both to maintenance and to smooth running, and, in fact, to some degree counteracts the work done by the steam on the driving side of the piston, which thereby also affects the speed of the engine.

It was generally discovered that the required lead for short cut-off and high speed was of no practical detriment to the working of the engine in full gear, as the preadmission at that point is disappearingly small. The proper amount of lead, however, is dependent somewhat on the service, and the port opening becomes larger with a larger lead, or, in other words, when all other conditions are equal in a Stephenson or Walschaert gear the openings differ by the same amount as the lead, so that $^1/_{16}$ in. more lead gives $^1/_{16}$ in. wider port opening; but it is hardly advisable to make this over $^1/_4$ in. or $^5/_{16}$ in. as a maximum, as the advantage of any additional port opening by means of a larger lead is more than offset by the increase in compression and preadmission the larger lead would bring about at early cut-offs, and would do no good in the latter cut-offs, even if it does not do any harm.

There is no fundamental reason that the Walschaert gear should produce any economy in steam consumption over the Stephenson motion when both are in the best conditions, but an advantage in this respect comes to the former by the fact that it remains in its good condition if once made so, from one shopping to another, and is, therefore, on an average more economical both in steam consumption and maintenance of the gear than the latter. The accessibility for attention is a great point of undisputed advantage of the Walschaert gear, which is also highly appreciated by the enginemen and attendants.

It will be borne out in the course of time that the bracing between the frames permitted by the Walschaert gear will bring about a considerable reduction in the maintenance expenses by the less wear and tear this additional rigidity will impart to the entire engine.

*Helmholtz Modification.*—Among the various modifications of the Walschaert gear the one made by Helmholtz is probably of some advantage. This modification consists in making the link straight, and the radius bar is connected to the lifting link instead of the link block. The curving of the link is compensated for by the reversing shaft or lifting-arm fulcrum being located in a given position above the link, so that the locus of the suspension point of the lifting link forms an arc of a circle with its chord perpendicular to the center line of the radius bar in its center position. The radius of this arc bears the same relation to the length of the radius bar as the distance of the radius bar connection above the link block bears to the length of the lifting link, which results in that this connection is moving in an arc with a radius of the length of the radius bar and the same motion of the valve is obtained as in the direct Walschaert gear.

Two advantages may be claimed for this modification, of which one is the straight link being simpler to make than the curved one, and the other is that on large piston valve engines with inside admission the link fulcrum can be lowered by the amount the radius bar connection falls over the link block, whereby the eccentric rod connection can be brought closer to the center line of the axle with less length of link and eccentric throw. It has, however, the disadvantage that there is little choice in the location of the reversing shaft or lifting-arm fulcrum, a proper position for which is hardly obtainable on all types of engines and admits of no other method of lifting the radius bar in linking up or reversing the engine.

*Allfree-Hubbell Gear Attachment.*—The Allfree contrivance is an attachment to the ordinary Stephenson motion by which the valve is given a symmetrically irregular motion, causing it to open and close quickly, and is of special importance at high speed and early cut-off. The effect of this movement is about the same as what would be accomplished with a valve with extraordinarily long valve travel, but with a somewhat delayed exhaust and compression. The general construction of this device is shown in Fig. 15, and consists in substituting for the knuckle pin joining the valve stem to the rocker arm a small crank shaft, to which crank the valve stem is connected and the shaft left free to revolve in the rocker arm bearing. To this shaft a pinion is keyed engaging a toothed wheel sector oscillating on the rocker shaft by means of a lever connection from the crosshead. This gives a composite motion to the valve, namely, one direct from the eccentrics and one from the crosshead transmitted by the rotation of the crank on the knuckle pin shaft in such a way that the two motions coincide at the opening and closing moments, but are in opposition at the extreme travel of the valve, when the latter is nearly at a standstill, while the main crank passes through a comparatively large angle with a uniformly open port, and the closing of the valve is rapidly accelerated in the same manner as the opening, causing a quick and sharp cut-off. Fig. 16 gives an approximate illustration of the motion of the valve relative to the ordinary circular motions represented by a Zeuner diagram. The exhaust and compression are similarly affected by this alternating, accelerating and retarding motion of the valve, delaying the exhaust and compression even at early cut-offs. The advantage is, as already stated, greatest at high speed when a relatively high average pressure is obtained, which again is dependent on the capacity of the boiler. It is quite complicated to attach, especially on certain types of engines when the driving wheels are straddled by the guide yoke and thereby limiting the space required for the rocker arms and bearings.

*Young Valve Arrangement.*—This gear consists chiefly in the application of the Corliss valves to the locomotive engine with one valve both for the steam inlet and the exhaust at each end of the cylinder. Each valve is provided with double admission and exhaust ports, as shown by Fig. 18. The steam ports are practically opposite each other, and the relation of the edges of the ports in the valve to these ports corresponds to that of the valve edges to the steam ports of the ordinary slide valve, forming the steam laps, lead and exhaust laps or clearance as the case may be. The exhaust cavity is a passage diametrically through the valve of sufficient width on one side to combine both steam ports with the main exhaust port simultaneously during the exhaust period. At right angles to the exhaust passage is a similar but somewhat larger cavity which corresponds to the steam chest with transverse passages through the valve body alternating with the exhaust passages, and the lap and exhaust edges are surrounded by carefully fitted slats, both on sides and ends to prevent leakage.

The motion is transmitted through a pivoted wrist plate to the valve from an ordinary Stephéson valve motion as indicated in Fig. 17. By means of pivoting the wrist plate on the arm of a bell crank whose other arm is connected with a union rod to a short arm on the reverse shaft, the wrist plate is raised and lowered by the motion of the reverse lever producing a moderate increase in lead, an earlier exhaust and later compression than the direct Stephenson motion produces in linking up the engine.

The main advantage of this valve is the quicker admission, closing and exhaust it accomplishes due to the double port openings, and the small resistance it offers to the valve motion, as compared with the slide valve, in being completely balanced. In common with the Allfree gear it gives a higher average pressure at high speeds than the ordinary valve and in a general way the illustration showing port openings in Fig. 16 is applicable also to this valve and gear. This gear, as well as in the previous case, involves additional complications over the ordinary gear, requiring special skill, both in its manufacture and adjustment, which to some extent counterbalances the above-named advantages.

## The Use of Form 19 for Superior Trains.

BY H. A. DALBY.

At the recent convention of the Train Despatchers' Association of America, held at Buffalo, one of the interesting questions discussed was the use of the "19" order for all trains, superior as well as inferior. There were present members from single-track divisions of the Lake Shore and Pennsylvania, where this is the daily practice, and a number of other single-track lines are using it in this manner. With proper signal equipment at telegraph offices, and especially in conjunction with the "middle order," it has proved highly satisfactory, and the advantages gained over the usual method, that of requiring the conductor, and possibly the engineman, to go to the office and sign the 31 form, are certainly great.

There should be a special form of train-order signal, or an auxiliary to the regular signal, to indicate to the approaching train that a "19" order is to be delivered. The three-position signal has been suggested for this, using the caution color of the middle position of the arm for such indication, but this does not appear to commend itself as does the practice on the Lake Shore, where the signal is kept in the "stop" position and the operator goes to the platform and displays a white flag or light. On seeing this, the engineman reduces speed low enough so that the order may be delivered to himself and the conductor. A whistle signal would also be useful; the engineman could then notify the conductor to be prepared. This would be almost a necessity in the case of vestibuled passenger trains, on which some little time is required for a trainman to get to the steps.

The success of this use of the "19" order depends on the question of certainty in delivery. This is accomplished by the use of clearance cards under suitable regulations. The rule should be that when the train-order signal stands at "stop" no train may leave the station without a clearance card. This clearance card must show the number of each order delivered; or, if there are no orders, that fact must be stated. An additional feature of safety may be added by requiring that the operator check over with the despatcher the numbers of the orders to be delivered and receive the "O. K." or "Complete" to the card. The despatcher records this in his book and all concerned have a complete record. The train is not stopped, and the wire work consumes much less time than the process of getting and transmitting the conductor's signature.

The operator may be required to put down a torpedo as an additional stop signal, or a green flag or light may be used by him instead of the white. The "X" response may be applied to the 19 in the same way it is now used for the 31. Hoops may be provided in

which the order can be fastened and safe delivery be thereby practically assured.

While the chief advantage is avoiding stops there are others. With Form 31 a fast passenger train must, in many cases, be "fixed" at its initial station with all the orders it will need over the whole district, and this, many times, on very uncertain information as to whom it will leave. By the use of Form 19 a restricting order could be sent to any station. Such a train gets orders which are to be executed 30 to 50 miles from where they are received, and sometimes they are forgotten. By this means they may be given only one or two stations in advance. The danger of a train running past a red signal is lessened by requiring the operator to be on the platform, where he can detect any indication of such oversight, and use his hand signal to effect a stop. When using Form 31 he remains in his office and is unprepared for such emergency.

## Lower Passenger Fares on the Pennsylvania Railroad.

Fourth Vice-President Thayer of the Pennsylvania, in charge of traffic, on July 31st issued the following official statement:

The Pennsylvania Railroad Company on Sept. 1 will place on sale 1,000-mile tickets at the flat price of $20, or two cents a mile, and these tickets will be valid on all its lines east of Pittsburg and Erie. The interchangeable mileage book, at present the only form of mileage sold by this company, is valid over six railroad systems besides the Pennsylvania, but is non-transferrable, and, therefore, requires a deposit of $10 to guarantee its exclusive use by the purchaser. The new ticket will be accepted for travel upon this company's lines only, upon presentation by anyone, making it available for use by individuals, firms, families or associations.

The management has also decided to reduce the maximum one-way fares to 2½ cents per mile upon all passenger traffic east of Pittsburg and Erie, although under its charter the company has a right to maintain a charge of 3 cents per mile for through passengers and 3½ cents for way passengers. As the inauguration of this policy will involve a vast amount of preparation, the exact date when it will go into effect cannot now be determined, although it is expected this will not be later than Nov. 1.

This reduction of fares has been the subject of serious consideration for a year past. For many years, as is well known, the company, at enormous expense, has been increasing and improving its equipment and facilities for passenger travel, adopting every modern device to protect the lives of its passengers and to provide the maximum of comfort and convenience upon its trains. It has also expended large sums to build relief lines upon which freight trains should be moved, that this class of traffic might be diverted from the present main lines and thus secure less liability for delay to the company's largely increased passenger service. The company has believed that the time would come when a much larger traffic could be handled profitably with a reduction of the present rates of fare.

A reduction so far-reaching in its consequences could only be entered upon after all possible elements and forces had been considered and thoroughly weighed. Nevertheless, the decision to take this step here indicated was practically reached last February. In view of the pending litigation at Harrisburg concerning the interchangeable mileage tickets, it was deemed advisable that the announcement of the company's purpose in this regard should be deferred until the decision of that case, which it had been confidently expected would have been reached before this. As it is now evident that this case cannot be decided until late in the autumn, the company has determined to postpone this announcement no longer.

The present interchangeable mileage ticket, provided the other railroads interested are willing, will be continued on sale.

## The Trans-Andine Railroad.

BY MAJOR J. ORTON KERBEY,
Ex Consul to Para.

South America is a wonderland, especially the part of it called "The Land of To-morrow." There are a thousand times more marvels in it than Captain Mayne Reid told. But the marvels don't make good ballast for railroad track, except on paper.

Much of the Pan-American literature that is being palmed off on the trading public of the three Americas, when Brazil, for example, is the topic, reads very much like a Jules Verne story to one who is on the spot; and a weird suspicion forces itself upon the reader that the "pan" attachment is principally for "scooping" purposes. The great "Pan-American Railway" is a beautifully taking conception. The American eagle shivers in every pin feather, and his teeth chatter with delight at the mere suggestion. But however glorious it may be for the great American eagle, when the average American citizen proposes to send his own private ten-dollar eagles a railroading, he wants to know how it is going to pan out and where the "pan" is going to dump after the "scoop" is made, and where the eagle is going to light when he comes down.

Not long since my attention was called to certain articles published on this subject, whose author has the reputation of knowing pretty near all that is worth knowing about South America, and which treated especially of the most necessary and most promising of Pan-American railroad schemes, as he thinks. The roads which he suggests, or some of them, would be situated so that they might be utilized as part of the great Pan-American Railroad, if that is ever built.

"If?" some reader may exclaim, "why, of course it will be built."

A continuous line of railroad may some time in the far distant future be in operation from New York to Buenos Ayres; but it will never be used for carrying through freight between those points. As long as half an ounce of coal can be made to move a ton of cargo a mile on the open ocean, no born Yankee is going to send his freight by rail to the Amazon Valley, or to Rio or to Buenos Ayres. The Pan-American Railroad will never be for Pan-American trade. An ocean steamer can beat a freight train by 50 per cent. as to speed, and by greater difference in cheapness of carrying. Consequently, it is nonsense—excuse me, it is poetry—this Pan-American Railroad dream.

It might become quite interesting for the American tourists in a parlor car to be whirled through a series of different revolutions as they passed through various countries. The trains might make as good time as tramp steamers, provided we did not introduce railroad strikes and riots with our reciprocity and railroad management.

The Land of To-morrow has 50,000 miles of available river navigation; and by building six or seven hundred miles of railroad to get around the rapids of the Madeira, Tpajos and Tocantins rivers, several thousand miles more would be added to Amazonian navigation, and unite the Plate and Amazon valleys. With 50,000 miles of water way, every man can have a steam boat at his front door, as often as he needs it, the year around.

There is only one steam railroad in the Amazon valley, the Braganca Railroad, running out 40 miles from Para, on which trains of two cars run regularly on Tuesdays and Saturdays. This road has never paid half of its running expenses; the deficit is paid by the state. The trouble is that in the greater part of South America there is no population back from the rivers and the coast to support a railroad, except in a smaller part of the country. In nearly all the rest, back from the river margins, there are forest-covered mountains. What lies back of these mountains is still as unexplored as the interior of Africa and perhaps more profitable to us and as interesting as Stanley's Equatorial Africa.

When the high lands of the interior are peopled they will need railroads to give them communication with the water courses, which will always be the great trunk lines of communication of South America by Amazon and Plate.

Except on extensive plains, the rule of railroad building is to follow the water courses, where nature has already done all the necessary grading. When a range of mountains or of hills is to be crossed, the road follows a valley up to the summit and descends the other slope by another valley. To follow the course of the range of the Andes, tunnelling the spurs and bridging the mountain valleys, is to multiply by one thousand the cost of building. But that is just what is done in much of the present railroad building on paper in Pan-America.

The water shed between the Amazon basin and that of the River Plate is a mountainous region, and its flanks are out on either side by the valleys tributary to the Amazon and Plate rivers respectively. Still the Pan-American Railroad dreamer proposes to shove a railroad more than 5,000 miles lengthwise through mountains from Panama to Patagonia, cutting at right angles every valley and hill for thousands of miles, through a nearly uninhabited region, the greater part of the distance.

The two objects proposed are to reach the possible mineral wealth of the region to be traversed, and more especially to give to South America communication with North America via Panama, Central America and Mexico. It is perfectly safe to predict that no railroad will be built along that route very soon. The natural outlet of that part of South America is two weeks nearer to Europe and the United States than the one proposed. A short railroad past the rapids is the solution of the problem.

The same writer has another railroad "castled in the air," to run from Manaos, on the Amazon, across the country to Paranaribo on the coast of Dutch Guiana. The distance is an insignificant 1,000 miles. Nothing would have to be paid for "right of way" for there is no one living on the route, and no one has ever been over the ground, so that it is impossible to prove that the plan is not feasible. There is a range of mountains to cross, but the writer has the general direction of water courses in his favor. He is crossing the mountains, and not riding them astraddle as in the southern plan.

But the great puzzle is to know what use the Trans-Adine Railroad could be put to after it were built. He thinks that it would give quicker communication with North America; but that is an enormous mistake. Ocean steamers sail direct to Pern, three thousand miles up the Amazon, the year around. They could make the distance from New York to Iquitos, via Para, and Rio and Buenos Ayres, in 30 days, and be there as soon as his overland train, with much less than quarter of the expense, and with no reshipment of cargo, the cargo going unbroken by steamer from points on the Amazon and affluents three to four thousand miles in the southwest. The whole scheme seems a desperate attempt to dispense with the 50,000 to 75,000 miles of Amazon and Plate river navigation by carrying the products from five to ten thousand miles overland.

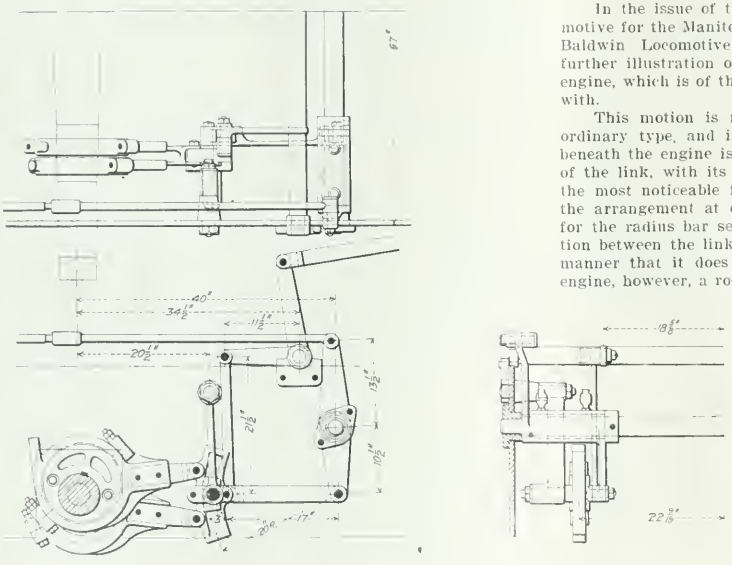
But the Amazon will not be dispensed with. It has not only the

right of way, but will hold it exclusively. No railroads need apply. They can't be built down the valley proper, for the river rises 30 ft. or more annually, and overflows its plains, changing its channel, tears out its islands, builds others and plays the mischief generally. At low water, this year, where last year there was a forest with trees 60 ft. high, a steamer may find 15 fathoms of water.

Over the bluffs that flank the flood plains a railroad would have to tunnel and bridge without end, and on crossing the tributaries of the Amazon there would have to be Firth of Forth bridges miles long built on mud 50 ft. above low water mark; for these tributaries annually rise from 30 to 40 ft. and overflow their flood plains for miles on each side. The Amazon will never allow an east and west railroad as its rival, nor allow itself to be bridged after it leaves its cradle in the Andes.

There are railroads to be built, however, as already indicated, to pass the rapids of the rivers Tocantins, Tapajos and Madeira, to unite the thousands of miles of the Plate valley to the Amazon. These three short railroads will add immensely to the wealth and resources of "The Land of To-morrow," for the territory thus opened up is habitable and very rich in its soil, forest, pastures and mines. None of these railroads is now contracted for, although two of them have been in the past.

The Madeira & Mamore Railroad, for passing the rapids of the Madeira river was a most disastrous enterprise. Fortunately, for Brazil, she was not to blame for the failure. P. & T. Collins, of Philadelphia, were the contractors for building the road. English stockholders laid an injunction on the funds and the work stopped. Five miles of finished track, several ship loads of rails, locomotives and other appurtenances still lie in the forests at Santa Antonio, on the Madeira, where they were abandoned 25 years ago. (See paper by O. F. Nichols in the *Railroad Gazette*, Jan. 1, 1904.)




Gooch Valve Motion for Manitou & Pike's Peak Railway Rack Locomotive.

Twenty years ago the Brazilian Government sent a commission of civil engineers to survey the route. After returning to Rio, there were charges of "sham survey," etc. The Commission quarreled, the survey was pigeon holed and is still there where it was 20 years ago.

The Alcobaca Railroad, on the river Tacantins, has fared no better; present prospects are dubious, although the Brazilian Government is promising that it shall soon be built. It was to have been built by the Para Transportation & Trading Company, an organization chartered by the state of Wisconsin. This company obtained the first choice of large tracts of land at a nominal price, exclusive privileges for the road for 90 years, and other advantages. The grant was obtained in a marvelously easy manner, to all appearances. But just as the company were about ready to begin actual operations the governments suddenly and rather mysteriously voted repudiation of part of the privileges. The bad faith implied in this partial repudiation caused the company to abandon everything and let the grant collapse by neglect.

If the history of the different railroad construction and trading companies could be written out in full, both on the side of the companies and on the side of the governments, it would in all probabilities serve as a most valuable guide for future railroad contractors in South America as to what ought not to be done by either business men or governments under any circumstances. Colossal bad faith is the mightiest obstacle that hinders railroad building.

The writer believes that when, or if, the Trans-Andine Railroad is ever built, it will be operated by electricity instead of the steam engine. This power can be obtained in the greatest abundance all along the route, from the melting snows on the peaks of the Andes, which create immense water falls in all the valleys or numerous canyons in sufficient volume to generate electric power, to not only operate the Trans-Andine Railroad, but all the other power plants that may be required along the route, from the waste or overflow.

There is no coal or fuel on the proposed route, the transportation of which from a distance would make its use almost prohibitory, and as a great part of the line would be located at the unusual altitude of 16,000 to 18,000 ft., or nearly three miles above the level of the sea, under atmospheric pressure that renders breathing difficult in the rarified air and where water does not boil, it would seem to offer difficulties in the way of the working of the piston from a steam pressure as well as of engineering problems.

## Gooch Valve Gear on Rack Locomotive for Manitou & Pike's Peak Railway.

In the issue of the *Railroad Gazette* for July 13 the rack locomotive for the Manitou & Pike's Peak Railway, recently built by the Baldwin Locomotive Works, was illustrated and described. A further illustration of the arrangement of the valve motion of the engine, which is of the Gooch, or stationary link type, is given herewith.

This motion is never found on American locomotives of the ordinary type, and is used in this country only where the space beneath the engine is very limited. The peculiarity of the location of the link, with its back or convex face toward the eccentrics, is the most noticeable feature, and will serve to attract attention to the arrangement at once. Ordinarily it is used without a rocker, for the radius bar serves as a satisfactory means of direct connection between the link block and the valve stem, in nearly the same manner that it does in the Walschaert gear. In the cost of this engine, however, a rocker with arms proportioned $10\frac{1}{2}$ to $13\frac{1}{2}$ in. is used. The link is of a very short radius, equal to the length of the radius bar, or 20 in., though it is evident that this may be of any dimensions suited to the particular engine for which it is designed.

The link is hung from a fixed point by a link hanger, as in the Stephenson motion, but is not moved in the reversal of the engine. This is accomplished by raising and lowering the radius bar with the lifting shaft and reversing link as indicated by the drawing.

It has frequently been customary to state that with this type of link the lead is constant. As a matter of fact the lead angle increases as it does for the shifting link. "The difference between the two is that the lead opening of the stationary link motion is more ample and the angle slightly greater, for all except the mid gear, than with the shifting link motion. Unlike the shifting link motion, however, the lead opening is not dependent on the arrangement of the eccentric rods, for these may be either crossed or open without altering the result."

## Foreign Railroad Notes.

Presses are running day and night to print the many millions of tickets which will be required by the German railroads after July, to satisfy the requirements of the new ticket tax law.

The gage of the Spanish railroads is 5 ft. 6 in. Negotiations have been recently made between France and Spain looking to the laying of a third rail from the frontier station at Port Bou, at the Mediterranean end of the Pyrenees, to Barcelona, and at the Atlantic end from Irun to San Sebastian, which will make it possible for cars from the French railroads to reach considerable Spanish towns, instead of only border custom houses, as at present.

The *Journal* of the German Railroad Union of June 23rd has an article a page in length on the life and services of Johann August Röbling, called out by the one hundredth anniversary of his birth on June 12th last. This is our John A. Roebling, who certainly is not forgotten, and never will be forgotten, by American engineers; but whose anniversary was probably not so well remembered in the United States as was done by this article in a German newspaper. The country which gave him birth and educated him has been more mindful than the country which he served so long and so well.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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VOL. XLI., No. 6. FRIDAY, AUGUST 10, 1906.


Last year, in New York state, 172 persons were hit by trains at grade crossings and 96 of them killed outright. This is nearly 10 per cent. of those who died in the state from old age during the same period, so that it seems desirable to fix the responsibility on those who are competing with Father Time in mowing people down. It is impossible for the railroad companies to stop this killing at grade crossings. With all possible precautions the number will tend to increase, rather than diminish, as electrification progresses and the number of trains increases. It is not difficult to determine the responsibility for these deaths. The New York state law prohibits any new steam railroad construction, or street opening, involving a crossing at grade. It undertakes to gradually eliminate all grade crossings by providing that the railroad company shall pay one-half the cost, the city or town one-fourth and the state the remaining one-fourth. The law says: "The legislature shall annually appropriate out of any moneys not otherwise appropriated the sum of $100,000 for the purpose of paying the state's proportion of the expense of a change in an existing grade crossing," but it also provides that balances in any one year, not expended for this purpose by the State Railroad Commission, lapse and cannot be used in following years. The appropriation of $100,000 a year is mandatory, while it is permitted to appropriate additional sums where towns and cities join with the railroads in asking for it. The responsibility for failure to carry out the intent of the law does not rest on the railroads. In no case, so far as we know, have they been reluctant to either elevate or depress their tracks through cities and towns. The people, represented by their legislators, are not to be blamed, for the appropriations have been made. The cities and towns have not been at fault, for they have shown a strong desire to pay their quarter of the cost of lifting or depressing the track to the end of stopping the killing and obstruction to street traffic and increasing the value of their property. It is the more obviously to the interest of the city or town, because the cost of getting rid of grade crossings includes the cost of adjacent street improvements, which is usually much greater than the city's contribution to the total expense. Who then is guilty? In 1902, 1903 and 1904 the then Governor vetoed nearly every appropriation made for this purpose by the legislature. Hindrance to the state's prosperity and the loss of human life meant little to him while political necessities held his watchful eye.

The New York State Railroad Commission has statistical, executive and judicial functions, the first of which is performed by its clerical staff, the second left undone and the third occupying (a conservative estimate made from its annual reports) about forty days a year, for which each member receives $200 a day, inasmuch as the yearly salary is $8,000, paid by the state, but assessed on the railroads. Of its five members each one was appointed for political reasons only. Not one member of this commission, which has power over life and death, and whose decisions are final, has been appointed for fitness. Its president was long chairman of the Republican state committee; another had to be "taken care of" when he left his place as Superintendent of Public Works badly stained by the wasteful expenditure of $9,000,000 on the Erie Canal; a third was dramatically taken at Albany from the train, of which he was a conductor, and led to the Governor to receive a certificate showing that his income was increased about 500 per cent. This increase of pay was properly dwelt on by the good conductor and by the reporters as being the most important part in the making of a new railroad commissioner, for, aside from the little time perfunctorily given to formal performance, balancing good and bad, the payment made for net valuable services may be computed at something like $8,000 a second. Their decisions are what might be expected from a commission so composed. For example, two different electric lines lately applied for permission to cross steam railroad tracks at grade at Niagara Falls and at Nepperhan. The topography made both crossings dangerous and earnest protests were made. The application was granted and up to date one man has been killed at each place.

Mr. Ripley's letter to the people of Kansas protesting against their agitation for a law limiting passenger fares to two cents a mile is a masterpiece, and we reprint it in full. If his facts are fairly stated—and they seem fair—his argument is unanswerable. There is a theoretical weakness in his position, in that the company's gains and losses, its wise acts and its mistakes or impositions, are spread over eight or ten states, and Kansas neither benefits by all the good things nor suffers from all the bad; but it is only theoretical—for practically the state, or any state, in dealing with an interstate railroad must be guided by those standards which are tangible and manageable, and these Mr. Ripley has set forth very clearly. This inability of a state to discipline a great railroad in all its doings is inherent in our federal form of government and the provisions of the Federal Constitution. If Mr. Ripley were to charge passengers five cents a mile in Arizona and two cents a mile in Illinois, it might or might not affect the people of Kansas; but they could not fairly do anything about it, and in either case their interest lies in close attention to those conditions (in their own state) which they can deal with. Nothing is clearer than that the people of Kansas get in passenger service more than they pay for. The railroad may fairly insist on making this fact

prominent. If the Atchison has taken too much money from the people—and no evidence is presented that it has—it has been on freight, not passengers; and freight rates would be the ones to be reduced. In fact, the only rational plea that the agitators for the universal two-cents-a-mile rate can offer in any state is that the railroads are doing well and ought to divide with the people. The problem of changing passenger fares is simple in form—while freight rate problems are always complicated—and so the demagog seizes on it as one of his most useful weapons. Always, in the past, cases of this kind, unfortunately, have been decided, not by full and frank argument such as Mr. Ripley now offers and asks for, but by appealing to local patriotism and prejudice or bald and short sighted self-interest. It will be a most hopeful evidence of progress in civic intelligence if this appeal shall be shown to have an appreciable effect.

The revision of the standard code of train rules that was made at the last convention of the American Railway Association is destined, probably, to stand mostly unchanged for some years. Like its predecessors, however, it requires a good deal of fixing up to fit it for use on any individual road, and we have therefore asked Mr. Forman to write out his ideas of how to do this. His article begins on another page. The Association committee almost of necessity leaves many things for the individual manager to attend to for himself in the final preparation of the code for use, but each of these details demands thoughtful attention, and the counsel of such a student as Mr. Forman is therefore of special value. He is by far the most thorough and discriminating critic who has dealt comprehensively with the standard code, and his standing as a critic is founded on long and valuable experience. He has lately taken part—and, we judge, the chief part—in editing the code for the Nashville, Chattanooga & St. Louis Railway, and the new N., C. & St. L. code shows that his ideas, as expressed in his book on Rights of Trains, have been quite generally adopted by the company. As the Nashville, Chattanooga & St. Louis is not a road to accept anybody's ideas without careful testing, this adoption is a significant testimonial to the excellence of Mr. Forman's work. Among the most interesting paragraphs in the present article are those on Rules 88 and 90 and on Rule 29, though the matter of a time allowance between opposing trains of the same class at meeting points seems to be one in which the N., C. & St. L. did not agree with Mr. Forman sufficiently to put his idea in practice. This disagreement well illustrates the need, even now, after nearly twenty years' trial, of thorough investigation of rules on the part of every superintendent on whom falls the responsibility of introducing or modifying a code. And this need is shown still more clearly when we consider that the weak point in Rules 88 and 90 which Mr. Forman brings out has existed, before the eyes of everybody, these many years. That no collision has occurred because of this weakness is no answer to the present criticism, for many a dangerous rule has gone unnoticed for years on busy roads.

In the present standard code, the product of so much cautious collaboration, there is scarcely a rule which it would be safe to call more important than another, for the violation of almost any one of them may be the cause of a collision. Certainly we do not mean to intimate that the two subjects mentioned—88-90 and 29—are more important than many others. But Rule 4 may fairly take the first place in one respect. It produces the largest volume of controversy. It surpasses in this respect the famous flagging rule, No. 99; for while both 4 and 99 were subjects of strife in the early days of the code No. 99 has now become quiet. No. 4, however, still rages. As the action of the N., C. & St. L. on it will give a practical turn to the discussions which have been going on for the past year or two we may expect still further invoices of fine-spun arguments. As far as they have to do with propositions to take action in real life—that is, with rules which a railroad company intends soon to adopt in actual service—we shall welcome these arguments. We take an interest in them, because we formerly lived on that same low level ourselves! Train rules constitute a fascinating subject, and Rule 4 is one of the fascinatingest features of the subject. But we are free to confess that our love for such discussions is based largely on our love for the men who do the discussing; that is, for our dear neighbors, in Tennessee and elsewhere, whose practice compels them to still treat Rule 4 as important. Also, we have a profound respect for the past. But in the twentieth century the only rational scheme of train running is that which employs the block system everywhere, and by so doing makes Rules 4, 99 and others over which there have been so many days and nights of discussion, no more important as safety measures than the waiting list of extra brakemen; that is, of no importance at all. Some of our train rules this No. 4, for example—come pretty near being a combination of comedy and tragedy. In our attempts to provide by rule for a complication of circumstances that would tax the ingenuity and patience of the Supreme Court, and in our innocence in entrusting the execution of such a rule to a hundred poorly trained freight conductors we approach the ludicrous. In the results of such action we see, or may expect to see, unnumbered tragedies. Rule 1 and all other rules must be made as perfect as possible, as long as the necessity exists for their use; but let us hasten to do away with such a burdensome necessity.

## THE HOCKING VALLEY CONSOLIDATION AND THE MINORITY STOCKHOLDER

There was announced on Monday of this week the plan for the consolidation of the Hocking Valley Railway Company and the Kanawha & Michigan Railway Company, two bituminous coal roads in the West Virginia and Ohio territory which have for some years been closely associated both physically and in control, the Kanawha & Michigan forming the southern connection into West Virginia of the Hocking Valley, with $1,510,000 of its $9,000,000 capital stock held by that company. The consolidation plan as now presented to the stockholders of these two companies in brief provides for a new issue of $30,000,000 in 4 per cent. bonds and $13,750,000 in stock by the consolidated company. Of the new bonds, $17,000,000 are to be issued in connection with the consolidation. Of this amount $16,500,000 are to be exchanged for Hocking Valley preferred stock at the rate of $110 in bonds for $100 in stock. The purposes for which the additional $500,000 bonds are to be issued are not stated. The $11,000,000 Hocking Valley common stock is to be exchanged, share for share, for stock of the new company. Of the remaining $2,750,000 stock in the new company, $2,694,000 is to be exchanged for the $4,490,000 Kanawha & Michigan minority stock outstanding in the hands of the public, or at the rate of $60 in stock of the new company for each $100 of Kanawha & Michigan stock. It is understood, though not so designated in the announcement, that with the funding into bonds of the Hocking Valley preferred stock, the stock of the new company will pay 6 per cent. instead of the 3 per cent. now paid on Hocking Valley common. At the current price of about 125 for Hocking Valley common, this would indicate a value of $75 a share for Kanawha & Michigan stock under the consolidation plan.

This favorable valuation of Kanawha & Michigan stock, which on May 26, 1905, sold as low as $29.50 a share, was brought about only by determined action on the part of Kanawha & Michigan minority stockholders. Control of the Hocking Valley itself through ownership of a majority of the common stock is held by the trunk line railroads, with Pennsylvania interests controlling one-half and the Chesapeake & Ohio, the Lake Shore and the Erie each, one-sixth. With the large increase in Hocking Valley earnings which resulted from the recent and present prosperity of the soft coal trade, it has become more and more desirable to these interests to increase the dividends on the common stock held by them. By the provisions of the organization adopted after the foreclosure of the Columbus, Hocking Valley & Toledo in 1899, the preferred stock is entitled to share equally with the common in any dividend above 4 per cent. on each class of stock. Therefore as the investment of the interests in control was in common stock, and the preferred stock was subject to redemption at par, the obvious thing to do, from the standpoint of the majority interest, was to retire the preferred stock. In connection with this action it was understood that the Kanawha & Michigan would be absorbed by the larger road, the figure at which it was expected that Kanawha & Michigan stock would be valued in this operation being considerably below $75 a share.

Led by the probability of such action and believing that a much higher value was inherent in Kanawha & Michigan shares, a committee was in December of last year formed to represent the minority stockholders of that road. $4,490,000 of whose $9,000,000 stock, or $10,100 less than a majority, is outstanding in the hands of the public. The purpose of the committee was stated by it to be to influence the directors to distribute a portion of the net profits in a dividend to the stockholders. Attention was called to the fact that the road had enjoyed five years of great prosperity in which gross earnings had increased from $760,000 to $1,760,000 and that there were indicated for the fiscal

year 1906 gross earnings of over $2,000,000. As a matter of fact the 1906 earnings have proved to be over $2,150,000. There was soon secured the support of more than a third of the total outstanding stock of the road, the proportion necessary under the Ohio law to block any consolidation plan, and direct negotiations with the controlling interests in the property looking to dividends on the stock or, in the event of consolidation, a price considered commensurate with the earning power and resources of the property, were begun. These negotiations lasted for several months and involved a number of important moves on the part of the combined minority interest. For example, when Kanawha & Michigan stock was selling at about $60 a share in the open market, the committee offered the Hocking Valley $75 a share for its majority stock, about $15 more than the market price. This offer was refused and the committee then turned about and offered to sell the stock deposited with it ($2,800,000 of the $9,000,000 outstanding) at a similar price. Neither of these offers were accepted by the Hocking Valley, but late in May an agreement was reached by which the consolidation of the Hocking Valley and the Kanawha & Michigan was to be effected according to the terms of the recently announced plan. With this arrangement, which gave the Kanawha & Michigan stock a value of about $75 a share, a price satisfactory to most of the minority stockholders, the work of the committee came successfully to an end. In a year the stock had risen from a low point of $29.50 and during progress of the negotiations from $38 to over $70.

The Hocking Valley-Kanawha & Michigan consolidation, as influenced by the Kanawha & Michigan minority stockholders' committee, is noteworthy as an example of a successful attempt on the part of minority stockholders to gain a share in arranging the financial policy of a railroad company. The rights of the minority stockholder form an all-too-clouded chapter in legal development. Until a comparatively recent date, this legal obscurity and the difficulty of concerted action on the part of small stockholders has made the average minority stockholder practically helpless in the hands of the controlling interest in his property. The present year is noteworthy in the number of movements by which minority interests are demanding a larger share in the profits and, where necessary, fuller information about the operation of the companies of which they own a part. The action of the minority stockholders in the Wells-Fargo Express Company (though this committee, said to represent 51 per cent. of the stock, can hardly be called a minority interest) and of the United States Express Company for obtaining larger dividends was referred to in the *Railroad Gazette* of July 27, in an editorial article on the express companies. Within the past week a similar committee has been formed in the American Express Company and a similar effort is under way to obtain for all the stockholders more of the profits. Like action is being considered by minority stockholders of the Michigan Central, a road which has for 10 years paid 4 per cent. on its stock and during that time increased its gross earnings from $13,600,000 to $23,200,000.

These attempts to give minority owners a larger share—in certain cases it would not be too strong to say *some* share—in the management of their companies, are distinctly a sign of the times. They are part of the general awakening in regard to "ways that are dark and tricks that are vain" in corporation management. Though it was not possible, as in the case of the express companies, for all real information in regard to the management of the Kanawha & Michigan to be concealed from its stockholders among the general public, there was apparently a good deal not known to them under the old regime. For example, it was made public during the process of negotiation that the controlling Kanawha & Michigan stock was no longer held by the Toledo & Ohio Central (also controlled by the Hocking Valley), but had been turned over to the Hocking Valley itself. The relations of the companies up to the time this became known were supposed to be that the Hocking Valley controlled the Toledo & Ohio Central, which in turn controlled the Kanawha & Michigan. There is inherently nothing wrong in the transfer of control of a railroad from one controlling company to another, and no doubt the transfer was made in all honesty; the morally, if not legally, wrong part of the transaction was that it was done without giving any information as to the transfer to the whole body of stockholders of any of the three roads interested. Of course, the controlling interests in Hocking Valley, who are also the controlling interests in the Toledo & Ohio Central, who are also the controlling interests in the Kanawha & Michigan, undoubtedly knew all the details of the transaction, but the minority stockholders seem to have been left entirely in the dark. The only reason it is necessary to point out the wrong character of such a transaction (we are not necessarily condemning this particular transaction) is because it has been so common for such things to be done without thought or comment. In such a transfer as this the controlling interests deal with themselves in three capacities—as buyer, seller and object of sale. They are, practically speaking, entirely in control, have all the facts at their command, and in general can, if so disposed, arrange matters to their own interest as against the interests of the whole body of stockholders. This is not saying that they generally do this, simply that they have the chance to do it. They ought not to have the chance.

Even with the consolidation plan as now arranged, there is apparently no reason why the common stock should be so highly favored as compared with the preferred, except that the interests which control the property happen to own common rather than preferred stock, and are able under the terms of the organization to retire the issue which stands between them and higher dividends In the nature of things, there is no reason why the charter provision that all dividends above 4 per cent. shall be equally for the benefit of all shares, whether preferred or common, should not have been left in force and the preferred and common stock been allowed to share equally in the future prosperity of the property. Entirely aside from this, however, it appears—though, of course, there is no absolute proof of the assertion available—that it was the intention of the interests which control the three properties to bring the Kanawha & Michigan stock into the consolidation at a very much lower price to the minority owners than that which, under stress of effective opposition by the minority, they have agreed to give for it. Although there may be circumstances not generally known which disprove this conclusion, it seems pretty obvious that at least one-third of the stockholders of the company secured what appear to be their fair rights from the interests in control only by force. This state of affairs in American corporations must be brought to an end before the present disturbing hostility to corporations can be expected to subside.

## VIRGINIA TWO-CENT FARE LAW INVALID.

Legislative railroad-baiting has received a decided setback in Virginia. The act passed during the last session of the Virginia legislature requiring roads in that state to place on sale on June 15, 1906, mileage books of 500 miles at two cents a mile has been held to be unconstitutional by the Corporation Court at Staunton and by the State Corporation Commission at Richmond in independent proceedings.

The contention of the roads that the law was void was based on several grounds, but they relied principally on two points. The first of these was that the Constitution of Virginia has divested the legislature of power to prescribe rates by the provision that "the authority of the Corporation Commission, subject to review, on appeal, to prescribe rates, charges and classification of traffic for transportation and transmission companies shall be paramount, but its authority to prescribe any other rules, regulations or requirements for corporations or other persons shall be subject to the superior authority of the General Assembly to legislate thereon by general laws." The second principal point was that the law was in violation of the Fourteenth Amendment of the Constitution of the United States in that it would deprive the railroad companies of their property without due process of law.

The Corporation Commission and the court both found the law to be unconstitutional and void on the ground that it was in violation of the Fourteenth Amendment, both decisions being based principally upon the decision of the Supreme Court of the United States in the case of Lake Shore & Michigan Southern Railway Company vs. Smith, 173 U. S., 684, in which it was held that a similar law enacted in the state of Michigan was in violation of the Fourteenth Amendment. In that case the court said: "The power of the legislature to enact general laws regarding a company and its affairs does not include the power to compel it to make an exception in favor of some particular class in the community and to carry the members of that class at a less sum than it has the right to charge for those who are not fortunate enough to be members thereof. . . . Regulations for maximum rates for present transportation of persons or property bear no resemblance to those which assume to provide for the purchase of tickets in quantities at a lower than the general rate, and to provide that they shall be good for years to come. This is not fixing maximum rates, nor is it proper regulation. It is an illegal and unjustifiable interference with the rights of the company."

The Corporation Commission did not find it necessary to pass

upon the contention that the Virginia legislature had been divested of power to prescribe rates, but Judge Holt, of the Corporation Court, denied that this was true, in an interesting argument in which he held in effect that this power resided in both the legislature and the Corporation Commission, but that the authority of the latter was paramount to that of the legislature.

This Virginia episode is interesting chiefly as illustrating the tendency of legislatures and the public, following the example of one high in official life, to seek to override the laws and the courts in their hysterical campaign against corporations. The Virginia legislature might have been excused for believing it had power to enact the Churchman law if the case of the Lake Shore & Michigan Southern vs. Smith had never been decided, but the evidence is conclusive that the members of the legislature knew this law was in violation of the Constitution of the United States and that they persisted in passing it for the sole purpose of being able to pose before their constituents as champions of "the people" against the corporations, leaving it to the courts to take the responsibility of making an unpopular decision in upholding the well-established law of the land. Not only were the Smith case and other cases bearing on the constitutional question thoroughly threshed over in the legislature, but the member who introduced the bill admitted before a legislative committee that he knew it was unconstitutional.

Then, following the enactment of the law, when it became apparent that the railroads, relying on the fundamental law of the United States, as interpreted by the Supreme Court, proposed to ignore the unconstitutional and invalid enactment, a campaign of violent abuse was inaugurated and was participated in by the press of the entire state, with few exceptions. The railroads were denounced as law breakers and as defying the laws of Virginia. It might be pertinent to ask in this connection whether the real lawbreaker in such a case is not the legislator who knowingly seeks to violate the fundamental law under the forms of legislation?

## NEW PUBLICATIONS.

*Universal Directory of Railway Officials.* Edition of 1906. 626 pages. Cloth. Published by the Directory Publishing Co., Ltd., 3 Ludgate Circus Building, London, E. C. Representative for the United States, A. Fenton Walker, 143 Liberty St., New York. Price, 10 shillings.

This is the twelfth year of existence of this very convenient and valuable publication, which gives a good list of the railroads of the world, compiled from official sources under the direction of S. Richardson Blundstone, editor of the *Railway Engineer*, together with a list of the officials of each road, and statistics of mileage, gage and equipment. No other single publication can take its place for reference purposes merely with regard to the physical characteristics of the railroads, while the list of officers is, so far as we know, entirely unique.

# CONTRIBUTIONS

Baltimore, Md., July 25, 1906.

To the Editor of the Railroad Gazette:

What considerations led the Master Car Builders' Association to fix 70 per cent. of the light weight of the car, as the braking power for freight cars? I am of the opinion that a braking power equal to the weight of the car can be used, if the co-efficient of friction of the brake-shoe on the wheel is made equal to that of the wheel on the rail. WILLIAM REDPATH.

[The object of limiting the braking power to 70 per cent. of the light weight of the car is to prevent the possibility of wheels slipping on the rails and wearing flat spots. Slight variations in the leverage of the brake rigging, variations in the cylinder pressure assumed in calculating the braking power and varying conditions of the rails must all be taken into consideration and some allowance made. A margin of 30 per cent. is found in practice to be about as small as can be allowed. It is obviously impossible to make a brake-shoe having the same co-efficient of friction at all times and with all wheels as that between the wheel and the rail.—Editor.]

### Wrongful Diversion of Foreign Freight Cars.*

Mr. Daly (Ill. Cent.). As a member of the committee, I will explain the conditions. During the time that mileage was in effect it was practically a rule for the roads to exchange cars for return loads. In other words, the road originating traffic called on the receiving line, or the road to whom they delivered the traffic, to put in their quota of the cars necessary to handle the joint traffic, and they did it. The originating roads also demanded a transfer of their cars when loaded with commodities that would stand transfer, and the receiving road transferred the freight.

Next came the Per Diem Agreement, and with that all of the old practices went out of use. The road receiving traffic from another road figured that the road originating must put its own cars into it; must deliver them to the receiving road and let them go through regardless of what effect it might have on their own local business, and the road receiving the traffic did not consider that they were under any obligation to participate in furnishing cars for the return traffic. The result is, that the roads originating grain, cotton, lumber and all low grade commodities of that kind, are today obliged to furnish practically all of the cars necessary to take care of the business, and let them go through. During the months of October, November, December and January last, we had 22,000 Illinois Central cars on the tracks of foreign railroads at all times, and we had an average of from 10,000 to 11,000 foreign cars on our rails. We have built 60,000 cars, which is ample to take care of our business, and to put in our share of cars for joint traffic with our connections. Still we went through that four months with 10,000 less cars than we own, and the connecting lines to whom we delivered good-paying revenue (either they or the connections beyond them), took this surplus 10,000 Illinois Central cars, and either used them locally or in joint traffic with others. The result is that we lost thousands of dollars in revenue, and we lost thousands of dollars on the investment we made in those additional 10,000 cars which we did not get the use of.

We considered thoroughly the question of a penalty for diversions. I will say, frankly, that I could not, with four times the force I have to-day, detect 50 per cent. of the diversions we made last year of foreign cars on our own road if we wanted to voluntarily report it to our connections; and what opportunity would we have of detecting diversions on other railroads? For example, we load a car to Philadelphia via the B. & O., the Pennsylvania or the Lake Shore, and the Lehigh Valley and Central of New Jersey. When that car reaches Philadelphia and begins to bob around on the B. & O., Pennsylvania, P. & R., or Central of New Jersey, how would we detect the diversions? It is a physical impossibility. The car might be loaded to St. Louis, Louisville or Cincinnati. It would appear to me and also to an ordinary clerk that there was a diversion. The road which loaded it back into St. Louis, Nashville, Chattanooga, or some point in the direction of home, would maintain that it did not divert the car. Again, the application of a penalty rule of that kind has never been successful. It simply means that the agent who is working for the interests of the company, renting the car in a way which he thought would be stretching the rule a little, but not seriously putting the car out of line, would be assessed this one, two or three dollars, as the case might be. That immediately puts bad blood between the agent and the company. The agent thinks the company is not his friend; is fighting him; and the result is, a penalty rule of that nature could not be successfully enforced.

Now, the suggestion was made of establishing limits, where certain roads' cars should be transferred. That, the committee found, would be impracticable, for the reason that a traffic line like the Pennsylvania, or the Vanderbilt system which extends over and covers the local territory in Illinois, could originate grain and let it go through on their line without breaking bulk; and if we undertake to enforce a transfer at Chicago or Buffalo against another road, for instance the Lehigh Valley or the Nickel Plate, it would create a hardship on those two roads and they could not compete with the road that did not transfer. So that would, from a traffic standpoint, shut out the recommendation of keeping your cars within a given area. At the same time the committee fully appreciated the fact that the owner of the car must necessarily be protected in the enjoyment of the use of its cars, or by a car of equal value from the other road. Your committee have not deemed themselves big enough or wise enough to lay down any particular plan—the pooling of cars or any other specific proposition. We have simply placed before you the conditions as they exist. In the past two years all railroads without exception have handled cars regardless of ownership, and it has got to such a point that the roads building equipment must necessarily look to us to take some action to break up this practice. The committee thought that by bringing it before you and exposing it, the gentlemen present could formulate in some manner a recommendation to the American Railway Association Committee, to attach to this report, that would tend to break up this practice. The executive officers of railroads must soon call a halt on the pernicious manner in which roads are handling other peoples' cars. We all admit guilt; we are all bad, and there is justice in the recommendation of this committee, that the railroads exchange cars equally between each other. That is a recommendation that we can all work to. It is no hobby. If we deliver to the Lake Shore at Chicago on December 1 50 loaded box cars—Illinois Central, Lake Shore or whatever they are—we naturally expect the Lake Shore to return us an equal number of

*Extract from discussion at the last meeting of the Car Service Officers (Denver, May 17).

cars; and in that way let the Lake Shore protect its own business. I might say that the originating roads, especially in the central and western field, are going to be up against it with the state authorities. Not only there, but also in the south. The states of Minnesota, Iowa, Missouri, Ohio and Louisiana have up the question of reciprocal demurrage. In Iowa the bill was to assess demurrage against the railroads on the basis of a dollar a day for failure to furnish cars within three days after being ordered. Now if we are to be fined a dollar a day for failure to furnish cars within three days after they are ordered, and the cause of the failure is due to the fact that the roads we are giving this traffic to are holding or misusing our cars and refusing to give us an equal number of their cars to protect us, the roads must then arbitrarily take the position, in self-defense, that you must transfer the stuff; but how much better it would be if the B. & O., Lake Shore, Erie and other roads would come together with the C. & N.-W., C., M. & St. P., Rock Island and other roads at Chicago, and say, "We are willing to meet you half way on this. Instead of transferring your cars we will give you 50 of our cars for every 50 of your cars you give us. Then we are protected and you are protected, and it is not necessary to penalize anybody and create a thousand times more confusion than we have now."

Mr. Bell (P. R. R.).—The Pennsylvania is building 36,000 cars as additions and as filling vacancies for old and low capacity equipment. We will have retired at the end of this year as out of service 16,000 old cars, and we will have new standard 100,000 lbs. capacity cars in service to take their place. The tendency in the last year has been that these cars get away from home and do not get back, and we are losing more of them every day. We have lost 2,000 of them in the last 30 days. We cannot go on improving our equipment and building standard cars, and have less cars to do the business on our own railroad. We cannot possibly continue business on that principle. I do not know what to suggest as a remedy. Our people are very much exercised about this question, and why should they not be? There has got to be a change of some kind. Mr. Daly has explained the whole situation in a very excellent way, but what are we going to do about it? The Illinois Central is not going to keep on building standard cars forever, and let them go away and he used at 20 or 25 cents a day. We are going to be up against this California proposition in a very short time. If they ever build San Francisco up again, which I understand they are going to, they will need a great deal of structural iron, and where is it going to come from? Largely from the state of Pennsylvania, and originating largely on the Pennsylvania Lines. Who is going to furnish the cars to take it to the Pacific coast? If we are going to furnish most of the cars to take that iron to the Pacific coast, and have them tied up there for months, we cannot do business at home. We might transfer it, but that is expensive business. I do not know that we ever could do such a thing, but there are some of the big roads thinking about something of this kind. It is the only remedy they can think of. Whether the business would ever stand for such a thing as that I don't know.

Mr. Beecham (C., M. & St. P.).—When cars have become plentiful, we have become exceedingly virtuous, and we are just as strictly opposed to the diversion of foreign cars on our road as anyone could possibly be, but we have educated our agents in bad ways. They have gone astray, and now it is going to take considerable time for us to get them back into line again. It takes a good while for instructions to permeate a system of 7,000 miles of railroad, and I presume that just about the time that we get those fellows eductaed up into proper ways of handling foreign cars, then a busy season will come on and we will let down the bars, and away they will go. That has been the practice ever since I knew anything about the handling of cars. Bell has referred to the proposition of making transfers, but he thinks that that will never be done. I agree with him. The business will not stand for it, and the road that undertakes to insist upon transfers will perhaps find itself with plenty of cars on hand and also with little business.

I do not believe in a penalty. The thing that we are trying to remedy is too great. An exchange of cars might possibly be the remedy for this trouble, but unless district car distributors are appointed and general distributors, there will not be anybody to see that the rules are carried out any more than they are now. The traffic will continue to distribute the cars in the future as it has done in the past. There is no question about that. The only way that I can see to prevent the distribution of cars by the traffic is to appoint umpires, or car distributors; men whose mandates must be obeyed; men who will know what the situation is on every railroad in this country, in a general way, and men upon whom every railroad can call for assistance when they need it. Those are the men, and only the men who can force the cars against the prevailing tide of traffic; and if such an arrangement as that could be brought about I think there might be some hope of a remedy being found for the trouble, but I am utterly unable to see any other way out of it.

Mr. Wrenne (N. C. & St. L.).—The suggestion that a road receive and return to a road an equal number of cars is impracticable at times. You cannot get as many cars back as you deliver at all times. We have not been able to do it for years past.

Mr. Daly.—The expense of maintaining a car and depreciation of a car is at the present time practically $144 to $150 per annum. For four months the 20 cents a day you get amounts to about $25 in per diem rental for that car. Now, during the remaining eight months of the year we do not need these 10,000 cars. We have no use for them. We have lost their use for the year; consequently we are out approximately $100 to $125 at the very least on each car, and confiscation and diversion of these cars has caused us to lose nearly a million dollars on the investment, as we get little if any return traffic in these cars. They come back empty when the busy season is over. The remedy to apply is to raise your per diem rates to a point where they will compensate the owner for his equipment during the busy season, for which period it was constructed. Why could not the American Railway Association set a date that would strike the beginning of the busy season for railroads throughout the country, on which date the rate per day per car would be increased, say to 75 cents or $1 for every day you have a car, and waive the penalty, that dollar a day for four or five months being sufficient to compensate the owner for building a car when he is deprived of the use of it. When the business gets dull, then drop down to 20 cents a day, in order to prevent creating the necessity for transferring freight to avoid settling on the high basis. The result of that would be that the railroads that have been living on other companies' equipment and doing business during the busy months with cars against the owners' wishes, and giving them no return traffic in the cars, would find it to their advantage to build equipment to take care of themselves during the busy season. If everybody does that, then you have free interchange of cars. But your committee have not considered it advisable to recommend that proposition, for the reason that it will take two or three years to put it into effect, and in the meantime we have lost two or three more million dollars waiting for it.

. . . If you undertake to transmit that power of handling the cars over the different systems to an outside party, who cannot possibly get a regiment of help around him to make him familiar with it, I am sure in 30 days two-thirds of the principal roads going into it would pull out of it. Each road itself is going to handle its own business. It is going to do it in its own way, and they are not going to have a clearing house or a pool commissioner to distribute their cars. But if you put the rate so high on per diem as to make it a penalty to hold a car under any conditions longer than necessary, then you have put the arrangement where it should be. If a road wants your car they ought to pay you at least what it is worth. Put the rate up to that point, and make it an object for the man who has the foreign car to get it home, and then you have accomplished what you are after. I would not for a minute consider that any commissioner—I do not care how big his brain or his body is or how big his office force is—could distribute cars for a lot of trunk lines or granger roads satisfactorily for six days, to say nothing of 30 days. He could not get an office big enough for his file cases to put his reports in for information necessary to have to permit him to handle the equipment satisfactorily.

Mr. Kearney (B. & O.).—I think Mr. Daly's suggestion as to an increase in the rate is the best suggestion made up to the present time. The B. & O. built 10,000 cars during the last few months. To-day we have 600 of our cars less on the road than we had a year ago. We are supplying 100,000 lbs. capacity cars for other people to do business in, and we are getting 20 cents a day. We are of course originating the traffic which takes them away from home. Other people get them and they do not load them towards us, and Mr. Hale has requested a recommendation from us of something definite.

Mr. Rawlins (K. C. S.).—The Kansas City Southern Railway originates a great deal more business than it gets back. We deliver at the Kansas City gateway 100 cars a day, mostly lumber, and the majority of that business goes to roads who have no loading back to us. It goes anywhere from 100 to 1,000 miles away from Kansas City. Would it be policy, or can we expect to adopt any penalty that will have those cars returned to us empty? We have already taken that matter up with our large connections and told them: "We do not expect you to return our cars to us empty when you have loading for them, but we do expect you to even up on the interchange"; and that seems to me to be a very simple matter. It is merely to make good the day's interchange. If the interchange with the Milwaukee road shows a debit of 50 cars per day, let them give us 50 cars, and it will fix it, as far as our road is concerned, perfectly. Not very long ago the Car Service Department was forced to recommend, in answer to the question of what additional equipment we needed, that we could not afford to buy any more box cars or stock cars when we already had more equipment, according to our mileage, than any one of our connections; and if we had 10,000 cars more our experience would be just the same as the Illinois Central.

Mr. Wolff (Penn. Lines).—There has been a good deal of talk about penalty; penalty for diversion. Let the penalty take the form

of discipline toward the employee who is so enthusiastic in obtaining traffic as to wilfully disobey the rules now in existence. Why not try this as a temporary expedient? Many orders are issued in a way that they are not expected to be obeyed. Certainly they are not obeyed. And then again (and I am sorry to say at somewhat rare intervals) orders are issued that are obeyed, and it is possible to issue such an order. Just as sure as I am standing here to-day, it would be possible, within 96 hours, to stop 80 or 90 per cent. of the so-called abuse of equipment of the railroads of this country. While I do not desire to make a motion on this subject, I merely offer this as a suggestion, and repeat, that if the existing law on this subject was enforced by every railroad represented here to-day (and it can be enforced if the proper executive law is placed behind the order), our troubles would cease.

Mr. Tomlinson (P. R. R.).—Years ago our late lamented Vice-President, Mr. Prevost, devoted a great deal of thought to this very question, and his remedy was first, as Mr. Wolff suggested, the enforcement of a suitable set of car service rules; and second, the application of a power to enforce those rules. It is all right to say we will go to our executive officers and induce them to issue positive orders; but to-morrow traffic develops. This road sees a prospect of getting 500 carloads of freight. Will the general manager enforce it? Therefore Mr. Prevost went further, and suggested a rule in which the road complaining of another road holding cars unduly, or diverting, or failing to enforce car service, should have the power under the agreement, to penalize that road, and as he suggested, a penalty of $500 a day might be too small. His thought was that that might be enforced by agreement. And that is the only way you can carry it through.

Mr. Clarke (M. & O.).—I agree with Mr. Bell, that per diem is not high enough. If you put the per diem up to one or five or ten dollars a day, it is easily settled. There is not a man here who cannot get a car home if he wants to. I misuse cars, and so do you, but if you put the per diem up high enough, there is not a man who will lose his job by not sending a car home. It is simply because we do not try. What is the use of going to an executive officer and asking him if we can load a foreign car or not. We, as representatives of the transportation departments, have it all in our hands. We have not the nerve to go to the general manager and say, put it up to ten dollars. If we did, you bet every foreign car would go off your road in 24 hours.

Mr. Drew (Wis. Cent.).—Mr. Daly's suggestion of 50 cents per day, or more in busy seasons, would have a wonderful effect. I think also that if we could by some means put a penalty on the roads who ship our cars back and forth between close neighbors, say for three, five or six months, at very regular intervals of about 25 and 26 days between, it might be a good thing. Maybe you have had some experience in that line. We had about 180 cars that had been off our road so long that we just simply wanted to see them to see if they didn't need to be repainted, and we sent a man to a certain section of the country to see, just for curiosity, what was being done with those cars. He returned last week. He said he discovered a very interesting traffic in that section of the country, which was a short haul, but which was to be equally divided between two or three roads who ran into the country where that traffic originated, and took that traffic out to an adjacent point where the cars would be unloaded. He found that not having very many cars of their own, it was their practice to not only take Wisconsin Central cars, but everybody else's cars, when they got into their hands, and they would use them in that traffic, which was joint, until they got our penalty notice. Then they handed them over to the other fellow and said, now you keep these a little while. In the meantime the other fellow had had some in the same way, and he simply passed his to the other chap. So those cars have been vibrating back and forth there and we have been receiving $6 a month on those cars we bought during the busy season just about a year ago. Nice new cars they were then, and they made one trip over our road and that is the last we have seen of them. Now those gentlemen were very kind when my representative went there, and said: "Well, that is a shame, and we will see that those cars are started now toward home." . . . Plain, simple honesty, fair dealing, is what we want in a great many cases.

Mr. Tomlinson.—I should like to ask Mr. Daly, under his proposed plan of balancing exchange of equipment, if, for instance, he delivered 50 loaded cars a day for a week to the Pennsylvania and got back a corresponding number of empties or loads, and at the expiration of a week the Pennsylvania said to him, "We are out of cars," what would he do? Would he go over and give us the freight, or what would he do?

Mr. Daly.—The friendly working relation which this exchange would bring about would be such as to be flexible. We have recommended no ironclad rules, that would work a hardship on anybody. We simply say to exchange cars equally between the delivering and receiving roads. Now if you have, during the past week, given us an equal exchange, it is up to us to carry you through and protect your loading, and next week when we are down and cannot make good our end, you equalize with us. Any rule is a bad one that is not flexible to meet conditions as they arise. I think the Pennsylvania and Illinois Central, under a good, fair reciprocal exchange would be benefited both equally, in taking care of the traffic, and we could afford to be liberal with each other as conditions arise.

Mr. Tomlinson.—Mr. Daly has not grasped the purport of my question. I assume for argument, that at the expiration of a week his own supply of cars is getting close and he has a lot of freight in sight. He does not want to give it to the P. R. R. because they have no cars to give back. What will he do? Will he divert that to other roads?

Mr. Daly.—When we put in a reciprocal arrangement of that kind the record necessarily kept by both companies would be such as to show to our general manager and our vice-president, if necessary, the conditions existing between us, and if we could not exchange cars as we agreed, it would be a matter for our superiors to take up and handle, and we would always have the information in proper shape to present to them showing these conditions and how often they occur. A great many of our troubles are the result of our not knowing our own business and not knowing the extent to which these abuses exist, either by being too busy or not having a record of them.

Mr. Ewings (N. Y. C.).—I think the day is coming when we will adjust per diem matters with our immediate connections only. The term "diversion" is a very hard one to define, and particularly as applied to the handling of equipment. Traffic conditions to-day in this country are such that no one is capable of properly defining the word. . . . It has been stated that we might exchange car for car at junction points. I would go a step further and exchange by class of cars on a basis of tonnage capacity. I know that it is a radical step. If we should deliver 10 box cars to a given connection, the total capacity of which aggregated 350 tons, we should have 350 tons of box car capacity from that connection that day, or payment at a rate per ton capacity, and that rate should be one that would force a road to pay its debts. I would advocate a cash settlement every day, but with the immediate connection only. To my mind some plan of that kind would make the cars follow the traffic. In whatever section of the country traffic demanded cars, that section would have them. The rate should be one that would be a combination of per diem and penalty; one that if a road does not pay its debts, the executive officials see it in dollars and cents. There is another advantage in a plan of this kind. It would not be necessary to have a standard rate for all classes of cars. It would not be absolutely necessary to have the rate for box cars in the eastern country the same as in the western or southwestern. That could be made a matter of agreement between the interested roads in various sections of the country. I presume in some sections, for instance in this western territory, that at times stock cars are more in demand than any other class of car. Let them have the higher rate. In the east it would be necessary to have the higher rate apply to box and coal cars. I suggest a rate of 1 cent per day per ton capacity. If we deliver a 50-ton capacity coal car to another road, we want a like carrying capacity coal car, or we want a cent a ton per day. It is nothing more or less than a junction settlement of freight accounts applied to exchange of equipment, and it seems to me very simple. I would like very much to have the committee consider it.

## The New Standard Code.

BY H. W. FORMAN.

Daniel Webster himself could not have asked for a more intelligent and discriminating audience than was assembled at the Auditorium Hotel in Chicago at the April meeting of the American Railway Association; but only one short talk was forthcoming. Either the work of the committees was so well done as to require no criticism, or the higher officials present had other problems to take up their minds and were in a hurry to get home. If any one expected to hear the proposed revision of the standard code talked over he had to go home with his thirst for knowledge unappeased.

If the code is "a mere statement of principles, which railroads may elaborate upon and amplify as their circumstances may seem to demand," the rules are now in much better shape than ever before, and if changes or amplifications are made with due regard to harmony with the general principles, they can be applied anywhere. In suggesting some amplifications I shall consider some rules that I have previously discussed, as it is my intention in this paper to consider the whole code.

At the end of this review I shall present a summary in which the rules discussed will be printed in full. Those rules of the standard code, which are omitted or passed without comment, are satisfactory.

To require all meeting or waiting orders to be addressed in duplicate to the operator at the meeting or waiting point is the best practice, but unless the despatcher can find time to properly issue such orders the result of adopting such plan will be disappointing. Those who contemplate using this rule should not lose

sight of the fact that the work of despatchers is thereby increased about one-fourth.

The form for putting rules in effect says that "special instructions may be issued by proper authority." As men are often in doubt about the order in which instructions should rank, I have dealt with this matter in a separate rule, No. 102. It is generally held that special instructions, strictly speaking, can be given only through the medium of a time-table. Matter posted in bulletin books should not be regarded as special instructions, though it must be obeyed just the same as if it was.

As newly employed persons may not be aware of the existence of a rule book, Rules A, B and E would look better if revised and consolidated, thus: "Employees whose duties are prescribed by these rules must be furnished a copy, which they shall keep at hand while on duty. They must be conversant with the rules and special instructions, and render every assistance in their power in carrying them out. If in doubt as to their meaning, apply to proper person for an explanation."

It is wrong to frame a rule so that something must be read into it. Take, for example, Rules G and H. An employee can cause as much trouble by using intoxicants just before going on duty, as while on duty. Rule H prohibits smoking by the janitor in the basement of a passenger station, or a laborer who may be repairing the roof. The rule could be changed to read, "The use of tobacco in the presence of passengers is prohibited."

As the book of rules is for the exclusive use of employees, to begin every rule in the back part of the book with "Employees are required," "Conductors must," "They will," etc., is unnecessary.

The new definitions show improvement, although some one has suggested that unless a halt is called we shall soon have definitions for car wheels and drawbars. At least two more would be acceptable, "precedence" and "trainman." "Precedence" means "authority by time-table or train-order to hold the main track over, or to move ahead of or against another train." My understanding of a "trainman" is "a person assigned to a train to take part in the work of its proper movement." Under this definition it will not be contended that mail clerks are included, but it does seem to be sufficiently broad to embrace the train and engine crews, and also baggagemen, who are sometimes required to flag. By Referring to Rule 104, as well as many others to be found in different books, it will be seen that it is necessary to know what classes are included when trainmen are mentioned. Inquiry will develop the fact that there is a wide difference of opinion as to the meaning of the word, and some will disagree with my interpretation of it, preferring to exclude enginemen and firemen.

It is difficult to make a sharp distinction between a "siding" and other side tracks. Perhaps "passing track" would have been better. Ask almost any conductor or engineman who has not been drilled on standard rules what a siding is and he will reply that it is any track except the main track; but if questioned as to a passing track he will at once define it as a track set apart for meeting and passing trains; one on which cars must not be left without permission from the train despatcher.

In nearly all books the watch certificate is printed. It is no more necessary to print this form than a dozen others fully as important.

Rule 4 may turn out to be satisfactory when some points are cleared up by the train rule committee. One question that is now being asked quite often is whether or not No. 1 can start by new time-table at 9 p.m., 30 minutes late, if due to leave its initial station at 9:30 p.m., by old table, and at 8:30 p.m. by new, and the new time-table is made to take effect at 9 p.m. I would not care to express an opinion either way, as to do so might cause some one to get an impression differing from that intended by the men who have authority to settle the dispute. I do not favor adopting the rule with the words "class, direction, and initial and terminal stations" retained. Such a condition occurs but once in a lifetime, and there is some risk in requiring men to check every schedule for these things every time a new table takes effect. Should there be a difference and the train therefore be not authorized to run, some one might overlook it in checking. It would be best to omit such words and provide for the differences spoken of in a different way—by annulling the schedule. If the words "and date" had been added after "number" in the last line of the first paragraph, the rule would have been plainer.

In order to economize space, slight changes in rules will not be noted here, but all that are printed in the summary may be understood to differ in some way from the code, in just what particular can easily be ascertained by comparison. For example, see Rules 7 and 26.

Two or three additional whistle signals are often provided in Rule 14: (*o*) Two short blasts, given three times, with proper intervals between, is a good signal to indicate that the brakes are sticking. (*n*) One short, one long and one short, can be used by passenger enginemen to acknowledge conductor's air signal indicating that the train holds an order to meet, or wait until a certain time for, another train at the next station, or the signal may also be given when a superior train is to be met by time-table. It is not safe to acknowledge such signal by two short blasts of the whistle, as this has often misled a flagman in front of the train and caused him to cease flagging, step aside, and allow the train to collide with his own.

At least two air signals can be added to Rule 16 to advantage: (*i*) six, to shut off steam heat; and (*j*) two short, followed by one long, to remind engineman of a train order, or a superior train to be waited for. It may be contended that two short, followed by one long air whistle, cannot be made and have enough air left to immediately signal to stop should it be found necessary to do so, but no trouble will be experienced if the proper reducing valve and whistle are maintained on the engine and kept in good order.

Although Rule 17, requiring the head-light to be concealed when a train has cleared the main track to meet another, etc., has been in effect for years astonishingly little attention has been paid to the matter. Means for covering the head-light are of the crudest kind. Generally the fireman must risk his life by going to the front of the engine, where he must climb up several steps and attach a shield, or open the front of the head-light to get at the curtain to pull it down. Electric head-lights are sometimes turned down, thus rendering the engine-number in the head-light so dim that the train cannot then be identified by its engine number. A few companies have provided an incandescent lamp to be switched on while standing on the main track to meet trains. It is quite difficult to see the track and signals in the face of a powerful arc light and a flagman back of it cannot be seen at all. It is possible to reduce the brilliancy of the arc light, but there is some risk in permitting the practice, as enginemen are apt to turn the light down too low and give a false indication to an opposing train. The old 23-in., deep-reflector oil head-light was in many ways superior to the present smaller oil head-lights, and there is a growing disposition to return to it. There is another way in which this rule is imperfect: the engineman gets no distinctive signal from the rear when his train is clear of the main track. Either he guesses at it, or has to wait until told by the man who has walked from the rear for the purpose. Often this causes delay to opposing trains, as they may arrive before the man has been able to make the long foot journey. It may be said that a stop-signal given from the rear is sufficient. This is no doubt quite common practice, but should the caboose leave the rails at the switch such a signal would be given at once and the engineman might then cover his head-light and cause a collision. When it is impracticable to go to the engineman, or when he cannot positively know that his train is clear on account of the siding being in a curve or the tracks close together, he should receive a stop-signal from the rear given by a green lamp. Where such a signal cannot be seen a man should be sent to tell the engineman that his train is clear of the main track. Under the rule the head-light means much to the approaching train, and it is therefore worth while to go into this question thoroughly, and make it practicable to comply with the rule.

Rule 19 provides that markers shall be turned to show green to the rear when a train turns out to meet another, the same as when it takes the siding to be passed. The argument in favor of the practice is that then men will form a good habit and not forget to turn markers when they are to be passed; that a train may desire to pass while they are waiting to meet a train; that it is good information for the following train; and that it furnishes the towerman necessary advice. If the man who made the rule will follow a freight brakeman around all night he will probably modify his views and change the rule back to read as it originally did.

The practice of allowing markers to show red to protect some other train is objectionable. When a train, to allow a following train to pass, finds it necessary to head in on another train, and the siding will not hold both trains, and the train met on the siding has to back part way out on the main track, each should look out for itself. Whenever the correct and sound theory that every train must be protected by its own men is departed from, collisions are advertised for. The markers should be changed to show green at the rear when clear of the main track, and the train which must back out should be fully protected by its own men. The principle in this case is the same as that relating to concealing the head-light—it is concealed when the train is clear of the main track, regardless of any following train.

Rules 24 and 102 relate to practically the same thing and would be better consolidated.

It would be interesting to know in how many states the law requires each car of a passenger train to be connected with the engine by a communicating signal appliance, and how the law is complied with on freights that carry passengers. Mixed trains often haul 15 or more loads and to attempt to work a bell-cord over this many cars is impracticable, but Rule 25 requires that it be done.

Rule 29 is badly administered on many roads. During a recent trip the different ways in which different roads were seen to be complying with the rule were remarkable. On one large system the engineman rarely whistled, except for stations and public cross-

ings, while on another road, where there were fewer trains, the whistle was used every few minutes. To get the block signal changed to proceed, four short blasts were blown, and its change was acknowledged by two short. With these unnecessary signals added to the station whistle, to the answers to conductor's signal to stop to let off passengers, the signal calling attention to flags displayed for a following section, and answering such signals given by other engines, there was a confusion that made the entire matter of whistling seem ridiculous. Sounding two short blasts at any and all times impairs its efficiency and often causes flagmen to be misled. In order to provoke argument, I shall propose a rule based on a radically opposite view, to illustrate how far some companies have strayed in the wrong direction.

In Rule 82 a decided improvement has been made. The old rule was generally misunderstood and was far from clear. Under the new rule there should be no misunderstanding, although it is somewhat more exacting than appears to be necessary. It will be noticed that a sharp distinction is made between the schedule and a train which may be using such schedule. The schedule is in existence until 12 hours after its leaving time at each station, while in the case of the train it becomes void when it is 12 hours behind either its arriving or leaving time; but if there be an unexpired part of the schedule the despatcher may authorize it to resume its run under the schedule, if he desires to do so, or he may give the schedule to some other crew. This is correct theory, because other trains must clear the schedule, not the train. The only objection I see to the rule is in stating that the train loses right and schedule when 12 hours behind either its arriving or leaving time; if it has three hours dead time at a station, and arrives less than 12 hours late, it should be allowed to leave on the schedule, if it can do so while the schedule is in existence.

When the second paragraph of Rule 85 is considered, it would appear that the word "may," instead of "will," should have been used in the third line of the first paragraph. Taking the rule as a distinct proposition it hardly covers the ground. A train may run ahead of another of the same class only to the schedule passing point, where it must take the siding and wait indefinitely for the train which is scheduled to pass it, unless advanced by train order. One is apt to get a different impression in reading this rule, and unless this point is cleared up it may be necessary to make a ruling to the effect that the train to be passed becomes inferior from the schedule passing point. The schedule passing point shown by time-table is a form of special instructions and supersedes the book of rules.

Code rule 86 appears to have been made by some one possessing a laudable bump of caution, but when applied where stations are far apart, making the running time of first class trains say 30 minutes between stations, it will impose unnecessary and unbearable delay upon freight trains. A simple 10 minutes clearance between passenger trains and inferior trains moving ahead of or following them would have been much more generally acceptable. This rule will do harm because managers hesitate about deviating from the recommended practice lest there may be a rear collision and in court they be asked to explain why they did not adhere to the standard code. The excessive caution exercised in this rule had better have been applied to the far greater risk of first class trains following each other only five minutes apart; or a lone engine or light freight, the most dangerous trains that are run, following a heavy passenger train closely. Rule 91 does not afford an adequate safeguard.

It would be better not to include instructions to protect, in case a train fails to clear the main track by the time required by rule, with other matter, as is done in code Rule 87. The subject is important enough to warrant its being given a separate rule number, as was done in the old code, and the words "or order" should be added after "rule."

Instructions as to how the inferior train shall take the siding are duplicated in Rules 88 and 89. There is no reason why the matter cannot be disposed of once for all in one rule. When it is remembered that the superior train may sometimes go to the switch farthest from the station to wait for the inferior train, and that time in the time-table or an order applies at such switch, the third paragraph of Rule 88 does not seem perfectly safe. Suppose that there is a crossover in the passing track; would not the inferior train be complying with the rule if it were to pass the initial switch and go to the crossover to pull into the siding? If there should be a collision where there is fog, or an obscured view from other causes, what would be the standing of the road in court? This is one of the most serious oversights in the rules, and one that should be speedily remedied. The rule should require the inferior train to pull into the siding at the initial switch or send out a flagman from that point.

Rule 88 will not be safe until it requires the inferior train to clear the opposing superior train of the same class a certain number of minutes, or in some other manner provides for a possible variation of watches. While watches have improved greatly even within the past 10 years, there will be in service for a number of years yet watches that cannot be depended upon to show absolutely correct time. Again, time is sometimes misread by looking at hands that are high above the dial from different angles. It looks bad to say in Rule 2 that watches may vary 30 seconds a week, and then prescribe in another rule a practice that might cause a collision, where the view is obscured, if two watches should be a minute apart. It will be said that to require a two minute clearance would necessitate giving too many helping orders to inferior trains to get them to schedule meeting points when on time; but, in practice, it will be found that where time is fast the despatcher fixes meeting points by order any way, knowing that the train is likely to call for help, or through fear that it may be delayed a minute or two by baggage, or animals on the track.

The first and second paragraphs of Rule 90 probably were framed with the view of safeguarding Rule 88, but they are not far-reaching enough to do so in every instance. Let us suppose that Numbers 1, 2 and 4 are first class trains, and that No. 1 is the train of superior direction. It is due to start from A at 2 p.m., scheduled to meet No. 4 at E; and No. 2 is due to arrive at A at 1 p.m., but is three hours late. Notwithstanding No. 2 has the same authority to move against No. 1 that No. 4 has, No. 1 may pass all stations just as fast as its engine can turn her wheels, totally disregarding No. 2, until station E is reached. Here No. 1 must stop, if No. 4 is not there and the view is obstructed; and must thereafter run prepared to stop at all sidings, until No. 4 is met. What is the difference between the two trains? If it is necessary to thus protect No. 4 so that it may come to a station up to the minute No. 1 is due to leave there, is it not equally vital that No. 2's movement against No. 1 be provided for in the same way? To be consistent, rule 90 must read "Until all overdue trains of the same class have been met, the superior train must approach all stations under control, except where there is an unobstructed view from both directions and the track is seen to be clear." Even this provision is open to criticism, because when restriction is placed upon No. 1 in this manner the moral effect is to encourage the men on No. 4 to take just a little chance that they otherwise probably would not. They feel that No. 1 will be on the lookout for them on the main track at the station about the time No. 1 is due to leave there. The word "superiority" should not be thus limited. It should always convey with it assurance that a train is superior in the most unqualified sense of the word. It will be noticed that should No. 1 be ordered to run an hour late, No. 4 could then advance beyond the schedule meeting point on a copy of the order and No. 1 would not be looking out for it. Also, No. 1 may be five or ten minutes late, but without orders to run late, in which case, of course, all opposing inferior trains would have to clear No. 1's time-table time; yet No. 1 is not relieved from the duty of approaching the schedule meeting point, and, other stations beyond, prepared to stop, thus hampering its movement unnecessarily. If Rule 88 provided for keeping the inferior train entirely out of the way of the superior train of the same class a given number of minutes, the restriction now placed upon the superior train by Rule 90 could be done away with.

Rule 92 says that a train must not arrive at a station in advance of its schedule arriving time. It should go on and say "except to properly clear at schedule meeting and passing points." If No. 15, a second class train, is scheduled to let No. 1, a first class train, pass at E, and has an arriving and leaving time there, how is it going to get there when on time and be in to clear by the time No. 1 is due to leave the next station in the rear where time is shown, if No. 15 is forbidden to come to E enough ahead of its arriving time to enable this to be done? It may be said that of course it may do so under Rule 86. If that be true Rule 92 should be qualified to harmonize with Rule 86 and put at rest an argument that will come up daily. It is not good practice to arbitrarily restrict a train in one rule and attempt to nullify the restriction by another.

*(To be continued.)*

## Foreign Railroad Notes.

A Hungarian journal says that the highest speed ever reached in Hungary was made during some trials recently with a "four-cylinder Atlantic locomotive of the latest style," which sounds quite American. The speed attained was 87½ miles an hour.

The State railroads of Wurtemberg are in charge of the Minister of Foreign Affairs. Baron von Soden, who has been the minister for some years, has retired, and is succeeded by Dr. von Weizsackes, who has been trained for the work during the past six years by serving as Minister of Schools and Churches. If Americans question the suitability of such training for a railroad manager, they will do well to remember that our Secretaries of War and the Navy are usually lawyers, and our Postmasters General often only wirepullers. Dr. Weizsackes is 53, the son of one of the most distinguished of German theologians; he has been in the State service since leaving the university, where he studied law, as do most of those who aim at high administrative service in Germany.

## Diamond Jubilee of the Great Northern Railway.

BY W. B. PALEY.

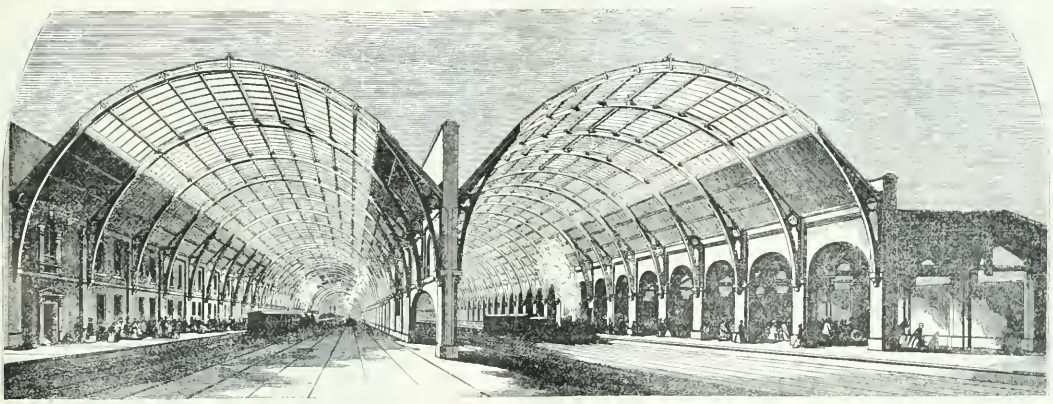
On the 26th of June one of the best known British railroads, the Great Northern, reached the 60th anniversary of the passing of its Act of Parliament. It is a somewhat remarkable fact, considering the extraordinary dimensions the great railroad mania of 1844-5 attained, that this is the only London trunk line, designed as such, which dates from that period. In its time it filled the only important gap left in the communications between London and the provinces, and for many a year was regarded as the last great line that would be built out of London.

The project was not entirely new, however, at the time when it was most prominently before the investing public. So early as 1835 there had existed, on paper, a Great Northern Railway, but it failed to get an Act, and passed out of sight the following year. The negotiations which led up to the formation of the present company date from the spring of 1844. The prize was so valuable that at one time four competitors were struggling for it. At last there remained only two, the London & York and the Direct Northern, which finally agreed to unite their forces under the title of Great Northern, and as such obtained their Act on June 26, 1846. It was not got without desperate fighting in Parliament and the utter waste of sums which would have made many miles of line. The two most powerful opponents of the scheme were George Hudson, the railroad king, the interests of whose lines were affected; and Robert Stephenson, who held that the estimates were much too low, in which opinion he proved quite correct.

The principal objects of the line were (a) to provide access for the agricultural produce of the great farming county of Lincoln to the London markets; (b) to enable South Yorkshire coal to reach the eastern counties and London, as regards the latter by a more direct route than the Midland, and (c) to join in a direct east coast line to Newcastle and Edinburgh by way of York. To effect the first object a loop was made from Peterborough round by Boston and Lincoln to the main line again near Doncaster, thus giving the system roughly the shape of the letter P. However, the Great Northern never got to York by a line of its own, and probably never will. Practically it ends at Doncaster, only 156 miles from London, though by joint ownerships and running powers further on it connects with Leeds and Bradford and with several local lines thereabouts wholly its own property. The North-Eastern and Lancashire & Yorkshire pour a vast traffic on it at Doncaster; in fact, the line has always been noted for being "fed from its extremities." It has also important connections in the Nottingham, Derby and Burton districts, but these only date about 30 years back and formed no part of the original scheme.

The King's Cross terminus was formed, in a poor and squalid neighborhood, chiefly upon the site and grounds of the smallpox hospital. Though considered abundantly spacious at the time, the position is now too confined and the G. N. R. is probably worse off, as to the possibility of future expansion in London, than any other line. The hospital was obtained for £60,000, a sum which would be ludicrously cheap nowadays for the space it covered. King's Cross, however, was by far the finest London station of its time, and is beaten by few even now. Its two great semi-circular spans, 800 ft. long, 105 ft. wide and 70 ft. high, produce a fine effect. The platforms have been extended beyond them at the north end and are about 950 ft. long. There is only one chief main line departure platform, the principle being to load two or even three trains, one behind the other, at it. The screen at the south end, with its two arches corresponding with the spans of roof, is more useful than ornamental, the openings helping greatly to light the station. It is a characteristic bit of Lewis Cubitt's work, Italian campaniles being quite his specialty. The roof girders were originally each formed of sixteen 1½-in. planks, screwed together at frequent intervals and always breaking joint. The girders were 20 ft. apart, 11 in. wide at the bottom and 9 in. at the top, the idea being taken from the Czar of Russia's riding house at Moscow. Both spans have long been replaced in iron. Besides the obvious drawbacks of wood, it was found that the eastern or up side wall of the station was in danger of being pushed down by the effort of the planks to straighten themselves. This side originally had no support other than a covered cab-exit road reaching up about 30 ft., but a long range of offices has since been built over the cab road and the up side is now as secure as the down, along which are the administrative offices, booking hall, etc.

A little way outside King's Cross the line goes under the Regent's Canal, with a very narrow margin of headway, and then under the goods yard, which abuts upon the canal. From here, on August 8, 1850, the first G. N. train left London, King's Cross station not being opened for traffic till Oct. 44, 1852. Tunnel after tunel succeeds, there being seven in the first 12 miles. They are in the London clay, which necessitated the cuttings being widely splayed, making the construction difficult and costly. Much of the clay was burnt for ballast by being mixed with coal in large heaps, which smouldered away for many days. The line rises 1 in 108 at the start for a couple of miles, and 1 in 200 for eight more, after a rest of three miles. Keeping pretty steadily to this summit level of 350 or 360 ft. for some 16 miles it gets down to very low ground,



King's Cross Terminus, Great Northern Railway.
—From the *Builder*, October, 1852.

to rise to about the same height 100 miles from London by nine miles of 1 in 200 and 1 in 178. With these exceptions the main line is decidedly easy, and as it is very free from sharp curves, high speed has always been a special feature of Great Northern practice. For many years it was much the fastest of the standard gage lines. Even in 1852 it ran the 44¼ miles from Hitchin to Peterborough in 58 minutes.

Probably no line in Great Britain works so hard for its living, all its heavy traffic being keenly competitive. A large suburban traffic has sprung up of late years, but is being cut into by electric tubes and tramways. Lincolnshire is largely its monopoly, but a railroad cannot live upon potato traffic. Immense quantities of bricks are brought to London from various places between Hitchin and Peterborough. The line is recovering steadily, however, after being badly hurt by the defection of its old ally, the Great Central, in 1899. It has had many financial ups and downs, having paid a dividend of only 2⅝ per cent. so recently as 1895, while many times it has paid over 7 per cent. For the 55 years, 1851 to 1905, however, it has paid on an average practically 4¾ per cent., which is quite as much as most British railroads can say for themselves. The unusually large proportion of about one-third of the system consists of joint lines, a policy which seems to have been carried a little too far in the past, as it often amounts to letting in a rival and paying half the cost of his coming. At the close of last year the Great Northern owned 705 miles solely and 245 more jointly, making 953, upon which the company ran 13 million passenger train miles, and 10 millions goods and mineral. A stock of 1,279 engines performed this duty. Various types of these have been frequently described in our columns. The Great Northern has always been one of the very smartest of English railroads, and maintains its reputation to-day as fully as it has ever done.

## Modern Scientific Lubrication.

In a paper read before the New England Railroad Club in April Mr. H. C. McCarty considered that much might be said for and against the use of grease. Ordinarily, oil is superior in its lubricating qualities, though under average mechanical conditions grease will endure more prolonged hardship in service, which is the special advantage found in its use.

In fitting driving boxes and rod brasses it has been found good shop practice to have both edges of driving-box brasses and rod brasses rounded with the usual radius in common practice, at one edge of brass. This practice may at first be questioned, but the conditions of service warrant carrying out the details. Both in the case of driving boxes and rod brasses there is a violent lateral movement under speed, and the simple philosophy is that a well-rounded edge will move over the surface of the journal with less friction than will an absolutely sharp edge. Engines at moderately high speed spasmodically throw excessive loads on opposite ends of driving boxes by the violent rolling action, and at the same instant there is a rapid lateral movement. It will, therefore, be appreciated that there is a most striking contrast in the effects produced by the rounded or perfectly square edge under these conditions. This sharp edge should not be removed by the use of a file, but by suitable tools on the machine with at least a $\frac{3}{8}$-in. radius. This requires more machine work, and for this reason often is not done. It is an important detail, although at first it may appear trifling.

The proper adjustment and maintenance of ordinary wedges are problems that are intimately related to the satisfactory lubrication of the engine. This is brought out especially by the blows that are delivered at each stroke of the piston in addition to the violent vertical action of the driving box, which is directly on the face of this occurs the side lug of the brass is in contact with the side lugs on the inside of the box, as shown on the plan, all of which produces serious difficulties.

Another condition, shown at the extreme right upper corner, is an improper angle of the wedge engaging on the sides of the brass, near the bottom line of the brass, thus producing a pinching effect on the brass as it is related to the journal. This is an extremely bad case, yet quite frequently found in service. It usually comes from a lack of care in conforming to the new pattern standards. It gets in service through lack of proper inspection. In short, any cramping must be avoided, for it has been proven conclusively in practice that the brass and wedge and box as assembled must have absolute freedom. The successful running of journals largely depends on the freedom given the brass, wedge and box, and it might be commonly compared to the great ease of an old shoe on the foot as compared with a new one. These details are mentioned to show the importance of checking up from time to time new brasses and new wedges. Finally it should be borne in mind that the side angle of the wedge must not engage with the side angle of the brass, thus giving a top or crown bearing between the wedge and brass. Perfect freedom at these points is absolutely essential if good results are desired.

One of the best means in existence for instructing men in the proper care and packing of journal boxes is to have a box made of galvanized iron, and fitted with glass on each side to expose to view the packing the whole length of the box, the object being to use this box when examination of men and their practices in the care of packing in boxes is being made. If a box designed on this principle is placed in an instruction car, it will serve a good purpose in improving the practices of men engaged in oiling and packing. Metal shields are placed over the glass while the men are demonstrating their work, and then removed by the instructor to show the effect of the practices followed.

Fig 1.

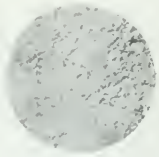


Fig. 2.

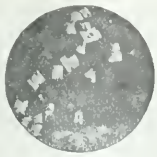


Fig. 3.

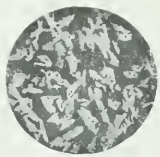


Fig. 4.

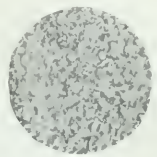


Fig. 5.

Fig. 6.

the wedges. With the present form of wedge and bolt it is practically impossible to maintain a reasonable degree of adjustment of driving boxes on heavy power. Attention is therefore called to the design shown in the accompanying illustration, in which there is the ordinary form of shoe on the left that fits the binder at the bottom and the top of the pedestal in the usual way. On the wedge side of the box there is a corresponding shoe fitting the binder at the bottom and the pedestal snugly at the top. Back of this shoe, within the flanges, is an ordinary square form of wedge. In this instance the wedge bolt is not attached to the wedge. With this construction under normal conditions the driving box is working on the face of the shoe on the wedge side of the pedestal, and not on the wedge, as in the case of present construction. There is therefore no action vertically on the wedge, and it cannot be disturbed, so that there is no such thing in this construction as a wedge creeping up and sticking. The shoe cannot creep, as it fits the binder beneath and the top of the pedestal above. Since the wedge is protected between the flanges of this shoe and back of its surface, there is no vertical action brought upon it by the box.

Another point of importance in lubrication is the proper fitting of brasses in journal boxes. The upper left-hand figure of illustration represents a M. C. B. form of journal bearing of proper size, and shows its correct relation to journal and wedge. The view to the right represents a brass of slightly improper design in detail, frequently found in service. It will be observed that owing to a large fillet in the angle of rib at back end of the brass, the wedge cannot be placed in its proper position, as clearly shown on the plate. This is an apparently trivial oversight in making the pattern, but it develops very serious results in service, as the brass in consequence is forced solidly against the back end of the journal, and the front end of the wedge is forced back of the lugs in top of the box. This is a common condition in daily service.

The end view to the extreme right represents a bad form of wedge or brass. In such cases the wedge or brass is unfit for service and should not be used. This is more serious in service than the former condition. General foremen and foremen of inspection can readily detect this by ordinary observation of brass or wedge. M. C. B. standard gauges for brasses and wedges are useful in detecting these imperfections.

The sectional view at the lower right-hand corner shows the radius of the wedge at the back end of practically the proper dimensions, while the radius at the rib at the back end of the brass is much too large, preventing the wedge from approaching the rib as it should. The enlarged view is made to more forcibly bring out the condition shown. The result is that when such crowding as

The metal in journal bearings is, of course, closely associated with lubrication. The chemical analysis of bearing metal in many instances is the only feature considered, but in addition to this there should be a microscopic study made of journal bearings as part of the system of tests made from time to time, to indicate the manner in which the metals are united. For although we may be using the best known formula, with the highest grade metals, yet good results may be defeated simply by indifferent or careless foundry practice. This can only be discovered through a microscopic study of the product from time to time, and it therefore is unsafe to test out brasses by chemical analysis only. Microscopic study has within a few years developed a marked improvement in foundry practice, and has brought up the standard of manufacturers of brasses to a much higher degree.

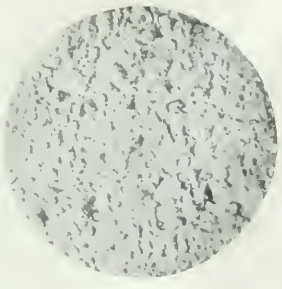


Fig. 7.

The accompanying illustrations are reproductions of microscopic photographs by which the structure of the several bearing metals is clearly shown:

Fig. 1 represents antimonial lead with from 1 to 25 per cent. of antimony. In this the metal is very uniformly amalgamated. This is, of course, a matter of the greatest importance.

Fig. 2 shows a similar metal composed of 16 per cent. antimony and 84 per cent. lead, which is in very general use.

Fig. 3 is composed of 20 per cent. antimony and 80 per cent. lead. In this the metal was not properly stirred while being mixed, and therefore shows decided crystals of antimony, producing hard spots in the metal and frequently resulting in hot journals.

Fig. 4 consists of 40 per cent. antimony and 60 per cent. lead. Here also the metals are separated and the antimony crystals prominently appear.

Fig. 5 is a genuine Babbitt metal composed of 80 per cent. tin, 10 per cent. antimony and 10 per cent. copper. The mixture is uniform and the metal of good quality.

Fig. 6 is a white metal containing 86 per cent. tin, 12 per cent. antimony and 2 per cent. copper. It will be observed by the large cubes in the figure that there is a distinct separation of metals. These cubes are almost entirely antimony and tin. This may appear an exaggerated condition, but it is shown to indicate what is likely to happen under careless foundry practice. A microscopic examination of brasses in special cases of hot journals would be found to develop many interesting conditions and result in a more intelligent course in applying remedies for such difficulties.

Fig. 7 represents a bearing metal in very general use containing 76.88 per cent. copper, 10.62 per cent. tin, and 11.71 per cent. lead.

Fig. 8 is a composition of 70 per cent. tin, 25 per cent. antimony and 5 per cent. copper; white metal. In the view to the left the crystals shown are small and uniform. In this case the metal cooled quickly. In the view to the right, with large developed crystals, the metal cooled slowly. This clearly shows the effect of foundry practice in the cooling of metals.

Fig. 9 represents a 5 in. x 9 in. Babbitt metal brass that ran cool for 4,000 miles and then suddenly became hot. Ordinarily it would

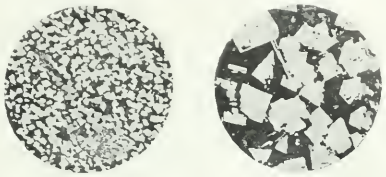


Fig. 8.

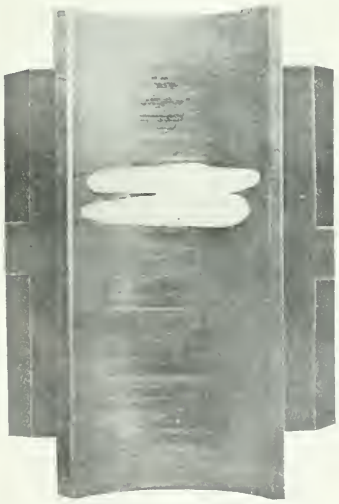


Fig. 9.

be supposed that the heating was due to hard spots in the bearing, but an examination did not prove this so. It was shown that the steel journal had a small hard spot corresponding to the patches shown on the brass. This could not be detected by the eye, but was discovered by carefully passing the finger over the surface. The hard spot problem, therefore, is not always a responsibility of the brass. It should be said that, in this case, the journal and bearing was flooded with oil, which clearly proves that a slight imperfection of journal or brass will abruptly cause a hot journal, although the most intelligent attention may have been previously given to it in oiling and packing.

Various mixtures are and have been used with satisfactory results for journal bearings and for lining journal bearings:

For lining bearings 13 per cent. antimony and 87 per cent. lead is satisfactory.

A mixture to which a somewhat heavier load can be applied is 5 per cent. antimony, 5 per cent. tin and 90 per cent. lead.

The mixture commonly in use for journal bearings proper is 10 per cent. antimony, 10 per cent. tin and 80 per cent. copper.

A mixture substantially as follows in extended use has produced very attractive results for journal bearings proper: 5 per cent. tin, 30 per cent. lead and 65 per cent. copper.

It should be remembered that the best known formula or mixture, either for lining bearings or for the manufacture of bearings, can be seriously impaired by careless foundry practice.

## Leaves from a Railroad Engineer's Note Book.

III.

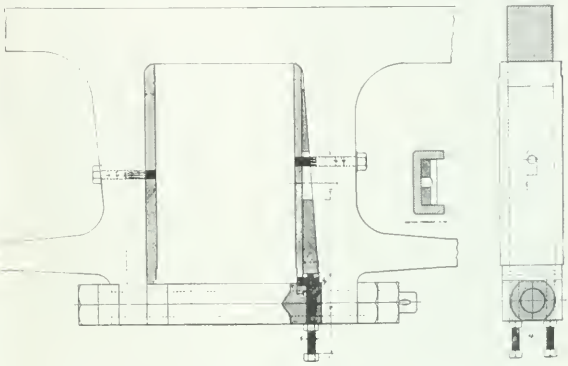
[Mr. W. W. Hoy, of Johannesburg, South Africa, Chief Traffic Manager of the Central South African Railways, spent about half of the year 1905 inspecting American and European railroads. The appendix to his formal report to his company, consisting of "brief notes on various railway practices," has the freshness and charm which belongs to honest jottings of first impressions, although a trifle more care would have prevented his occasional errors.]

### CANADIAN RAILWAYS.

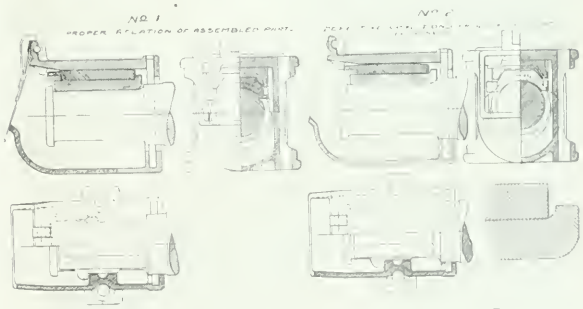
*Canadian Pacific Railway.*

I left Montreal at 9.40 a. m. on Sunday and arrived at Vancouver at 12.30 p. m. the following Friday. The distance is 2,942 miles and the speed averaged 21⅛ miles per hour.

The passenger rolling stock in general use is the open sleeping-car type, built to accommodate 16 passengers, with one stateroom, which has accommodations for two passengers. Palace cars are now being run, but an extra charge of 36s. per passenger per night, in addition to first-class fare and sleeping fee, is made for what in America is regarded as luxurious traveling.



Suggested Arrangement of Pedestal Wedge.




Proper and Defective Arrangement of Journal Boxes.

Tourist or colonist cars have partial sleeping accommodation, bedding being supplied at one-half Pullman rates.

No privately owned Pullman cars are run on this line in general traffic. All cars are owned by the railway.

Gas is the general illuminant on all cars.

Several passenger carriages are fitted with mosquito netting.

Books, periodicals, newspapers, post-cards, illustrated playing cards, postage stamps, telegraph forms, guide-books and time-tables, etc., are obtainable on all trains at various centers—one bulletin to each car.

Compressed air is used in the saloons to force the water from tanks to wash basins, no pumping being necessary.

Each car is supplied with hair and clothes brushes.

Iced spring water is supplied for all filters, which are attended to at appointed stations.

Passenger vans have grooved floors with holes bored through to allow the escape of water from melting ice and so avoid damage to traffic.

The dining-car waiters are all European, and during summer wear white duck jackets and white aprons. Each waiter wears on his breast a metal plate number.

The dining car inspector has a special uniform.

The chairs in buffet and smoking compartments have rubber

pads screwed on the base of the legs to lessen vibration and prevent sliding.

The train staff consists of one conductor for each division, one colored assistant (who is called a porter) for each car, one or two baggagemen as required, two brakemen, one dining-car inspector, four dining-car stewards.

The staff on the train by which I traveled numbered 1 conductor, 13 attendants and 9 others, in all 23.

The native porters travel with the car from ocean to ocean, a distance of nearly 3,000 miles.

Trains leave stations, without warning, as soon as the booked time of departure arrives.

The "despatcher" arranges the passing of trains at night time over sections up to 50 miles in length. It is customary to close certain stations during the night.

Trucks conveying fruit are heated or chilled according to the season of the year. When heat is necessary the temperature is maintained by two oil lamps in each truck. An additional charge of 10 per cent. above the usual freight charge is made for this service.

Perishable cars are iced at appointed stations en route, for which service special charges are made.

The manifest freight car system is in use, the head office being at Montreal.

In case of error in or delay to the movement of rolling stock it is customary to debit the agent responsible with the charges incurred, leaving him at liberty to recover the amount due from the staff to blame.

A special account, known as "wrecking account," is kept, to which all damages of whatever description to trucks, engines and other rolling stock (including passenger vehicles) are debited. The results of working are taken out before this amount is placed against the working expenses.

Very few of the intermediate stations on the main line are equipped with fixed signals, but each siding—intermediate or otherwise—has two boards placed a certain distance from the facing points. The board with name of station (black lettering on white board) is placed one mile in advance of each set of facing points for the guidance of the running staff.

At certain stations signals are provided to admit of trains running through without stopping for orders.

Disc indicators are in general use at facing points, but intermediate sidings have warning boards only.

At certain stations, where, in the interests of the expeditious working, it is necessary to shunt outside the points, a warning board with "Yard Limit" painted thereon is placed about a mile from the last pair of points, and shunting is allowed within such area without resorting to the usual practice of protecting the trains. All drivers approaching such stations have to keep their train under control as soon as the board is visible, in order to stop immediately if necessary. The drivers on the American railways did not lower their speed below 20 miles per hour on any occasion of passing such signal.

Switches at stations are attended to by brakemen. The station-master attends only to station duties.

Stubb switches are still in use, but are being gradually withdrawn, as they are not suitable for main line working.

MacPherson's patent safety switches and points are used at junctions of sidings with main line. These switches are also used in connection with loop intermediate sidings where train crossings are not very numerous.

Compound engines are employed with very good results, their use effecting a saving of from 15 to 20 per cent. as compared with simple engines.

"Thermit" is utilized with good results, but is still more or less under experiment.

A special "weakening groove" is adopted on all engine cylinders.

Simple engines are now being fitted with superheaters.

To facilitate locomotive working, and to avoid detention to engines awaiting light repairs, the locomotive parts of engines under heavy repairs are very often exchanged.

Picked coal is used on passenger train engines, and a very close check is exercised on all coal issues and the coal consumption of engines.

The locomotive shop plant has been arranged on a very progressive system.

All machinery driven electrically is of the individual type installation.

Oil furnaces are in general use, the fuel costing from $3\frac{1}{2}$ to 4 cents per gallon.

Wherever possible, piecework has been introduced.

The hours of employees in the locomotive shops are from 7.00 a. m. to 5.30 p. m., 30 minutes being allowed for lunch.

Smoking is not allowed during working hours.

The railway is mostly single track, with crossing stations where necessary.

Long loop stations, having short wooden platforms erected about the center of the loop, are provided for train crossing purposes.

Eighteen wooden sleepers are used to each 32-ft. rail. Old sleepers are always burned to prevent theft or to obviate pretext for theft.

On certain sections which have not been relaid the weight of rail is 56 lbs; 126-ton engines, drawing mail trains, are run over these sections without causing any particular damage.

The broken joint system of laying rails is in general use. There is much less noise in running, and the train travels very smoothly.

On all curves the rails are supported by a special chair placed on every fourth sleeper. Additional fishplates are used to each rail on curves.

At distances of about one mile there are placed sleepers which are cut to hold three rails to prevent their burial by snow, etc., and the nearest telegraph pole is marked by means of a white ring placed round it, about 6 ft. from the ground, to indicate position of rail rack.

A limited supply of ballast trucks is owned by the maintenance department, and when additional ones are required the same are obtained from the traffic department and paid for at the rate of 30 cents per day.

Ballast engines, enginemen and guards are hired from the operating department. The men are paid directly by the engineering branch while working for that branch. Complaints against the men are dealt with by the operating department and investigated conjointly with the department borrowing the men's services. In complaints of a serious nature the men are returned to the operating department and a new staff requisitioned for.

The railway is fenced almost throughout its entire length. As soon as a farmer brings his fence up to the railway boundary the railway is required by law to fence its line at that section.

The length of a District Engineer's section is about 500 miles.

Wooden loading platforms are provided at prairie stations to enable farmers to load their grain.

Grain elevators are provided by grain merchants at certain stations, to which farmers can bring their grain for sale and despatch to the coast. The farmers, of course, have the alternative of direct loading of their produce to the coast, where a better price is generally obtained. I understand certain of the levators are owned by the railway administration.

The cartage at Winnipeg is performed by a cartage contractor, who also collects all charges from the public and pays to the railway department daily the accounts thus collected.

The live stock liability limit has been fixed at $50.

The scale department, which is attached to a branch of the department, under the Superintendent of Motive Power, examines, tests and repairs all weighing machines and scales. Any broken or damaged parts are taken out of the machines and replaced by new castings by this department.

The policy of the railway is to promote men who acquire a practical railway experience, and whose qualifications, appearances, etc., fit them best for the higher positions. Promotion to any position is open to all grades in the service.

A special inspector from the head office visits the various stations and reports personally on the general working to the head of the department and to the President.

The administration does not encourage fining, but rather dispenses with the services of staff against whom there are complaints.

*Grand Trunk Railway.*

This railway keeps a complete record of all its rolling stock on the car manifest system. Some railways record only the express freight.

ENGLISH RAILWAYS.

*Great Western.*

Rail motors.—The tariff from London (Paddington) to Southall, 9 miles, is 14 cents; from Westbourn to Southall, 8 miles, 12 cents; return fares, 24 cents.

No season tickets are issued.

The vehicles can be driven from either end, and the crew consists of driver, fireman (often a lad) and guard or conductor. The speed works out at 20 miles an hour.

The cars have accommodation for 52 passengers. The seats are of cane. Gas lighting is employed.

The motor carriages run on the usual train signals.

Up to the present the cars are paying, and in some cases are hauling trailers where traffic calls for extra accommodation.

Road auto cars are being generally introduced, and are being developed to act as feeders for main arteries of traffic.

The road cars are worked by petrol, and so far have proved successful. Whether they will stand the wear and tear of roads long enough to earn their capital cost and maintenance is still an open question, for experience has taught that after two or three years the cars do not run easily, and in some instances are forbidden to run by the "Watch Committee" of twenty towns on account of the noise or odor which they occasion.

The development of the petrol machine still necessitates considerable care being exercised before a decision is come to for its adoption. Improvements are regularly being made in the use of petrol.

The Continental mails are conveyed from London to Dover direct, a distance of about 80 miles, by postal road motor car.

*Midland Railway.*

Somer's Town goods station. A day's work consists of $10\frac{1}{2}$ hours, and that of a night is reckoned at 9 hours.

The goods staff are paid by results. Each gang consists of one checker, one caller and two barrowmen.

All traffic dealt with exceeding in quantity 25 tons per day is paid for at the rate of 14 cents per ton.

To enable the truck-packing staff (who are paid by the day) to participate in the bonus system—which works to the satisfaction of both the men and the railway company—an exchange of gangs is made every two months.

A large amount of traffic is warehoused at Somer's Town for the convenience of consignees. There is also a large store for accommodation of potato traffic situated at this station.

The goods station is on two levels; the upper station has 26 roads with corresponding bay platforms to admit of the sorting of traffic for direct despatch, while the lower is utilized for feeding the upper floor by means of hydraulic lifts.

*London Railways.*

The most striking feature of a study of the railways in and about London was the extremes in railway practice obtaining, more particularly with regard to the city and suburban traffic.

The working of some of the underground railways is open to considerable improvement, as the station stops vary between 35 seconds and 4 minutes. The City & North London Railway, however, with an average stop of 11-44 seconds, is as up to date as possible. The factor which will militate against the urban services ever approaching those of New York in point of rapidity in the conveyance of passengers from one part of the city to another is the length of time occupied in gaining excess to and egress from the railways.

The Metropolitan and the District Railways are being electrified. One peculiarity of these installations is that the electric trains of the one line cannot run over the rails of the other, owing to some technical detail, as I am informed, in the adjustment of the slipper shoes.

The new electric stock on the District Railway is of the end and middle door type. The end doors are used for the entrance of passengers, while the double doors in the center of the coach are used for the exit of passengers and are labeled accordingly. Air pressure is utilized to operate these doors.

The fares vary on the different railways. The Central London Railway (commonly known as the "Tuppenny Tube") has adopted the American system of one uniform fare and class; the Metropolitan and District Railways still preserve the two classes and the sliding scale of fares; the City & North London Railway has also adopted the latter, but there is only one class for travelers.

The London & South-Western Railway has an electric railway—underground—from Waterloo to the Bank. Tickets are sold on the train in the same way as on trams.

At the underground stations, which connect with the main line stations, an electric push-bell is placed in a conspicuous position on the wall of the station for the purpose of calling a porter to assist in conveying baggage from one station to another.

The larger portion of the suburban stock is of the swing door type (average stops, 25 to 57 seconds). In times of pressure two guards accompany each train; one travels in front and signals to the guard in the rear of the train when his portion is clear.

To give stability to trains which have to stop and start very quickly, as in the suburban services, the coaches are linked up so closely that there is practically no play between the buffers, and all jarring is obviated.

Motor coaches are coming into use on several railways to act as feeders during the slack times of the day.

A motor bus connects Victoria Station with Paddington, and is utilized for the free conveyance of through booked passengers, with their luggage, and also the public, the latter being charged 6 cents per head.

It is a very common practice to see guards, who are awaiting orders, assisting on the platform with passengers' luggage.

At Victoria and London Bridge stations it is a very frequent occurrence to see horses led along the platform, while passengers are entraining, and put into horse trucks for conveyance by the same train.

BELGIAN STATE RAILWAYS.

Engines are mostly of the compound design and are of the heavy modern type constructed for speed in the case of passenger and for haulage capacity in the case of goods trains.

The Belgian locomotive seems to me to be among the best met with on the Continent.

In general passenger traffic only second and third-class accommodation is used; the second-class compartment equals any of the first-class compartments I have seen, while the third class is also excellently finished.

With the exception of express trains, the speed of through trains is not extraordinary.

A good many tank engines are employed on these railways.

The Westinghouse air-brake is fitted to all rolling stock.

Passenger carriages are lighted mainly by electricity; the compartments are all well ventilated.

Two baggage racks are provided on each side of the compartment, which is also fitted with danger-emergency stop-signal cords.

Side-door corridor carriages are being introduced. The present carriages accommodate only three persons on each side. The old stock provided for a side. This is evidently not a satisfactory advance.

To encourage travel on the Belgian State Railways it is the practice to quote remarkably cheap railway fares for season and circular tickets.

It is possible in Belgium to obtain a season ticket to travel over the whole of the Belgian State Railways (2,530 miles), available for five days, at a cost of $5.80 first class, $3.90 second class and $2.25 third class.

Fortnightly season tickets, which enable the holder to travel as often as he likes in every direction over the Belgian State Railways, are issued at the following fares, which include one passage each way between Dover and Ostend: First class, $15.35; second class, $10.65; third class, $7.40.

It is necessary to supply a photograph when purchasing, so that it can be affixed to the ticket issued in order to prevent transfers.

Cheap circular tour tickets are issued by the Belgian State Railways in conjunction with other Continental railways at specially reduced fares. The railways, who are parties to this agreement, are the Belgian, German, Austrian, Swiss, French and Italian.

It is calculated that, on an average, there is a saving of $33\frac{1}{3}$ per cent. between the circular tour and ordinary single ticket rates, the use of the former enabling passengers to plan out their route beforehand and to know the exact cost of their journey. Journeys may be broken practically at any station.

There is one drawback to the issue of these tickets, viz.: that no free allowance of luggage is granted, but handbags and luggage which is not bulky or likely to cause inconvenience to other passengers may be taken into compartments. Luggage may be forwarded in advance by goods trains.

The question of the introduction of ocean-rail tickets has been under consideration by the several railway administrations and steamship companies in South Africa, and an arrangement has practically been come to whereby ocean-rail tickets will be issued at an early date.

The result of my investigations more than convinces me that the early introduction of circular tour tickets will lead to considerably increased passenger traffic.

FRENCH RAILWAYS.

At certain suburban stations the platforms are marked off to indicate the exact position at which trains will stop. Some of the notices are painted on the concrete or stone platforms, such as "Second-class Carriages Stop Here."

On the Paris-Lyons-Mediterranean Railway pillows and blankets are issued to passengers at a charge of 10 cents each. For a lunch basket, including wines, a charge of $1 is made.

A special service is attached for the conveyance of milk and other descriptions of perishable farm produce traffic.

The coaches provide for three classes of passengers and are of the short side-door type of vehicle. They are not very well kept, being dirty and untidy in appearance, although in the first and second classes white lace antimacassars are provided in each compartment for the head cushions.

Disc signals are provided at all points.

*Paris Metropolitan Suburban Railway.*

Power: electricity supplied by side rail.

The train consists of from five to seven bogie carriages, with accommodation for 200 first and second class passengers.

Provision has been made for each saloon to be fitted with two double side doors.

One attendant is appointed to each carriage to see to the opening and closing of doors.

Train stops vary from 10 to 15 seconds.

The fares for the whole distance are as follows: First class, 5 cents; second class, 3 cents. But workmen can, before 6 a. m., purchase return tickets for 2d. each.

There is a double line of rails laid down throughout the whole system.

Tickets are procured at the booking office. They are punched at the entrance to the platform, and all first-class tickets are examined on the train. On arrival at destination the tickets are either

placed into a collecting box or retained by the passengers. The bulk of the passenger traffic is second class.

As an indication of the development of this particular type of traffic, which has been brought about by the frequent service and low fares, the following particulars are of especial interest:

| | |
|---|---|
| 1900, total passengers carried | 15,890,528 |
| 1901, " " " | 48,478,116 |
| 1902, " " " | 62,122,728 |
| 1903, " " " | 100,107,651 |
| 1904, " " " | 117,550,521 |

Further particulars are afforded in respect of the 1904 traffic totals, viz.:

| | |
|---|---|
| Collective tickets | 13,904 |
| First single tickets | 14,533,336 |
| Second single tickets | 80,306,484 |
| Return tickets | 22,696,797 |
| | 117,550,521 |

The length of line operated is $22\frac{1}{2}$ miles.

The running time for trains over this line is generally 35 minutes, which works out approximately at $38\frac{1}{2}$ miles an hour.

In 1904 the number of carriages in service was:

| | |
|---|---|
| Motors | 249 |
| Carriages | 396 |
| | 618 |

The seating accommodation in the new stock is:

| | |
|---|---|
| Seated | 25 |
| Standing in passage | 5 |
| Standing in open compartment | 20 |
| | 50 |

The number of car miles run during the year 1904 was 20,185,934.

Automatic block signaling is in operation throughout the system.

All stations have been provided with high level platforms.

A very good suburban service is maintained.

Motors are provided in every alternate car.

There is a heavy passenger traffic which is moved very quickly and without any apparent effort.

No express trains appear to be run, although to cope with the traffic, which is still on the increase, more spacious and larger carriages are being provided.

Next to the Interborough Rapid Transit in New York, I regard the Paris system as the best in point of expedition. There are several features on the Interborough Rapid Transit of New York which it would appear advisable to adopt in similar services, *e.g.*:

1. There is larger carrying accommodation for passengers per car.
2. The door fastening and door control are better.
3. The speed is faster.
4. The express tracks are a decided advantage.
5. One fare is charged for any distance.
6. There is no distinction in class.

GERMAN STATE RAILWAYS.

Return tickets at less than two single fares are being abolished on the Government State Railways. They will, I understand, only be issued in future at the cost of two single fares.

At most of the large German stations an automatic ticket machine is placed near the entrance to the platform for the sale of penny platform admission tickets.

The rapid express from Berlin to Munich, by which I traveled, consisted of five bogie vehicles and an engine. Its composition was auxiliary bogie baggage van next to the engine, one dining car, two first-class saloons and one van. Gross weight of train about 200 tons.

Each saloon and berth is numbered, and a passenger, on presenting his ticket to the conductor, is shown to his reserved seat.

First-class accommodation only is provided, the charges being the ordinary first-class fare, plus 20 per cent. and the usual sleeping fee.

First and second class bogie stock, similar to Central South African Railways carriages with center corridor, has recently been introduced on other than suburban or express trains.

Second and third class side door passenger stock only is used for suburban traffic.

The third-class bogie carriages convey 16 passengers per compartment, or 66 passengers in all.

The windows, which are of the sliding type, stretch across the length of the compartment. The roofs are fitted with torpedo ventilators.

The open compartments are provided with a very suitable rack arrangement.

On through trains, at times of pressure of traffic, an enamelled label plate, bearing the sign "second class," is placed outside the door by the conductor, when a compartment is altered from first class to second class.

On mixed trains the passenger carriages are placed next to the engine, the goods trucks being at the rear of the train.

The locomotives in use for suburban traffic are of the small side tank type.

The signal and gates at Neupenzberg are worked from the station at a distance of one mile. The installation is worked by double wire connections.

On certain of the lines, where the traffic is not very heavy, women are employed in maintenance work on the roadway, doing duty similar in all respects to that performed by plate-layers and gangers.

Each goods vehicle is marked with the number of the men and animals which it is capable of conveying in time of war. Generally the trucks are marked to carry 48 men or 6 horses. The military authorities of our own government would do well to consider these loads and contrast them with the loads carried during the recent war in South Africa, when only about one-half the number of men were placed in a truck of the same size, although the length of haulage and the time occupied in transit would be greater and longer, respectively.

I was much impressed, when traveling through Germany, by the fact that there is an evident lack of the commercial consideration in the management of the railways in that country. While, as is well known, the Germans as a body are advanced to a high standard of commerce, their railways undoubtedly bear a military aspect. There was invariably reticence in affording data connected with railway matters, more particularly in Prussia, which was rendered more significant by the knowledge that German railway officials had been given every facility for acquiring particulars of British railway practice.

JAPANESE MILITARY RAILWAYS.

In connection with the war lately terminated in the East, the Japanese Government built a short light military line and obtained for the working of this railway 370 eight-ton engines and 1,200 trucks.

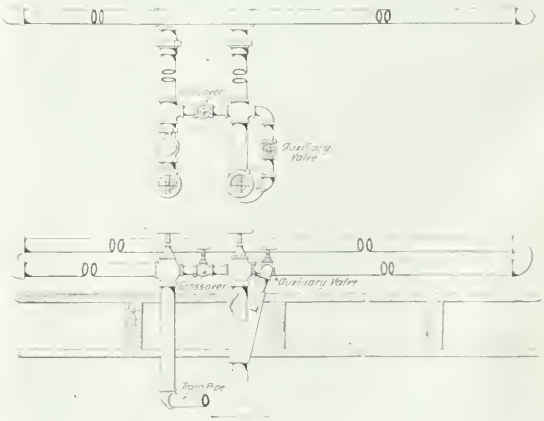
The material required for the building of this line amounted to 10,000 tons. The weight of rail was 23 lbs. per meter and the gage 2 ft. A similar railway was built for military purposes by the Russians.

In running these trains it is intended to run them with two engines coupled together.

The rolling stock and material was supplied by Germany.

## The Parker System of Car Heating.

The Grand Trunk Railway is applying to its passenger equipment a new system of heating, which was devised by a conductor on that road. Its adoption by the Grand Trunk follows a thorough test covering a period of four years. The chief advantages claimed are the absence of escaping steam at the drips, and the low pressure with which effective and uniform heating of the train is accomplished. A drawing illustrating the application of the system to a passenger coach is shown herewith.




The Parker Heating System. Piping for Passenger Coach.

The peculiar features of this system are the admission simultaneously of live steam to *both* ends of the radiating pipes, and the closing during service of all drips or outlets except the one at the rear end of the train pipe. There is also provision for thawing out with live steam the discharge pipe should it freeze up. The only change required from the usual piping for the direct system is the insertion of the crossover, with controlling valve, between the supply and discharge pipes, and the piping and auxiliary valve for thawing out the discharge pipe.

The method used converts the usual direct steam system into a hot water system, the instructions for operation especially directing that any water of condensation present in the radiating pipe at the start should be permitted to remain, and all waste or drip valves, except on the train pipe, be closed and kept so until the end of the run. Then, if necessary, the accumulated condensation may

be blown out to prevent freezing. In blowing out, the crossover valve is closed, of course, permitting the steam to pass through the radiating pipes in the usual way. If the discharge pipe is frozen, by opening the auxiliary valve—the crossover valve being open—the pipe is thawed out by the live steam almost instantly. This may be done while the train is in motion, if necessary.

The system requires a relatively low steam pressure for the desired train temperature. It is claimed that tests have shown a 10-lbs. train-pipe pressure to maintain a uniform train temperature of 70 deg. F. and higher, with an outside temperature of 5 deg. below zero. We understand that even under extreme temperature conditions there is an entire absence of escaping steam around the train. The low pressure is not only economical as regards the demands on the locomotive boiler, but greatly reduces trouble from burst hose, defective pipes and connections, etc.

The cost of application of the system is, of course, very low—simply the small amount of material and labor necessary to make the two connections required, costing in all about $4. The patentee of the system is Thomas Parker, and it is being applied under the name of the Parker Anti-Freezing and Hot Water System, London, Ontario.

## Uniform Live Loads for Railroad Bridges, and Shearing Stress in Webs of Plate Girders.*

BY A. W. BUEL, ASSOCIATE BRIDGE ENGINEER, WESTERN PACIFIC RAILWAY.

As a substitute for the system of live loads for railroad bridges consisting of two typical engines, followed by a uniform load per foot of track, the writer offers the following suggestion for discussion:

A live load per linear foot of track equal to

$$\frac{T}{\sqrt[3]{S}+\sqrt[6]{S}}$$

in which $T$, the index of the loading desired, has a value equal to the weight of each driving axle in pounds, and $S$ is the length of the span in feet.

The values of $T$, approximately corresponding to the usual loadings of the Cooper series, are as follows:

$T = 40{,}000$, for Cooper's E-40,
$T = 45{,}000$, for Cooper's E-45,
$T = 50{,}000$, for Cooper's E-50,
$T = 55{,}000$, for Cooper's E-55.

The table submitted herewith gives the value of $\sqrt[3]{S}+\sqrt[6]{S}$ for spans from 10 to 500 ft., and the live load per foot of track for the $T = 50{,}000$ loading. This table also shows the equivalent uniform loads for Cooper's E-50, for moment and shear, and the average, or mean, equivalent loads of the two.

From this table it will be seen that while the loading proposed is greater than the equivalent uniform load for moments of the Cooper series, for spans from 10 to 120 ft. in length, by from 9.2 to 17.5 per cent., it is only 2.0 per cent. greater for spans of 350 ft.

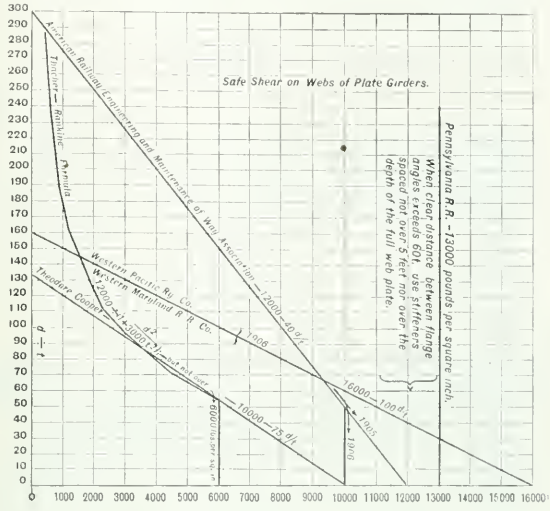
Compared with Cooper's equivalent load for shear, it is from 0.4 of 1 per cent. to 3.5 per cent. greater for spans from 40 to 80 ft., the higher value being for spans of 60 ft. For spans of 10 to 30 ft., it is from 7.6 to 2.0 per cent. less than Cooper's equivalent uniform load for shear, and for spans of 90 to 120 ft. it is from 0.4 of 1 per cent. to 3.3 per cent. less. For a span of 350 ft. it is practically identical for shear.

TABLE OF UNIFORM LIVE LOADS PER LINEAR FOOT OF TRACK FOR SPANS FROM 10 FEET TO 500 FEET.

| Span in Feet. $S$ | $\sqrt[3]{S}$ | $\sqrt[6]{S}$ | $\sqrt[3]{S}+\sqrt[6]{S}$ | Equivalent Uniform Load for Cooper's E-50. For Moment. | For Shear. | Average of Equivalent Load for Shear and Moment. | Uniform Live Load per Foot of Track. $\frac{50{,}000}{\sqrt[3]{S}+\sqrt[6]{S}}$ |
|---|---|---|---|---|---|---|---|
| 10 | 2.1544 | 1.4678 | 3.6222 | 12,250 | 15,000 | 13.625 | 13,804 |
| 15 | 2.4662 | 1.5704 | 4.0366 | ..... | ..... | ..... | 12,387 |
| 20 | 2.7144 | 1.6475 | 4.3619 | 10,313 | 12,500 | 11.410 | 11,463 |
| 25 | 2.9240 | 1.7100 | 4.6340 | ..... | ..... | ..... | 10,790 |
| 30 | 3.1072 | 1.7627 | 4.8699 | 9,125 | 10,500 | 9.815 | 10,267 |
| 35 | 3.2711 | 1.8086 | 5.0797 | ..... | ..... | ..... | 9,843 |
| 40 | 3.4200 | 1.8493 | 5.2693 | 8,200 | 9,400 | 8.800 | 9,489 |
| 45 | 3.5569 | 1.8860 | 5.4429 | ..... | ..... | ..... | 9,186 |
| 50 | 3.6840 | 1.9194 | 5.6034 | 7,613 | 8,700 | 8.160 | 8,923 |
| 55 | 3.8030 | 1.9501 | 5.7531 | ..... | ..... | ..... | 8,691 |
| 60 | 3.9149 | 1.9786 | 5.8935 | 7,225 | 8,200 | 7.715 | 8,484 |
| 65 | 4.0207 | 2.0052 | 6.0259 | ..... | ..... | ..... | 8,298 |
| 70 | 4.1213 | 2.0301 | 6.1514 | 6,975 | 8,000 | 7.490 | 8,128 |
| 75 | 4.2172 | 2.0536 | 6.2710 | ..... | ..... | ..... | 7,973 |
| 80 | 4.3089 | 2.0758 | 6.3847 | 6,750 | 7,800 | 7.275 | 7,831 |
| 85 | 4.3968 | 2.0969 | 6.4937 | ..... | ..... | ..... | 7,700 |
| 90 | 4.4814 | 2.1169 | 6.5983 | 6,600 | 7,600 | 7.100 | 7,578 |
| 95 | 4.5629 | 2.1361 | 6.6990 | ..... | ..... | ..... | 7,464 |
| 100 | 4.6416 | 2.1544 | 6.7960 | 6,438 | 7,500 | 6.970 | 7,357 |
| 110 | 4.7914 | 2.1889 | 6.9803 | 6,425 | 7,360 | 6.895 | 7,163 |
| 120 | 4.9324 | 2.2209 | 7.1533 | 6,412 | 7,240 | 6.825 | 6,990 |
| 130 | 5.0658 | 2.2507 | 7.3165 | ..... | ..... | ..... | 6,834 |
| 140 | 5.1925 | 2.2787 | 7.4712 | ..... | ..... | ..... | 6,692 |
| 150 | 2.3133 | 2.3051 | 7.6184 | ..... | ..... | ..... | 6,563 |
| 160 | 5.4288 | 2.3300 | 7.7688 | ..... | ..... | ..... | 6,436 |
| 170 | 5.5397 | 2.3536 | 7.8933 | ..... | ..... | ..... | 6,334 |
| 180 | 5.6462 | 2.3762 | 8.0224 | ..... | ..... | ..... | 6,233 |
| 190 | 5.7489 | 2.3977 | 8.1466 | ..... | ..... | ..... | 6,138 |
| 200 | 5.8480 | 2.4183 | 8.2663 | ..... | ..... | ..... | 6,049 |
| 225 | 6.0822 | 2.4662 | 8.5484 | ..... | ..... | ..... | 5,849 |
| 250 | 6.2996 | 2.5099 | 8.8095 | ..... | ..... | ..... | 5,676 |
| 275 | 6.5030 | 2.5501 | 9.0531 | ..... | ..... | ..... | 5,523 |
| 300 | 6.6943 | 2.5873 | 9.2816 | ..... | ..... | ..... | 5,387 |
| 325 | 6.8753 | 2.6221 | 9.4974 | ..... | ..... | ..... | 5,265 |
| 350 | 7.0473 | 2.6547 | 9.7020 | 5,050 | 5.150 | 5.100 | 5,154 |
| 400 | 7.3700 | 2.7150 | 10.0850 | ..... | ..... | ..... | 4,960 |
| 500 | 7.9400 | 2.8170 | 10.7570 | ..... | ..... | ..... | 4,650 |

From this table it will be seen that while the loading proposed is greater than the equivalent uniform load for moments of the Cooper series, for spans from 10 to 120 ft. in length, by from 9.2 to 17.5 per cent., it is only 2.0 per cent. greater for spans of 350 ft.

Compared with Cooper's equivalent load for shear, it is from 0.4 of 1 per cent. to 3.5 per cent. greater for spans from 40 to 80 ft.,


Safe Shear on Webs of Plate Girders.
American Railway Engineering and Maintenance of Way Association—12000—40 d/t
Thacher—Rankine
Formula
Western Pacific Ry. Co.
Western Maryland R. R. Co.
Theodore Cooper
17000
16000—100 d/t
16000—75 d/t
17000
17000
Pennsylvania R.R.—13000 pounds per square inch.
When clear distance between flange angles exceeds 60t, use stiffeners spaced not over 5 feet nor over the depth of the full web plate.
d/t
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000

If we compare the proposed loading with the average of Cooper's equivalent uniform loads for both moment and shear, the excess of the former, in per cent., is as follows:

For a span of 10 ft., 1.7 per cent. excess
For a span of 20 ft., 0.8 per cent. excess
For a span of 30 ft., 5.0 per cent. excess
For a span of 40 ft., 8.0 per cent. excess
For a span of 50 ft., 9.5 per cent. excess
For a span of 60 ft., 10.0 per cent. excess
For a span of 70 ft., 8.6 per cent. excess
For a span of 80 ft., 7.6 per cent. excess
For a span of 90 ft., 6.9 per cent. excess
For a span of 100 ft., 5.5 per cent. excess
For a span of 110 ft., 4.1 per cent. excess
For a span of 120 ft., 2.5 per cent. excess
For a span of 350 ft., 1.0 per cent. excess

While these excesses are considerable for spans up to 110 ft., they are no more than the difference between the typical wheel loadings and the probable actual loadings. Taking into account the close agreement between the proposed loading and Cooper's equivalent uniform loads for shear, and the fact that the material excesses, compared with Cooper's equivalent uniform loads for moment, are confined to spans of 120 ft. and under, it is not unreasonable to expect it to give satisfaction in practice.

As most spans for which it gives excess moments would be plate girders, for which, in the past, many roads have required that "no part of the web shall be considered as resisting flange stresses," and as with this loading plate girders should be proportioned by their moment of inertia, plate girder spans so designed under this loading would be very little heavier than we have been building. The fact that it gives heavier loadings for short spans than for long spans, as compared with the Cooper series of wheel loads, will not generally be considered an objection, and the writer does not believe serious criticism will be advanced against the relatively heavier loadings for floor systems.

With almost identical loads for spans of 350 ft., it drops off so that for spans of 500 ft. the loading is about 10 per cent. less than Cooper's, and this, the writer believes, is as it should be.

Herewith is presented a diagram showing graphically several formulas for shear in plate girder webs and spacing of stiffeners.

The Thacher-Rankine formula is Rankine's formula, with

*Reprinted from Bulletin No. 75 of the American Railway Engineering and Maintenance of Way Association.

Thacher's constants and with $d$ measured horizontally or vertically instead of on an angle of 45 degrees, and is, perhaps, one of the oldest, and has, possibly been more generally used than any of the others. This does not include impact.

The Pennsylvania Railroad permits a maximum shearing stress on *net* section of web plates, including impact, of 13,000 lbs. per sq. in., which does not seem unreasonable. The rule for the spacing of stiffeners, however, has no relation to the allowed stress per sq. in., which is constant, and, for the average values of $\frac{d}{l}$, permits a stress per sq. inch about twice as great as that of any other specification illustrated on the diagram.

Cooper's straight-line formula corresponds, very closely, with the older formula—$12{,}000 : \left(1 + \frac{d^2}{3{,}000\,l^2}\right)$,—for all values of $\frac{d}{l}$ from 40 to 100. The writer believes Cooper's formula $\left(16{,}000 - 75\,\frac{d}{l}\right)$ is, everything considered, the best yet proposed where impact is not included. With impact included, for which case it was not intended to apply, Cooper's formula would give excessive webs and stiffeners, and should be modified.

The formula recommended by the Committee of the American Railway Engineering and Maintenance of Way Association—$12{,}000 - 40\,\frac{d}{l}$—gives stiffener spaces so much greater than either of the older formulas most generally used, that its recommendation or adoption as "standard" does not appear to be wise or conservative. It is better than the purely empirical rule of the Pennsylvania Railroad, but the formula $12{,}000 \div \left(1 + \frac{d^2}{3{,}000\,l^2}\right)$ was based on a rational theory, and Cooper's formula gives nearly the same results and is more practical in application. It is not clear why 12,000 is used as the base of the Committee's formula, when 16,000 is the base for both tension and compression.

The formula here proposed—$16{,}000 - 100\,\frac{d}{l}$—has been tentatively adopted by the Western Maryland Railroad and the Western Pacific Railway. It starts with the same base of 16,000 lbs. per sq. in., as is used for tension and compression, and includes impact, the same as the Committee's formula.

It is reduced by $100\,\frac{d}{l}$, so that for $\frac{d}{l} = 30$, the allowed stress is 13,000 lbs. per sq. in., at which point it crosses the empirical line of the Pennsylvania Railroad. For values of $\frac{d}{l}$ under 30, no good reason is apparent why the higher stress per square inch should not be permitted, especially as impact is included in the total stress.

When $\frac{d}{l}$ is about 67, the line crosses that of the Committee's formula, with an allowed stress of about 9,800 lbs. per sq. in. This is near the lower limit of the values of $\frac{d}{l}$ for webs of plate girders that will occur in ordinary cases.

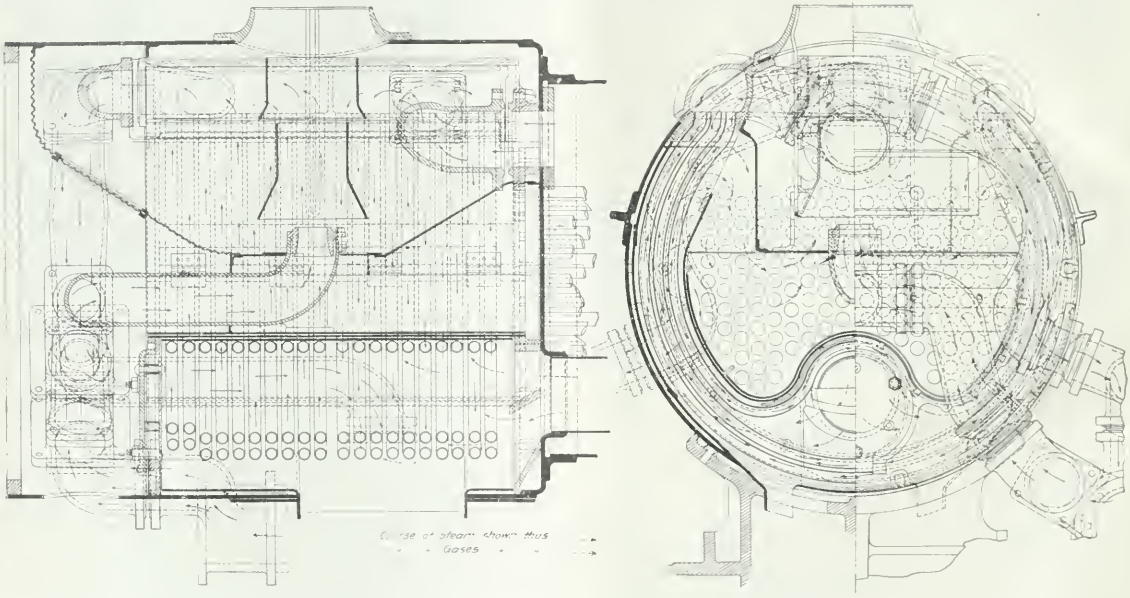
When $\frac{d}{l}$ is greater than 67, the proposed formula will require somewhat closer stiffener spaces than those of the Committee's formula, but not so close as the older Thacher-Rankine or Cooper's formulas, notwithstanding the fact that impact is not included in the latter.

The formula proposed, with impact added to the total shear, saves on an average, one pair of stiffeners for each 30 linear feet of girder, as compared with the Thacher-Rankine formula with no impact added.

An inspection of the diagram and the comparisons given above will show that the formula here proposed—$16{,}000 - 100\,\frac{d}{l}$—gives results between the extremes of past and present practice, and that it is both conservative and rational.

## The Schmidt Superheater.

It is well known that of all the railroads on this continent the Canadian Pacific has been the most persistent in its efforts to encourage the use of the compound locomotive and, later, to develop the superheater. In this work the Cole and Schmidt devices have been used as well as the one designed by the officers of the motive power department. The Schmidt superheater as used abroad is of two forms known as the smokebox and fire-tube types, respectively. While the latter seems to have been most extensively applied to the locomotives of the Prussian State Railways the older type, though modified in detail, is the one that was first applied and used in the smokeboxes of the locomotives of the Canadian Pacific.




Schmidt's Smokebox Superheater, Canadian Pacific Ry.

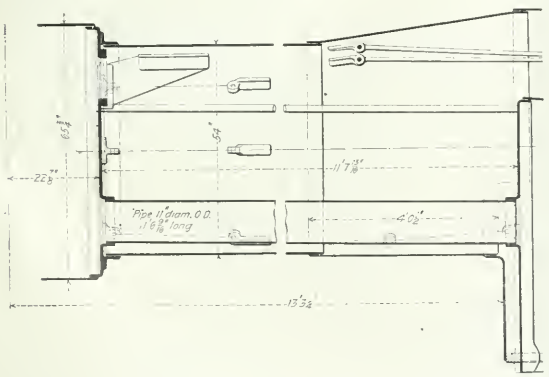
This type calls for a very marked change in the tube arrangement of the boiler. Instead of a nest of small tubes filling the boiler to the required height a number are replaced at the bottom by a large flue. In the case of the boiler illustrated this flue is 11 in. in diameter. Not only does it displace the tubes by its own large section, but it is surrounded by an ample water space to provide for a free circulation, so that in all about 28 tubes are omitted for this alone that could otherwise be used. In addition to this, the central row of tubes that are ordinarily used are left out, so that in all about 41 more tubes than are used could be put in. The 54-in. boiler shown has 158 tubes, each 11 ft. 9⅜ in. long, by which sufficient length of smokebox is obtained, though, on the whole, the heating surface is materially lessened; probably by about 20 per cent. below what could be given to a similar boiler without the superheater. The flue has a thickness of 5/16 in. and is riveted to flanges turned in on each of the two tube-sheets. The other fea-

tures of the boiler are of no interest so far as the superheater is concerned.

The smokebox is well filled with the superheater pipes and fittings, as will be seen from the engraving. The gases from the small tubes discharge beneath and back of the diaphragm as in an ordinary engine, and pass forward to the netting and thence to the stack as usual. The gases from the flue, which are, of course, hotter than those from the tubes, enter the nest of superheater tubes at the bottom and circulate through them. Quoting from Mr. Vaughan: "The steam from the dry pipe passes into the rear end of a header placed near the top of the smokebox on the right-hand side, which header is divided into a front and back portion by a transverse partition. From the back of the header the steam passes through the small superheater pipes to the rear end of a corresponding header on the left side, and from the front of that header through other superheater pipes to the front section of the right-hand header, and thence to the cylinders. The superheater pipes are curved to surround the gases flowing from the large tube, which then pass upward on each side and then into the smokebox proper. As in all superheaters of this type a damper is provided to close off the flow of gases through the superheater when the engine is shut off, as at that time there is no steam in the superheater pipes, and they would be damaged by the hot gases if they were allowed to pass through freely."

While this type of superheater has been extensively used in Germany its application in this country has been very limited, and although the results obtained have been very satisfactory, as almost any degree of superheat can be obtained by an adjustment of the gases passing through the large tube, the tube superheaters seem to offer more attractive conditions for American practice.

As will be seen from the engravings, there is considerable complication in the front end, together with a number of steam joints,




Boiler for Schmidt's Smokebox Superheater, Canadian Pacific Ry.

which, while they do not give very much trouble, are objectionable, mainly in the fact that the clips and bolts are difficult of access and the joints hard to make tight in the first place, although when this has once been done they do not seem to have a tendency to develop any leaks.

Regarding economy of action, as already stated, the amount of superheat can be brought up to almost any desired point, working conditions ranging from 550 to 650 deg. of superheat. Tests have shown the coal consumption to be below that of either the compound or the simple engine, giving a saving of about 20 per cent. as compared with either a two or a four-cylinder compound and 25 per cent. as compared with the simple engine of the same cylinder dimensions.

## President Ripley Protests Against Reduction of Fares in Kansas.

Mr. E. P. Ripley, President of the Atchison, Topeka & Santa Fe, on August 1 published the following letter:

To the People of Kansas:

The company now owning and operating the Santa Fe Railway is a little more than ten years old.

Do you know that in that ten years the road has been largely rebuilt and largely re-equipped?

Do you know that the track on the main lines is as good as any in the country and better than most, and that the branches have also been improved in condition and service as fast as men and money could be obtained for the purpose?

Do you know that in order to accomplish these results the Santa Fe Company has spent in these ten years in Kansas alone not less than 17 millions of dollars, part of which was taken from earnings that might have been distributed to stockholders, and the rest borrowed?

Do you know that the road is fully worth to-day the amount of its total capitalization?

Do you know that in these ten years the preferred stockholders have received total dividends of only 28¾ per cent., or 2.87½ per cent. per annum, and that common stockholders have received but 21½ per cent., or a little over 2 per cent. per annum?

Does it strike you that these payments are excessive, or that those who risked their savings in the enterprise have received too great a reward? How does this return compare with those of the farmer or business man on his investments?

Do you know that in Kansas the passenger train mileage of the Santa Fe has about doubled in the last ten years and that its trains are as comfortable and luxurious as those run anywhere in the world?

Do you know that the passenger rates are as low as they are in any state west of Ohio and Michigan, notwithstanding that you have only 18 people per square mile, while Illinois has 86, Iowa 40, Missouri 45?

Do you know that many passenger trains in Kansas are run at an actual loss and solely for the accommodation of the public?

Do you know that while the people of Kansas would individually save but little money by a reduction of passenger rates, the effect of such reduction would be keenly felt by the railroads, because it would reduce nearly all interstate rates, so that for every dollar saved by a citizen of Kansas the railroad company would lose several thousand dollars?

If you know all these things to be true, what reason or excuse is there for demanding that your legislature pass a law attempting to reduce the passenger rates?

We think we can demonstrate to any court or other tribunal that a reduction in passenger rates is unjust, and is equivalent to confiscation of our property, but we do not want conflict with our patrons; we do not want to be continually litigating in the effort to preserve our rights. We believe that when the people know the facts the misrepresentations of demagogic politicians and a sensational press will not be regarded.

The Santa Fe desires to conduct its business fairly and with due regard to the rights of the public; it raises no objection to public supervision and reasonable regulation; it desires above all things to keep out of politics, yet, when attacked it must defend itself, and when the sole platform of a candidate is that he is "agin the railroads," we are fully justified in protesting against his election. That is what every man and every interest in the state would do if attacked.

If my statements are true you cannot believe that the agitation for a two-cent-rate bill is justifiable; if you doubt the statements, or any of them, I can prove them correct.

I do not desire to be drawn into a newspaper controversy with politicians or demagogues, but should this fall into the hands of any honest voter, who doubts my statements, or desires further information, I hold myself in readiness to answer any communication addressed in good faith.

## Chinese Railroads.*

During the past few years a very sensible change has taken place in the attitude of the Chinese government towards railroad building. For many years the mandarin class has fought this mark of civilization with all the vigor of true fanaticism, examples of which appeared in the destruction of the line from Shanghai to Ausoung in 1877, and later in that of the lines from Pekin to Paoting-Fou, and from Pekin to Tientsin. Now, however, these people appear to have been brought to regard the railroad as a source of prosperity.

This new attitude seems to open an almost indefinite field of action to European ambition and activity; but the imagination should not be allowed to outstrip itself in this regard. While the Chinese like to come in contact with Europeans, their confidence in their own credit is such that they feel quite confident that, in a short time at least, they will be possessed of a personal technique that will enable them to keep for themselves all of the profits of the industrial enterprises that may be developed in their country.

Without attempting to encroach on the future, a brief review will be presented of the roads that have already been built or which are now building in Chinese territory.

The first attempt at railroad building was made by the English in 1876 at Shanghai. It was a short line only 9.3 miles long, connecting the city with its seaport. It was finished in June, 1876, but in October, 1877, the Chinese government saw fit to destroy it, and sent the rails to the coast of Formosa, where the sea and the climate soon destroyed them. This road was not rebuilt until 1898.

*North-Eastern Railway of China.*—We must go back to 1891 for the building of the second line, that of the North-Eastern Ry. of China, intended to connect the Kaiping mines with Tongkow and Tientsin. Up to 1895 the coal carried to that point was sent by river

*Translated from *Le Genie Civil.*

to Pekin and the territory reached by the Grand Canal and the tributaries of the Peiho. The extension of the line to Pekin asked for, at the time, by the mandarins of the region, was finished in 1898. At the same time the construction was pushed on towards the provinces of Pi-chili and Manchuria, as far as the Russian station of Inkow on the left bank of the Liao.

The Chinese line from Inkow to Pekin is built to the English gage of 5 ft. It consists of two divisions, one of 210.8 miles from Inkow to Chanhai Kwang; the other of 233 miles, on to the city of Pekin. The running time over each division is 12 hours, and calls for frequent changes either accidental or provided for, due to the crossing of rivers.

As a matter of fact the road belongs to the Chinese government, but was built by English capital and is operated by an English syndicate. The operating force is divided between English and Chinese.

*The Pekin-Hankow Line.*—The exceedingly complex financial and administrative conditions that prevailed in building and operating the North Eastern Ry. are to be found in all enterprises of the same kind that have been exploited in China. Although it has often had recourse to foreign capital, the Celestial government has never conceded its railroads to the nations so represented. The truth is that the Asiatic roads are in hands of native companies, working under the direct authority of the imperial administration. As an example of this, the text of three edicts is cited, which set forth the conditions under which the Pekin-Hankow line was built, and which may be considered as a sort of prototype for the control of new enterprises.

I.

"On the 14th day of the 9th moon of the 22d year of Kwang Siu (Oct. 20, 1896), this imperial decree is set forth: "We have communicated with the princes and ministers of the Tsung-li-Yamen directing that they examine the report that has been addressed to us jointly by Wang-Wen-Cho and Tchang-Tche-Tong, regarding the construction of a railroad from Lou-Kew-Kiao to Hankow (the starting point of the line is Lou-Kew-Kiao, a town located a few miles from Pekin), as well as the proposition to create a company whose direction shall be confided to Sheng-Kwang-Houei.

"In the report which was presented to us a short time afterwards by the Tsung-li-Yamen, it is stated that, in accordance with our will, reports have been asked from Sheng-Kwang-Houei; that, according to these, all precautions have been taken and everything correctly reported. He asks our authorization to form a company, of which we should name him as director, for the purpose of building a rail line from Loui-Kew-Kiao to Hankow as well as from Sow-Tcheow to Shanghai and from Canton to Hankow, which will be taken up later.

"The company is to furnish its own capital and will float a foreign loan; will establish a fund for depreciation, and the government will furnish the funds. It is to be hoped that the state officials and merchants will associate in this matter so that these great works may be quickly finished.

"It is also stated in the report of the Tsung-li-Yamen that the line from Lou-Kew-Kiao to Hankow, being the principal line, cannot be made double-track, since it would then be impossible to build it first.

"A copy of the note communicated by Sheng-Kwan-Houei, having been submitted to our august attention, we have finally summoned the latter to an audience and having found all the details that had been laid before us to be true, we have commissioned the said official to use every effort in the execution of the works for which we have issued plenary powers. We have furthermore directed that Wang-Wen-Chao and Tchang-Tche-Tong should busy themselves with the enterprise." Decreed herewith.

II.

"On the 24th day of the 4th moon of the 23d year of Kwang Siu (May 25, 1897,) we have received the following note in vermillion: That the parties have conformed to the decrees." Decreed herewith.

III.

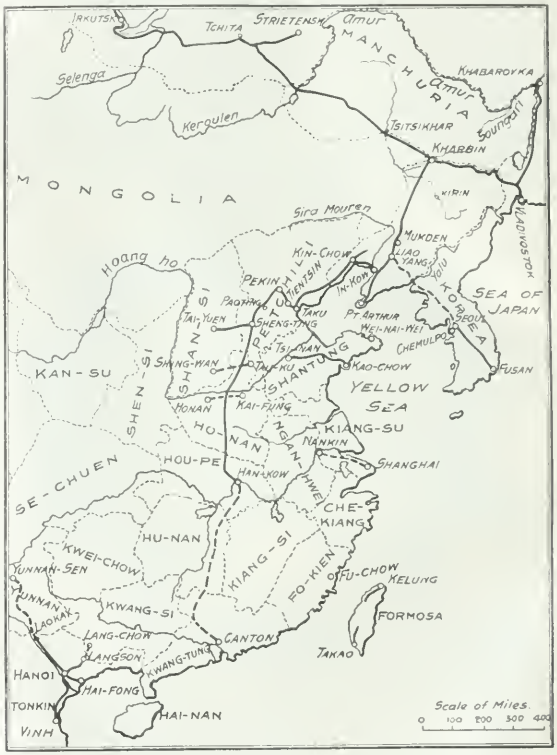
The 24th day of the 6th moon of the 24th year of Kwang-Siu (August 11, 1898). The report presented to the Throne by the Superintendent of Commerce of the ports of the North, the Vice-roy of the Hon-Houng and S. E. Sheng relative to the additional contract of the Belgian loan for the railroad from Lou-Kew-Kiao to Hankow, and containing a copy of the new contracts for a loan and operation, received the following imperial acceptance in vermillion on the 24th day of the 6th moon of the 24th year of Kwang-Siu (August 11, 1898). The parties have conformed to the agreement. Decreed herewith. SEAL.

It appears that after a failure to obtain a national subscription, the Emperor Kwang-Siu authorized Sheng, the Director-General of the Imperial Chinese Railway Company, to negotiate abroad in order to obtain the funds in the way of a loan. But this resolved itself into a question of a concession to a French or Belgian company.

A loan of $22,400,000 was subscribed by Belgium in which French capital played a preponderating role, and was issued in the form of reimbursable obligations in the shape of 20-year bonds starting from January, 1909. In case of an earlier payment of the loan of the Chinese government, which was made possible after Sept. 1, 1907, the contract becomes null and the Belgian company will be turned out.

The construction of the railroad is under the direction of a chief engineer appointed by the Belgian company, but he is entirely subject to authority of the Director-General of the Imperial Chinese Ry. Co. The personnel of the force is selected and presented by the Chief Engineer, but is appointed by the Director-General, who reserves the right of discharge where satisfactory service is not rendered. Furthermore, the director has an absolute right of control by means of Chinese or foreign agents chosen by him, whose duty it is to report but who have no authority to give orders direct to the staff.

In case of dispute between the Belgian company and the Chinese government, the difference is to be submitted to the judgment of a member of the Wai-you-pou and the Belgian Minister in China; in the case of a disagreement between these two, the final




Map Showing Chinese Railroads.

decision shall be rendered by the Minister at Pekin of that foreign country which shall have shared in the loan, namely, France.

In the matter of operation, the Belgian company has more authority and power of initiative It is called upon to direct, administer and operate the line.

The Chinese Railway Co. has merely the right of control over receipts and expenditures. A saving clause for the interests of the mandarinate is to the effect that, as far as possible, the supplies needed for maintenance and repairs shall be ordered from the shops and mines dependent upon the Director-General of the Chinese Railways. The line, which is of the standard gage, has a length of 744 miles; it crosses throughout its entire length the great alluvial plain, 372 miles broad, which extends from the foothills of the Tibet plateaux to the sea. At one point only, before reaching Hankow, it crosses the crest of the ridge separating the valleys of the Hoang Ho and the Yang-tse-Kiang, on grades 1.5 per cent., with a tunnel about 1,150 ft. long. After traversing the three rich provinces of Pe-Chili, Ho-Nan and How-Pe it reaches Hankow, 682 miles from the sea, on the left bank of the Yang-tse-Kiang, at the mouth of which Shanghai is situated.

Important as Hankow is from the standpoint of its population (about 1,500,000) it is none the less so from that of its situation. The river is navigable for vessels drawing 23 ft. of water, and

in 1904 its shipping amounted to 5,320 vessels, with a tonnage of 3,372,000. The amount of its foreign exchange was $110,000,000, of which $13,000,000 was from sales of tea. Between Shanghai and Hankow there are a number of important cities, among them Nankin. Here, then, are all the elements of an important traffic for the new line which was opened throughout its whole extent on the 12th of last November, after the completion of the great bridge of 1.86 miles long over the Hoang-ho, a bridge of 120 spans of from 100 ft. to 160 ft. each.

*The Chan-Si Line.*—French engineers traveling in China at different times have been impressed with the many and varied resources of the Province of Chan-Si. Situated at the west of Pe-Chili, surrounded on all sides by mountain chains, Chan-Si, whose area is about equal to that of the British Isles, occupies the first step in the ascent to that great plain of the east, in the direction of Tibet and Mongolia. Its average altitude is between 2,500 ft. and 3,500 ft. The eastern slopes are steep and formed of granite rocks. To the west it is not so steep, and the slopes are formed of a loamy mixture of clay and sand.

This province contains great mineral riches: 150,000 tons of anthracite coal are taken every year from the Ping-Ting mines by caravans of camels, asses and mules. The population is as dense as in the most thickly settled departments of France. These are the advantages which this province offers for the construction of a railroad penetrating into the heart of China.

Negotiations, entered into by the Russo-Chinese bank, resulted, in 1902, in two related contracts: one for the issue of a loan and the construction of a road, and the other for the operation of the same. Soon after the floating of this loan, the Russo-Chinese bank withdrew and handed the business over to the "Societe Francaise de Construction et d'Exploitation de Chemins de fer en Chine" (French company for the construction and operation of Chinese railroads), which was definitely incorporated on Feb. 12, 1904. The general organization of this enterprise was modeled after that of the Pekin-Hankow line, though some modifications were introduced in the matter of the foreign contingent of the force, the creation of special services for the authorities, etc.

The contract for the operation of the road runs for 30 years, as in the case of the Pekin-Hankow road, and expires when the full payment of the loan has been made. The road has a length of about 155 miles, and it is now being built. From its starting point on the outskirts of the city of Cheng-Ting, a place of 50,000 inhabitants, it runs to the southwest and reaches the high mountains almost at once. We will not enlarge upon the topographical difficulties which the execution of the Chan-Si line presents; they lie, for the most part, in the crossing of the great rivers, as well as in numerous ravines, formed by the loess, and extending in all directions, and whose perpendicular sides are frequently several hundred feet high. The meter gage has been adopted to facilitate the passage of obstructions with short radius curves.

The line is divided into two distinct sections. The first starts from the Pekin-Hankow road at the Tchen-To station, 9.3 miles south of Cheng-Ting-Fou, on the right bank of the Ho-To-Ho, which empties into the Tientsin; rises somewhat to cross the Hsi-Ban, a tributary of the Ho-To-Ho, and then enters the valley of the Chih-Ho, which it ascends to its source, 94.25 miles away. It is expected that the first part of this section, 46.5 miles, will be opened this year, the terminus of which will be Nang-Tsu-Kuan. The second section, which will start from the Ping-Ting station, the center of the coal operations, will offer many difficulties in construction, and many important works will have to be executed. The third section will extend from Ping-Ting to Shou-Yang.

The section of the line which is to descend from the summit of Shou-Yang towards the Yellow river has not yet been decided upon in detail, as the difficulties of construction have brought out two alternative routes which are now under discussion and examination. As the method of construction does not permit a serious undertaking of the work beyond Shou-Yang, before the lapse of a certain time, the delay due to this examination offers no serious inconvenience.

*The Yun-Nan Line.*—A new line, whose construction is of special interest to France, is now being built on the southwest frontier of China, from the point of contact with the Province of Tonkin. At the diplomatic convention of April 10, 1898, China conceded to the French government a line connecting Tonkin with Yun-nan-Sen, the capital of the Chinese province of Yun-nan. It will form a prolongation of the French railroad running up to the valley of the Red River from Hanoi to Laokay, a frontier town and will develop the outlet of the rich Province of Tse-Chou-an into Tonkin.

The construction of the Chinese part, with a length of 286 miles, and the operation of the entire line from Hanoi to Yunnan-Sen has been confided to the Compagnie Francaise des Chemins de fer de l'Indo-Chine and Yunnan (French Railroad Company of Indo-China and Yunnan). The portion from Hanoi to Laokay is being built by the colony. Work on this line, which is meter-gage, is at present being made difficult by the local authorities, who pretend that it will be bad for native labor.

*Line from Taokow to Chin-Huan.*—This road, starting from the valley of the Yellow river, lies practically at right angles to the Pekin-Hankow line, which cuts it into two unequal parts. The right to build it was conceded in 1898 to a very strong English company known as the "Pekin Syndicate," in order to serve important concessions which this company had obtained in the Provinces of Chan-Si and Ho-Nan. Work was commenced in 1902 to connect by means of a standard gage road, Ching-Huan, in the mining region, with Taokou, on the Wei river, whence the output of the mines can be taken by water to Tien-Tsin.

In 1904, 75 miles had been built and the principal mining centers reached. The Chinese government then entered into negotiations with the Pekin Syndicate for the purchase of the line. These negotiations were terminated in 1905 by an agreement, according to which the Chinese government obtained possession not only of the part that had been built but of that which was building; about 90.5 miles. The Pekin Syndicate was authorized to issue a Chinese loan of the Pekin-Hankow type of $3,150,000, forming the payment for the line and the funds for the rolling stock wherewith to operate it, which was granted for a period of 30 years.

*Shanghai-Nankin Line.*—After the signing of the Pekin-Hankow contracts England claimed that China had failed to carry out previous agreements and demanded compensation. As a result of this the British and Chinese Corporation obtained an authorization to build a road from Shanghai to Nankin in 1898. Still, it was not until 1904 that the enterprise was set upon a definite footing, similar to that of the Pekin-Hankow and Chan-Si lines, by the issue of a 5 per cent. government loan or one secured by bonds upon the line and guaranteed by the government. It puts Shanghai into communication with Nankin. This road, which is about 186 miles long, crosses a level country, but one that is cut up by innumerable streams and canals. The Blue river, upon the right bank of which the city is located, is navigable by heavy draft vessels and will form a powerful competitor. The road is now being built from each end, and has been opened over that portion (10 miles) which, demolished in 1876, was rebuilt in 1898.

*Kai-Fong-Fou and Ho-Nan-Fou Line.*—In November, 1903, a concession for this road was granted to a Belgian company known as the Compagnie Generale de Chemins de fer et de Tramway en Chine (General Railroad & Tramway Company of China). The contract was made upon the same basis as those of the Pekin-Hankow and Chan-Si Lines. Up to the present it has issued only one-half of the loan, which will amount to $5,000,000. This road from Kai-Fong-Fou to Ho-Nan-Fou, a distance of 155 miles, will follow the left bank of the Yellow river, and will connect with the Pekin Hankow line at the point where it crosses the river. Construction has begun.

*Province of Chan-Toung Line.*—This is an entirely independent enterprise, for which the Chinese government gives no guarantee, and is being built by a German company known as the Chantung-Eisenbahn-Gesellschaft (Shantung Railroad Co.). It will be 270 miles long, connecting Tsi-Nan-Fou, the principal city of the Chan-Toung peninsula, with the port of Kiao-Tcheou. The gage will be one meter.

*Canton-Hankow Line.*—This will be one of the main arteries of travel, forming, with the Pekin-Hankow line, of which it will be an extension, the great north and south road of China. An American syndicate, to whom it had been conceded in 1898, having been somewhat slow in building the first 23 miles between Canton and the important port of San-Shin, the Chinese government took advantage of the default and placed the road on its general program. It bought the concession by reimbursing for expenses incurred in surveys and construction to the amount of about $3,500,000. A loan of $5,000,000 has been floated with the Bank of Hong-Kong, secured by the receipts for opium customs in the Provinces of Hon-Pe and Ho-Nan. The sum of $3,400,000 has been paid to the American syndicate, and the remaining $1,600,000 will be used in building the road. It is expected that there will be a strong competition to build and operate this line, which the Chinese government will undoubtedly wish to arrange for on the same basis as the others. Although the question has entered into the negotiations it is, as yet, impossible to state the result. Important as this concession is, it is not the only one sought for, and we find besides the European nations both Japan and the United States in the ranks of the bidders. Success in this will depend more upon the ability of the diplomats having the matter in charge than upon that of the capitalists and engineers. In short, from 3,000 to 3,600 miles of railroad, corresponding to the actual needs of the country, are actually being surveyed or are in different stages of negotiation.

But it must not be forgotten that these enterprises involve numerous risks, as well as offering a chance for profits and an increase of the sphere of influence, etc. It will, therefore, be the part of prudence to weigh them in advance before entering upon a program hastily.

For a number of years the customs, prejudices and even the hostility of the Chinese people have increased the amount of these risks. The change in the point of view that has been brought about

in the minds of the governing classes, facilitating the work as it has, still leaves a wide margin of uncertainty in the result; and the difficulty of securing contracts will be accentuated as the Chinese government comes to understand the profits that can be made out of such enterprises. On the other hand, the question of operation and traffic presents itself with all of its ramifications. The small lines running to the ports will be sure of sufficient traffic, but will it be the same with the trunk lines of the interior, serving a population that is frequently very poor and oppressed by the exactions of the mandarins? The question is whether the railroads can struggle victoriously against common customs and the economical transportation of water in a country where time and speed are negligible quantities.

Hence it appears that the question of Chinese railroads is one of the diplomatic rather than the technical order; a point that must never be forgotten.

## The Deformation of Railroad Tracks.

In a special investigation into the influence of the tie on track deformations, experiments were made with wooden ties of different lengths and also with a steel tie in use on the State Railway of France, and a composite one formed of wood and steel. This composite tie is formed of two U bars laid with the legs up and holding between them two rectangular blocks of wood about 27½ in. long, separated by an empty space. The points studied were the creeping of the rails, the variation of the gage on straight lines and curves, vertical and horizontal displacement of rails, the compression of the wood in the line of the support, the drawing out of the spikes and the blow delivered at the joints.

All of these appear to be the result of two main movements, the transverse and vertical. The transverse movement results because the tie is not only forced down into the ballast, but is bent by the passing load so that it does not sink uniformly throughout its whole length. Hence the pressure is not carried evenly down into the ballast, but is greatest directly beneath the rails. It has been generally supposed that a loaded tie carried its burden throughout its whole length, and that, in order to lessen its depression into the ballast it was merely necessary to lengthen it. But these investigations have shown this supposition to be wrong.

Long ties, that is to say those more than 7 ft. 6 in. long, are bent under the action of the load, on a curve whose concave side is uppermost, with a slight bellying at the center, and an inclination of the rails towards each other.

Short ties, that is those less than 6 ft. 10½ in. long, bend on a curve whose convex side is uppermost, and the rails are tilted away from each other.

It would seem that between these two forms there should be one where there would be a vertical displacement on a straight line, without an inclination of the rails in either direction. Observation has shown this to be the case with wooden ties whose length lies between 6 ft. 10½ in. and 7 ft. 2½ in. The composite ties referred to, with blocks loaded at the center, also give very good results from this point of view.

Experience has confirmed the fact already known, that pressure transmitted to an elastic body (the ballast and soil) through a rigid elastic mass (the tie) when nearly constant near the center of loading, diminishes rapidly on receding from that point. Practically, with the current dimensions of ties and ballast, there is no object in extending the supporting surface more than 14 in. on either side of the rail. Tamping the tie is useful only throughout the length and distance that corresponds to an effective distribution of the pressure. At all other points it is a detriment in that the tie is strained if it rests upon its ends or center, and so deflects excessively and abnormally. It is, in a way, suspended from points where the load is naturally the least.

The vertical movement is also a matter of importance. Before the arrival of the load each tie is first raised; then, as the load approaches, it descends and is embedded in the ballast below the position it originally occupied. The rail takes on a sinusoidal form and presents to the wheels a series of undulations. The use of very rigid rails, and stiffer ties, can reduce the tractive force by 30 per cent. and the movement of the joints by half.

The suppression of the shock or blow at the rail joints, due to the vertical movement, has long attracted the attention of engineers. Attempts have been made to secure an elastic joint by the use of suspended joints. But they have thus created single points of depression, having a much greater deflection than others in the immediate vicinity, especially at the ties. This deflection has been measured by means of a special apparatus and has been found to be as much as [illegible] in., whereas the yielding of the tie would not quite reach ⅛ in. It is best, then, to support the joint in order to avoid that so-called elasticity which is the cause of the destruction of the rail and rolling stock. If the deflection of the ties and the movement of the joint can be avoided, it will undoubtedly make it possible to attain even higher speeds than at present.

M. G. CUENOT, in the *Moniteur Industriel.*

## New Southern Pacific Steamships.

The first of three steamships building for the New York-New Orleans passenger service of the Southern Pacific Company was launched at the Cramp yards in Philadelphia last week. This vessel, named the Momus, is a full powered steel passenger and freight coastwise steamship, 440 feet long, 53 feet beam, and of 17 knots speed. Her loaded displacement will be 10,200 tons, and her gross tonnage about 8,000 tons.

She is a single screw; has three double-ended and four single-ended Scotch marine boilers designed for 230 pounds steam pressure. Her engines are vertical-inverted, direct-acting, triple expansion.

There are accommodations for 152 first-class, 58 second-class and 250 steerage passengers. The dining room is on the main deck forward, and has a seating capacity of 162. There is a library forward on the saloon deck, and smoking room, bar and barber shop are aft on the promenade deck. There are four luxurious suites with two rooms, brass bedsteads and baths. There are twelve bathrooms, in addition to the privatee baths of the suites, which, with toilet rooms, have artificial ventilation.

She is specially constructed to handle cargo in the most expeditious and economical manner, for which purpose she is provided with overall side hatches and side ports in the lower decks, having a cargo capacity of 4,000 tons. She has refrigeration for 100 tons of perishable freight.

Two sister ships, the Creole and the Antilles, of the same general dimensions, are to follow. The Southern Pacific purchased the Cromwell Line of passenger steamships running between New York and New Orleans several years ago, the purchase including the vessels Comus and Proteus, now used in the service, and the steamship Louisiana, which no longer runs between New York and New Orleans. The Comus and Proteus are excellent passenger vessels of about 5,000 tons, and run at a speed in the vicinity of 15 knots. The new vessels, 3,000 tons larger and two knots faster, will be the largest coastwise steamers on the Atlantic seaboard. The next largest steamer now engagd in strictly coastwise service is the San Jacinto, of the Mallory Line, a 6,000-ton vessel running between New York and Galveston. The new Ward boats, named Merida and Mexico, running between New York and Havana, are of 5,000 and 6,500 tons, and the Morro Castle, in the same service, is of 6,000 tons. Two new steamers of 8,000 tons are also building for the Ward Line. Until the former Mexico and Havana, now sold to the government for use in the Panama service, were built for the Ward Line, the largest coastwise steamers engaged in regular service were about 4,500 tons. It will be seen, therefore, that in the last ten years the size of the largest steamers has nearly doubld. It is noteworthy that the tradition of single-screw steamers for the coastwise trade has not been broken even in the case of the new Southern Pacific boats. The Ward Line has been building twin-screw steamers for some years, beginning with the Havana and Mexico, previously mentioned, but with these and two other exceptions there has never been a twin-screw steamer on the Atlantic Coast engaged in regular deep-sea coastwise service. The other exceptions are the San Jacinto and the City of Savannah (formerly La Grande Duchesse), built by the Plant Line and bought by the Ocean Steamship Company of Savannah some years ago.

The Southern Pacific has found its New Orleans passenger service very popular and profitable. The two steamships now in service have not been sufficient to meet the increased traffic since the line was put under the excellent management of the railroad company. The sea trip is five days at present, but the new steamers should be able to reduce this somewhat. In connection with the two now in service, they will supplement the excellent fleet of 5,000-ton fright steamers operated by the company between New York and New Orleans and Galveston under the name of the Morgan Line.

## Foreign Railroad Notes.

The railroads, posts, telegraphs and telephones owned and operated by the Belgian Government showed an increase of $2,000,000 in receipts last year, as compared with 1904. There was no increase in railroad mileage, which is still about 2,500 miles.

The latest (to date) Italian Minister of Public Works, Signor Gianturco, is a lawyer, and professor in a law school, a member of Parliament since 1889, and an eminent orator. He has at different times been Minister of Education and Minister of Justice.

The Japanese control the Manchurian Railroad, and a despatch from Tokio says that a special low rate has already been introdnced on the railroad for Japanese tobacco and a few other commodities. This action is giving rise to serious apprehension among foreigners interested, as they fear that through manipulation of the railroad rates special advantages may be afforded to Japanese goods and the spirit of the open door nullified.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 7. FRIDAY, AUGUST 17, 1906.


The New York State Railroad Commission, in addition to promoting the killing of men at grade crossings by being supine instead of effective in availing of the present good law, is this year making an ill-judged use of the $250,000 appropriated by the legislature for the state's quarter of the cost of avoiding grade crossings by carrying the railroad either over or under highways. A member of the Commission is our authority for the statement that it has already frittered away two-thirds of this large sum in scattered spots throughout the state with no general plan for accomplishing the greatest benefit by clearing up a region. Furthermore, it has not been done in good faith, for the following reasons: The New York Central decided, in response to general public demand, to safeguard the traffic through the Park avenue tunnel, to increase the capacity of the Grand Central terminal and give better, more frequent and reliable service in the suburban region and to near-by cities by electrifying, not only the terminal, but also all the approaches to the city from Croton on the main line and from White Plains on the Harlem. It was obvious that, with the enormous increase in number of trains in this suburban zone, any grade crossing was impossible—too many lives would be lost. For example, at Mount Vernon, on racing days, crowds of thousands cross the track and the conditions would be ripe for ploughing up and making a killing which would shock the world. More than a year ago there was submitted to the Commissioners a list of grade crossings, in the order of their importance, and suggestions made that the state make partial appropriations as shown in the table. These eleven interested communities were not only willing, but anxious, to pay their quarter of the cost; the railroad company wanted to pay its half in addition to an additional expenditure of $15,000,000 for accompanying improvements, and the Commission stood alone in blocking the way to an improvement in the value of property, more expeditious service and saving the lives of people hit by passing trains:

| Order of importance. | Location. | Estimated cost. | Estimated final cost to the state. | Suggested partial appropriation. |
|---|---|---|---|---|
| 1 | Yonkers | $618,460 | $154,615 | $100,000 |
| 2 | Mount Vernon | 303,000 | 75,750 | 50,000 |
| 3 | Ossining | 146,848 | 36,712 | 20,000 |
| 4 | Hastings | 73,100 | 18,275 | 10,000 |
| 5 | Irvington | 54,000 | 13,500 | 5,000 |
| 6 | Tarrytown | 179,600 | 44,900 | 25,000 |
| 7 | Bronxville | 46,400 | 11,600 | 5,000 |
| 8 | Tuckahoe | 92,000 | 23,000 | 10,000 |
| 9 | East Chester | 18,500 | 4,625 | 4,625 |
| 10 | Hartsdale | 65,400 | 16,350 | 10,000 |
| 11 | White Plains | 200,000 | 50,000 | 25,000 |
| | Totals | $1,797,308 | $449,327 | $264,625 |

Accompanying this table the suggestion was made that the Board of Railroad Commissioners, after giving the usual public hearings, should approve the plans which would then properly authorize the local communities to do their part of the work, and the Board should appropriate in each case a portion of the total estimated cost, leaving the remaining portions to be covered by such appropriations as the legislature might make. The railroad company was requested to assume the risk of these later appropriations being made, to which it assented. Inasmuch as in many cases several years will elapse before the state will be called upon to pay its proportion of the cost, it would appear as if these partial appropriations would be ample, and at the same time the Board would not exceed its authority under the Higgins law. The work could then actively proceed and the communities secure the benefits accruing from the elimination of dangerous grade crossings and from an improved transportation service.

The subsequent proceedings continue to be interesting: The communities concerned and the company joined this year in asking the legislature to appropriate $250,000 in order to accomplish this great public benefit. The appropriation was made, and then, for the first time in its existence the State Railroad Commission, with its politicians, its stained office-holder and statesman conductor, got busy and diverted that money from the purpose intended, and so mended their political fences. The bad result is a stagnation of property values and local improvements, and a present loss of improved transportation service north of High Bridge, on the main line, and north of Wakefield on the Harlem, for the New York Central announces that it will not—dare not—electrify to Croton and White Plains and pay for the lives of people which its trains will surely hit at grade crossings.

## THE STREET RAILWAY AND THE COMMUNITY.

On Saturday afternoon, August 11, at 3:30 o'clock, at the height of the Coney Island rush traffic, Justice Gaynor, of the New York Supreme Court, handed down a decision to the effect that a certain passenger did not commit breach of peace in refusing to pay two fares for the trip from Brooklyn to Coney Island, and added as an obiter his opinion that the Brooklyn Heights Railroad Co. had no right to exact two fares for a continuous ride over its owned and leased properties. The learned Justice created no new ruling, in fact, his obiter contradicted the decision of the Appellate division of his own court, handed down last summer, that two fares between New York and Coney Island were legal. That is to say, a judge of the lower branch of a court went out of his way to reverse (if the term may be allowed, where no reversal was technically

possible) the judges of the higher branch of the same court. His opinion under these circumstances carried just the same weight as the opinion of an editor; valuable, perhaps; interesting, certainly; but not law.

But the furore which this extra-legal opinion created has had no parallel in the history of rapid transit. The newspapers of the lower order blazed forth with great headlines proclaiming that no one need pay but one fare from New York to Coney Island. Borough President Bird S. Coler raced about in his automobile urging the company's patrons to resist the extra payment—gave his best efforts to incite a riot, and was quite successful. The Brooklyn Rapid Transit Company, with law and justice entirely on its side, and undoubtedly with full knowledge of the resistance which the enforcement of those rights would cause, proceeded to strict enforcement, and at the point on its line where the five cent limit was reached, it proceeded to demand the additional fare and to eject from its cars those who refused to pay. This is the method used in such cases by, so far as we know, every railroad in the world. The law requires that in such ejectments no more force than is necessary shall be used. In the riots which ensued, undoubtedly some employees lost their temper and fought with those who wanted to fight. The criticism, therefore, if any, is that the company was undiplomatic. The possibility of municipal ownership is a danger not to the transportation companies but to the people, and by so much as the Brooklyn Rapid Transit Co., in its violent assertion of its own rights, put a weapon in the hands of the demagogues, it erred, for the Borough of Brooklyn has become the storm center of this form of demagogism.

The attitude of Brooklyn toward its transportation service has been inexplicable to many who do not recall the history of the companies now consolidated. The original charters of many of these companies were granted recklessly and abused by those who obtained them. The street railways were badly constructed, overcapitalized and starved. When, a few years ago, the present management took charge, it found what might be called a nearly universal and justifiable hostility to the rapid transit system. The rail ends were imperfectly bonded and none of them welded, so that the company sustained a great loss of power and the waste currents did damage to an alarming extent. The elevated structures, which were at once inspected by expert engineers, were so weak and dangerous that the management was in doubt whether or not to stop the service on them immediately. The power houses were entirely inadequate for the movement of enough cars to properly serve the public. The first duties were plain: to weld the rail ends and stop the loss and annoyance; to strengthen the elevated structure and prevent the possibility of a terrible disaster; to increase the power and make it adequate.

The company having accomplished this much has found itself absolutely blocked in extending its lines in Brooklyn, and in affording decent service between the boroughs of Brooklyn and Manhattan by the refusal of the authorities to allow them to make proper connections between the Williamsburg and Brooklyn bridges.

It might have been expected that the citizens of Brooklyn seeing and knowing that its rapid transit corporation was doing its best to give additional facilities and make them safe, would abandon at least a part of their hostility, but this they have not done. The municipal ownership idea and its extraordinary advocates have temporary complete control of that class of citizens which really likes riot. Hopeful people—those who believe that this Republic will endure, that people can govern themselves—consider such outbreaks as this as passing incidents. Although we wish to be classed among these hopeful persons, nevertheless we fear that temporarily the demagogues of Brooklyn have been strengthened in their unworthy cause by the action which has led up to the riots.

## KILLING TRACKMEN—THE CHEAPEST WAY TO LESSEN IT.

A recent undertaking by the engineer in charge of reconstruction on a busy line to reduce the number of Italian workmen hit by passing trains had an interesting result. To further safeguard these men, a set of rules for foremen was worked out with the intention of printing it and enforcing it. Rule 3 was as follows: "A watchman must be stationed at all times where he can see approaching trains so as to warn the men in sufficient time to allow them to get out of the way. The warning must be given with a whistle, as follows: One blast indicates approach of train on track No. 1; two blasts indicate approach of train on track No. 2," etc. Before this rule was drafted a collection of different kinds of whistles had been made, and one that was far-reaching and distinctive had been selected.

But the Law Department, to which the proposed order was submitted, said: "We have concluded that for the present it is better not to promulgate any rule whatever on the subject, but let men watch out for themselves." This recommendation was based on some then pending legislation on the subject, and on a Court of Appeals' decision in a case where a workman, who was hit, claimed damages because the foreman had ordered him to work without looking up, while he, the foreman, would look out for the safety of the men. The Court said the foreman had no right to assume this responsibility for the company. This decision in favor of the employer was, of course, a warning to the company to avoid an official assumption of responsibility for any definite method of watching out.

But, since this decision was made, the United States law, approved June 11, 1906, has changed one of the basic principles of the theory of negligence. Interstate railroads are now liable under certain conditions for damages occasioned by the negligence of co-employees, and it seems well to repeat what was said in these columns June 29:

> "To avoid, or at least to diminish, the heavy loss to which all the carriers will be subjected by this law, it will be necessary, first, to revise the rules for the prevention of accidents; next, to promulgate others more adequate; and then see to the strict enforcement of them. This will tend inevitably to save life and limb, and to that extent at least the law will exercise a salutary influence and accomplish a world of good."

Track work is dangerous, and the number of men killed in the reconstruction work now being done on many busy railroads is increasing, and worse than that, we fear that it is increasing more than in proportion to the number of men so employed. Heretofore it has undoubtedly been less costly to the railroads to, as quoted above, "not promulgate any order, but let men watch out for themselves." But the tendency of legislation, both by Congress and by some States, is to make the employer liable for deaths and injuries due to negligence of a co-employee who has a degree of authority over the killed or injured one. This is simply an application of the doctrine of law that what one does through another, he does himself, and it is probable that future enactments and future decisions will be to the end of determining, or making a more exact definition of what degree of authority a negligent co-employee must have in order to make the company liable. A New York state statute of this year defines as vice-principals (not fellow servants) employees entrusted with authority of superintendence, or to direct another employee in the performance of duty, or having control of the movements of a signal, switch, engine, car, train or telegraph.

The number of hours a day of useful work that a foreman can get from track workers varies greatly. There are places where it runs as low as an hour a day. Of course, the foreman knows that his value to his company depends largely on his ability to make his men trust their lives to his watchfulness and continue to work, without looking up, until the foreman or watchman shouts. Beckoning is not enough, and, theoretically, a whistle, of a tone not to be confounded with any other whistle, is a more definite and inspiring warning than shouting.

It does no good to have ignorant workmen sign contracts exempting their employer from liability. Before a jury this gives the attorney for the plaintiff a fine chance to prejudice the case by claiming that this poor working man, not knowing or thinking of the dangers, could only get a chance to work by signing his life away.

In view of the recent laws, the tendency of legislation and the number of men killed on track work, it would seem to be wise to voluntarily assume the responsibilities which are coming, and take steps to reduce the killing and the cost of it. This would mean a more careful study of the art of protecting workmen on track and officially promulgating definite instructions. The engineers and foremen do the best they can, but heretofore, generally, engineers have not been allowed to formulate and print definite instructions, and make foremen and watchmen pass an examination on their understanding of those instructions.

## DELAY AND DIVERSION OF FREIGHT CARS.

The only hope of ameliorating the evils of the freight-car situation hangs on the car service committee of the American Railway Association. Everybody admits the existence of the evils—wrongful use of foreign cars on your own road, and sending such cars to other roads without leave, both for real traffic needs and for the

purpose of cheating the owner out of 75 cents a day; and everybody is dumb, or, at least, extremely diffident when it comes to naming the remedy. The reader has doubtless noted the nonplussed state of the minds of the car service men as shown in the *Railroad Gazette* of August 10. Nobody can reason out a remedy. Reasoners naturally feel satisfied only with a remedy that seems likely to succeed everywhere, and no such remedy has been found. This being the case, there will be a perpetual deadlock unless some arbitrary power can secure the adoption of a remedy that is only partly satisfactory. Only an arbitrary power would dare to adopt a remedy admittedly imperfect. The committee is such a power. Far be it from us to call those estimable, efficient and amiable gentlemen arbitrary, in their acts or their dispositions, nevertheless we look hopefully to them to force a reform which may not be susceptible of a complete defense by reasoning. What we mean is this: Everybody is at sea as to what ought to be done first, and yet is anxious to have something done. In that frame of mind there will be a strong sentiment in favor of action by the Association in October. The commitee being the only body that has given to the subject the necessary amount of study, reflection and experiment, its views will be the only ones that logically can prevail. As no one else will be able to marshal the facts for a case against the committee, the committee must carry its point, right or wrong; that is, arbitrarily. Was not that the way that per diem was adopted? Again, we are emboldened in our rashness in the role of prophet by the action at Chicago last April on the diversion question. The Association backed the committee unanimously.

This indorsement of the committee's proposal that diversion of cars be punished only when the owner has officially forbidden the diversion of specified cars to specified roads was substantially an order to propose at the next meeting a rule prescribing a penalty for diversion. As it is fair to expect that such a report will be forthcoming, it is worth while again to give the committee's reasons for not recommending more drastic action.*

Although the committee is severely cautious and dignified in its language, it is clear that its conclusions may be summarized as (1) a higher per diem rate would be a very risky experiment, (2) delays and diversions cannot be provided against by an automatic rule. On the other hand, a rule which goes into effect at the will of the car owner has been worked, with increasing success, for four years (in the matter of penalty for delay). Under such a rule, applied to diversion, each road can keep its cars on preferred routes, and can prohibit everybody from sending them to any road which has not dealt fairly in the past. Such a road will find itself ostracized, as it were; will find all its neighbors enjoined, under penalty, from delivering foreign cars to it.

Again, if in order to break penalty, a system has divided itself for car accounting purposes, it may, under the action of a diversion rule of this kind, find each of its parts restrained from the diversion of foreign cars to each of the other parts. Thus the diversion rule would not merely be an extension of the present penalty rule, but almost the reverse of it, and railroads escaping the frying pan of a penalty for delay would find themselves in the fire of this penalty for diversion.

In our last comment on this subject we suggested that until something is done by the Association, everybody should use the telegraph and the Golden Rule; should trace by wire very vigorously for his own cars and use his conscience scrupulously in the handling of other people's cars. An esteemed correspondent has mildly ridiculed the last suggestion. Not that he has not a conscience—he has one, and it is in use—but that there is no use in trying to make men honest by rule except as we can devise a rule which will make it for their interest to be honest. We admit the force of the criticism, but we are just old-fashioned enough to like to set the Golden Rule up to look at now and then. We should have great hopes from the other half of our recommendation. With the world as it is, the next best thing to forcing our unreliable neighbor to exercise a conscience is to force him to admit that he hasn't any. The mental exercise may do him good. If you follow up your cars closely enough you may be able to make some headway in that direction with evildoers. The vigorous tracing of cars might have a salutary influence, even during the short time between now and October. After October we can try something more direct; the committee may be expected to give us a good weapon in the combination of frying pan and fire above referred to.

## THE CAPE TO CAIRO PROJECT.

Much interest was aroused the world over by the announcement that Alfred Beit had left £1,200,000 to endow the Cape to Cairo railroad and telegraph scheme. The detail of this endowment, as set forth in the will, was as follows:

> I believe that by the promotion, construction and furtherance generally of railways and telegraphs, including wireless telegraphy, telephones or other methods of transmission of persons, goods and messages, civilization will be best advanced, especially in Africa, for the benefit of the inhabitants of that country, whether native or immigrant, and I know from experience how difficult it is at times to find funds for the construction of such methods of transmission in new and undeveloped countries.

He makes provision "for the purpose of assisting the promotion, construction, equipment, or furtherance of any such method of transmission, as aforesaid, in south and north Rhodesia, Portugnese Africa, both east and west, German East Africa and such other parts of Africa as may be traversed in establishing what is known as the Cape to Cairo Railway and the Cape to Cairo telegraph system, including telephones."

So far as we know, this is the first time that railroad construction has been specifically provided for by endowment, and we look upon Mr. Beit, like Cecil Rhodes, as a strong man to whom the great African country was dear. These were two builders of empire, even though their methods of building were large methods and harsh ones. Rhodes built during his lifetime. The work of Beit while he lived was more obscure—he was rather the banker than the active builder—and it is not until his death that the extent of his interest in the country has been shown.

But in view of this interesting and unusual bequest, it is worth while to again take up for brief review the Cape to Cairo project that has been so widely exploited, with so little hope of fulfilment. There was printed in the *Railroad Gazette* just a year ago an account of the existing South African railroad system, in which it was shown that at the time of the Boer war the communications north and northeast from Cape Town were over the Cape Government Railway to Vryburg and thence on to Bulawayo, 588 miles northwest of Vryburg, over the lines of the Bechuanaland Railways, Bulawayo having been reached by this system in 1897. After the war the Bechuanaland Railways became the Rhodesia Railways, connecting with the Cape Government system at Mafeking. North from Bulawayo the lines now form a rough letter U, the Rhodesian Railways inclining northwest to the Victoria Falls on the Zambesi river and then north again on an extension now in progress which, at last advices, reached to Broken Hill, 107 miles north of the Kafue river, and 2,013 miles by rail from Cape Town. Northeast from Bulawayo the Beira & Mashonaland Railroad practically continues the direction which the Rhodesian Railways take south of Bulawayo, and extends as far as Salisbury, near which point a junction is made with the line which starts from the port of Beira on the Indian ocean and runs northwest.

The distance from Cape Town to Vryburg is 771 miles; from Vryburg to Victoria Falls 870 miles, and from Victoria Falls to Broken Hill, 373 miles more, making this total of 2,013 miles which have been built from the Cape along the general longitudinal axis of Africa. This is the south end of the route. From the Mediterranean end of Africa, the Egyptian State and Egyptian-Soudan railroads afford communication from Alexandria to Khartoum, which is approximately 1,350 miles south of Cairo by the route

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*The idea is frequently expressed that we shall be able in the near future, by increasing the per diem rates, to put it at such a point that we shall be able to do away with the penalty rate feature altogether, but the Committee fears that if we adopt too high a rate, we shall interfere seriously with the free movement of freight cars when loaded, and cause a large amount of unnecessary empty mileage with foreign cars. Certainly when cars are plenty, a high per diem rate would result in frequent transfers at junction points, and in the hurrying home of cars which are really not needed there.

Without, however, deciding whether or not it will ever be practicable to do away with "penalty," it is obvious that the present per diem rate is not sufficient to move cars in periods of car shortage, and that the penalty arrangement must be maintained for the present.

In the line of avoiding unnecessary empty foreign mileage when cars are plenty, the present rule is so arranged that it is not automatic, and delay can only be penalized when cars are held in contravention of the expressed wish of the car owners. Under this rule, arrangements are frequently made by which certain railroads are not penalized for delay, and thereby unnecessary empty mileage is often saved.

The Committee feels that any automatic rule for diversion would result in the unnecessary transfer of cars at junction points and increased unnecessary empty mileage. It is easy to conceive of frequent cases where an automatic penalty for diversion would result either in inconvenience to the public, transfer at junction points, unnecessary empty mileage, or all three.

There are many cases where a technical diversion will serve the interests of the car owner better than a strict adherence to the home route. Under the circumstances, the Committee feels that the only safe course in framing a rule for diversion will be to adhere to the principle now tested for nearly four years in the penalty feature for delay, and to provide that no diversion shall be penalized unless it is made in contravention of the expressed wish of the car owner.

The proposition is so novel a one, however, that the Committee feels that it needs the counsel and support of the Association before formulating a diversion rule, and it therefore proposes the following resolution:

*Resolved*, That a penalty for diversion should be imposed only in cases where cars are delivered to specified foreign roads contrary to the expressed wish of the car owners.

In case this resolution should be approved, the Committee will use it as a basis for a rule to cover a penalty for diversion, which it will present at the next meeting of the Association. *Extract from report presented at Chicago, April*, 1906.

traversed. A portion of this route is by steamer, but connections are made with trains having through sleeping car and dining car accommodations, so that it is essentially a completed and serviceable system of travel. The rails stop a short distance south of Khartoum. The next stage of the journey may now be performed by river steamer from Khartoum to Gondokoro, 1,181 miles. Gondokoro is located in the northwest corner of British East Africa on the River Nile, about 200 miles from Lake Albert Nyanza. In this part of Africa there is now in operation the Uganda Railway, which runs from Mombasa, on the coast of British East Africa, about 175 miles north of Zanzibar, to Lake Victoria Nyanza on the equator, but this railroad does not help in establishing communications between Cairo and the Cape, being primarily an east and west route from seaboard.

Supposing that the Rhodesia Railways are connected with the Egyptian-Soudan Railways, the route seems likely to lie by way of Stanley Falls on the Congo, and Gondokoro. From Broken Hill to Stanley Falls, which may roughly be described as located at the bisection of the eastern part of the Congo with the equator, the rail distance should be about 1,325 miles, and from Stanley Falls to Gondokoro on the Nile it should be about 600 miles. Add the 1,181 miles from Gondokoro to Khartoum and it will be seen that something over 3,100 miles of railroad will have to be built through the equatorial part of Africa.

The project is not an encouraging one. In fact, it is so discouraging that we have often stated that it may safely be predicted that no Cape to Cairo railroad would be seen by any one now living. In the first place, there is no commercial need for a trans-African railroad, and the basis reason for this is that the parts of Africa which either supply traffic or seem likely to are much better adapted for sea routes than they are for rail routes. The whole trade of the 3,000 difficult miles between the Zambesi and Khartoum can almost be disregarded from a railroad standpoint, while most of this trade, such as it is, is tapped by the Uganda line, which was built to carry it direct to the coast of the Indian ocean, giving a short haul by rail and the long haul by sea.

It has also been pointed out as a minor difficulty that the Rhodesian system, the Uganda and the Egyptian-Soudan lines are built on three different gages. The Cape system is 3 ft. 6 in. throughout; the Uganda line, approximately 585 miles long, is of 3 ft. 3⅜ in. gage, laid with light rails not adapted to carrying the rolling stock either of the Cape or of the Egyptian system, while the Egyptian lines are in part 4 ft. 8½ in. gage, from Alexandria to Luxor, say 400 miles south of Cairo; they are 3 ft. 6 in. gage from Luxor to Shellal, 150 miles, and 3 ft. 6 in. gage from Wady Halfa to Khartoum. A gap exists between Shellal and Wady Halfa, as mentioned, and on this 200-mile stretch traffic is now carried on river steamers.

The engineering difficulties of the route need not now be dwelt on, further than to point out the great swampy area which lies between Gondokoro and Lake Albert Nyanza.

Alfred Beit has left $6,000,000 to further this project. Supposing that a railroad could be built and equipped in the equatorial Africa region for $50,000 a mile, which is doubtful, this sum would build 120 miles. If it could be built for $25,000 a mile, which is impossible, 240 miles would be accounted for. Supposing that 240 miles were built, there remains a stretch of some 2,800 miles, discouraging alike to the engineer, the contractor and the traffic man. Just what economic use Central Africa is ultimately to be put to in the scheme of the world's commerce and industry we do not know, but we unhesitatingly advise those who wish to journey from Alexandria to the Cape to go by sea, and to plan to go by sea for the rest of their lives.

## Westinghouse Electric & Manufacturing Company.

For the first time in more than five years a formal report has been submitted to the stockholders, the last statement, covering the period up to March 31, 1900, having been presented at a meeting held Feb. 20, 1901. The present income statement therefore covers a period of six years. It shows gross earnings of $114,618,537, operating expenses $97,726,009, leaving net earnings of $16,892,529. After various additions and deductions from these net earnings, including among the latter the $9,922,070 paid during the six years in dividends, the company's surplus on March 31, 1906, was $11,540,642.

The general balance sheet of that date shows factory plants at East Pittsburg and Allegheny, Pa., and Newark, N. J., including machinery and equipment, carried at $10,630,000. Under "Investments," stocks and bonds of subsidiary American manufacturing companies of a par value of $7,210,900 are carried at $5,191,000, and stocks and bonds of foreign companies of a par value of $13,750,000, at $10,661,000. There are also included here the stocks and bonds of the Lackawanna & Wyoming Valley Rapid Transit Company, the third rail electric road between Scranton and Wilkesbarre, Pa., carried at $6,300,000, an item which appears for the first time in the company's statement. The item most to be criticized, on account of its obscurity is "Other Assets," $7,031,537. This includes charters, franchises, patents, office furniture and fixtures, insurance and taxes paid in advance—a collection of asset items which might easily range from actual cash to the most valueless sort of "good will."

There is reported the recent securing of important contracts, aggregating $6,000,000, from the municipal authorities of St. Petersburg, for building electric tramways in that city. As a result, a company has been organized under French laws to take over an electric manufacturing plant already in operation in Moscow which will take in hand the business of providing for the new contract. Attention is called to the development of the single-phase alternating-current system of railroad operation as the most brilliant accomplishment of the company's development work, a department which requires the services of 45 per cent. of the engineering force. On the following roads the system is already in successful operation: The Long Island, Atlanta & Northern Railway, Indianapolis & Cincinnati Traction, Vallejo, Benecia & Napa Valley, and the Warren & Jamestown Street Railway. Other steam roads, or new roads on which the single-phase system is being installed are the New York, New Haven & Hartford between Woodlawn, N. Y., and Stamford, Conn.; the Grand Trunk for the electrification of its Sarnia tunnel; the Spokane & Inland Railroad, a new road in the state of Washington, for the complete operation of its lines; the Fort Wayne & Springfield Railway, and the Springfield & Butler Traction. For testing purposes a line of road between East Pittsburg and Trafford City has been equipped by the company with the latest type of catenary suspension trolley line for high tension alternating current transmission. Here the single-phase electric locomotives manufactured are tested. This road is also fitted with third rail and substations for testing direct-current locomotives.

Sales during the past year have shown large increases. Sales of railroad motors, for instance, have increased 51 per cent. over any previous year; of the electro-pneumatic unit switch system of multiple control, over 60 per cent., and of turbo-generators 94 per cent. over any earlier year. The following table shows sales for the last six fiscal years:

| | |
|---|---|
| Year ended March 31, 1901 | $12,516,072 |
| Year ended March 31, 1902 | 17,927,340 |
| Year ended March 31, 1903 | 19,571,294 |
| Year ended March 31, 1904 | 18,569,614 |
| Year ended March 31, 1905 | 16,570,717 |
| Year ended March 31, 1906 | 24,939,602 |

If sales for the current year keep up to the average of the first five months of the calendar year 1906 (more than $2,850,000 a month), as it is stated may reasonably be expected, the total sales will amount to $34,000,000, as against $24,940,000 in the last fiscal year.

The report loses strength and significance as a statement of the company's affairs from the numerous partisan statements which it contains. For example, in regard to the single-phase alternating current system, the Second Vice-President says: "The system furnishes the only means to-day by which existing steam roads can be economically operated by electric power." Similar remarks are made about the company's output in nearly every department. It is evident, however, that the company is obtaining a large share in the great prosperity which is to-day so characteristic of the electric manufacturing and supply business.

Last week, Tuesday, August 7th, some 260 switchmen employed in the New Haven local yards of the New York, New Haven & Hartford Railroad went on strike, filing with the company a statement of their grievances. These included, among other things, dissatisfaction with the assistant yardmaster. Most of the strikers were members of the Brotherhood of Railroad Trainmen. On last Saturday, August 11, the strike was broken by the following order signed by two of the higher officers of the brotherhood:

*To Chairmen of all Grievance Committees on the New Haven System:*

Make copies and post where all members can see the following: The undersigned officers on the ground find an illegal strike in effect in the yard service at New Haven, many of our members participating; men on strike now ready to resume duty; company not willing to re-employ them.

We must concede the position of the company is justified. We have told the company our organization would do its duty fearlessly and protect contract. Members are cautioned to remain at work and pay no attention to those who might try to influence them to risk their places, as the brotherhood will co-operate with the company to protect contract.

Capable men, members of our organization, in search of employment are requested to report to the undersigned, as a number of men are required to fill positions at present vacant. (Signed) VAL. FITZPATRICK.
JAMES MURDOCK.

Mr. Fitzpatrick is Second Vice Grand Master, and Mr. Murdock, Fourth Vice Grand Master of the brotherhood. Their action was taken after consultation with the General Manager of the road.

It was proved to the satisfaction of the union officers that the strike, which was undertaken entirely without authority from the central body of the organization, was unwarranted and that the company was not willing to take back the strikers into its employ. Therefore the influence of the whole organization of railroad trainmen was thrown in favor of the railroad company and against the striking group of their own members. This, contrasted with the record of labor unions in general, is a remarkable instance of sincerity and prompt action in defence of the employer's side of a contract on the part of a labor union. In the railroad service, however, it probably is by no means exceptional, and merely goes to show again the marked superiority of the railroad organizations over the general run of unions. If all unions could include men of a high enough stamp to have the moral courage to take action against their own members when those members had broken their contract with their employer, the labor union question would lose most of its dangerous features.

Two eastern railroads within a year have submitted their schedules to the referendum. Last May the Erie asked its commuters to record their use of the Twenty-third street ferry, in New York, and the Long Island now goes further, and seeks definite suggestions about the fall time-table. Mr. Peters' circular is as follows:

> It is expected that the time-table will be changed from the summer to the fall arrangement early in September, and generally the trains will be about the same as shown on time-table in force from May 17 to June 14 this year. That trains may be arranged to accommodate patrons as much as possible, they are requested to express their wishes to the Traffic Manager or General Passenger Agent, at 263 Fifth avenue, New York, by letter before Aug. 10, 1906. It is desired that these communications be written on only one side of single-sheet letter paper.

This announcement was placarded in a conspicuous manner, and received nearly 100 replies. Many of the smaller communities along the line were chiefly concerned in securing the stoppage of through expresses, and such requests as these it was usually impossible to grant. But a number of helpful and practical suggestions with regard to minor adjustments were brought out, and these have proved of considerable service to the company in planning schedules to give the maximum amount of satisfaction. The experiment was clearly a success, and will be repeated. It seems evident that the best way to stop complaints about passenger schedules is to interest the people who use them in the making of them. Suburban passengers want the railroad to do as well as it can, and the railroad most assuredly wants to do as well as it can by them, for the better pleased they are, the more of them there will be. The experiment of giving them at least an advisory voice in train management costs nothing except the printing of the posters, and ought to be a very effective way of nipping hostility in the bud.

## July Railroad Law.

The following abstracts cover the principal decisions in railroad cases handed down during July by the United States Supreme Court and the other federal courts:

*Franchise Taxes.*—The refusal of the taxing authorities of a State to allow a deduction from the capital stock of a railroad company which is taken as the basis of a franchise tax imposed by law on acount of the considerable proportion of its rolling stock which in due course of business is always absent from the State, does not amount to an interference with interstate commerce or a taking of property without due process of law within the meaning of the federal constitution, and this more particularly where it is not shown that any of this property was outside the state a sufficient length of time to admit of its taxation in other states.—New York ex rel New York Central & Hudson River Railroad Co. v. Miller, 26 Sup. Ct. Rep. 714.

*Interference with Interstate Commerce.*—An order of a state railroad commission compelling a railroad company engaged in interstate commerce to deliver cars containing interstate shipments to a private siding beyond its right of way amounts to an unlawful interference with interstate commerce without regard to whether this action is viewed as an assertion by the commission of its general power over carriers or of its power to make such an order in a particular case in favor of a given power or corporation. McNeill v. Southern Railroad Co., 26 Sup. Ct. Rep. 722.

*Duties of Train Dispatcher.*—A train dispatcher having issued orders sufficient if obeyed to insure the safe operation of trains approaching on the same track should issue supplemental orders where he knows of the disobedience of the original orders and that such disobedience will result in a collision, provided, of course, that he can reach the engineer disobeying orders in time to prevent the collision.—Santa Fe Pacific Railroad Co. v. Holmes, 26 Sup. Ct. Rep. 676.

*Railroad Mail Clerk a Passenger.*—The rule of the Pennsylvania courts that a railroad clerk while at work is not a passenger, but occupies the status of an employee, and is entitled to recover for injuries only in the event that an employee could recover, which rule is opposed to that accepted by most American courts, does not apply where the mail clerk, at work on a train belonging to one company, is injured in a collision between his train and a train belonging to another company on a track over which both companies have joint trackage rights.—Farrington v. Delaware & Hudson Co., 143 Fed. Rep. 565.

*Injunction as Remedy for Damages.*—A railroad company granted the right to build its track along a street is not to be enjoined from building its road on the ground that damage will result to abutting property owners. This question can only be litigated in an action at law for damages.—Whittaker v. Atlanta, Birmingham & Atlantic Railroad Co., 143 Fed. Rep. 583.

*Future Pain an Element of Damages.*—The liability of a railroad company for future damages for personal injuries is strictly limited to a compensation for such pain and other effects of the injury as are reasonably certain to result from it, and a recovery of damages for pain and suffering which may possibly result in the future should be refused as remote and speculative.—Chicago, Milwaukee & St. Paul Railway Co. v. Lindeman, 143 Fed. Rep. 946.

*Trains Interfering with Operations of Fire Department.*—A railroad company will not be liable for a loss by fire because one of its trains ran on tracks across which the fire department of a city was preparing to run a line of hose to a burning building even though the trainmen were signaled to stop by persons beside the track, when the fire was not visible to the trainmen, and there was no hose upon the track which they could have seen and it was not clear that the engineer heard or understood the signals or should have known of the existence of the fire.—American Sheet & Tin Plate Co. v. Pittsburg & Lake Erie Railroad Co., 143 Fed. Rep. 789.

*Enjoining Location of Grade Crossing.*—A Tennessee county court vested by statute with discretionary power to locate highways cannot be enjoined from making a location across the tracks of a railroad company unless the location involves the taking of property essential to the operation of the railroad or would work other irreparable injury to the railroad company or would amount to a violation of some existing law.—Cincinnati, New Orleans & Texas Pacific Railway Co. v. Morgan County, Tenn., 143 Fed. Rep. 798.

*Injunction against Ticket Scalping.*—Owing to the inadequacy of legal remedies to reach the evil, injunction is a proper remedy to prevent the scalping of non-transferable round trip tickets issued at reduced fare on account of public gatherings in different parts of the country and in proper cases the injunction should be permanent, reaching future violations, since the court, under a familiar equity rule, having jurisdiction of the parties and the subject matter, should in its final decree administer full relief.—Louisville & Nashville Railroad Co. v. Bitterman, 144 Fed. Rep. 34.

*Injury to Trespasser on Track.* A person of mature years and in the full possession of his faculties who walks upon a railroad track for more than half a mile without once looking back or stopping to listen for an approaching train by which he was struck is wanting in ordinary care for his own safety and cannot recover damages for his injuries. He is not excused by the fact that the wind and other noises tended to deaden the sound, as such a condition should have made him more vigilant.—Northern Pacific Railway Co. v. Jones, 141 Fed. Rep. 47.

*Death of Alien.*—The right to recover for the wrongful killing of a person is not defeated by the fact that the person and his next of kin are citizens of a foreign country.—Baltimore & Ohio Railroad Co. v. Baldwin, 144 Fed. Rep. 53.

*Crossing Signals.*—The law requiring trains to signal their approach to crossings was enacted solely for the benefit of persons using the highway and a failure to sound such signals cannot be urged in an action for injuries to a trackman at work near a crossing. A like rule applies to the violation of speed ordinances.—Western Railway Co. v. Gesswine, 144 Fed. Rep. 56.

*Right to Connect Switch Tracks.*—Under laws making all railroads public highways and their owners common carriers, the owner of coal mining property adjoining the right of way of a railroad is entitled as a matter of right to connect switch tracks built on its own land with the track of such road to facilitate the loading and shipping of coal. Nor may the railroad company refuse to accept and transport coal tendered by a shipper on the ground that it is not uniform in quality with other coal mined on its line and that the marketing of such coal will injuriously affect the sale and consequently the shipment of the superior coal.—Olanta Coal Mining Co. v. Beech Creek Railroad Co., 144 Fed. Rep. 150.

In the Cape of Good Hope colony many of the short branches and extensions do not pay on account of ox wagon competition. In the report for the year 1905, recently issued, the traffic manager of one of the lines reports, in regard to a new 19-mile branch, that, as there was a very plentiful supply of wagons and an abundant supply of grass during the season, ox wagon rates ruled low, and the railroad secured little general traffic. The recommendation to meet this competition is to have main instead of branch line rates introduced on the new line.

## Prince Khilkoff on Russian Railroads.

We have from time to time alluded to the remarkable work done by Prince Khilkoff, late Minister of Communications, in connection with the Trans-Siberian Railway during the recent war.

During his recent visit to England, in connection with the Interparliamentary Congress, he gave an interview of some length to one of the British representatives of the *Railroad Gazette*. The latter writes: "Armed with a letter of introduction from one of the best known men in Russian politics, I went to seek out Prince Khilkoff in the Painted Chamber in the House of Lords where the conference was sitting."

A perfect babel of tongues prevailed and an equal variety of costumes, Russian peasant deputies and Japanese princes, Polish revolutionaries and German land owners, American Senators and Austrian aristocrats conversing amicably together. I was, however, unable to find the object of my search until lunch time when the whole of the delegates were gathered in Westminster Hall. Here I found him seated between the Spanish and Russian Ambassadors, and subsequently I had a long talk with him at his hotel.

One of the facts which I particularly desired to get confirmed by Prince Khilkoff was the maximum capacity of a single line as constructed; he informed me that a maximum of no less than 20 trains had been passed over the line in 24 hours. This performance was the more remarkable as the line mostly consisted at that time of very light rails weighing not more than 40 lbs. per yard, laid down in a great hurry and often without proper supervision by contractors who were not over particular, at a rate, in some cases, of 10 kilometers a day. Passing places only existed every seven or eight kilometers, and the first thing that was necessary at the outbreak of the war was to add 243 new passing places, besides relaying some 2,000 kilometers of line with heavier rails. Under these circumstances, it was not surprising that the various estimates made as to the capacity of the line varied considerably. The Russian general staff at the outbreak of the war considered that seven or eight trains per day would be the maximum possible. The German general staff believed that it was capable of being made to carry 11, while our own military authorities in India, who had more practical experience of this type of railroad to go upon, estimated the possibility of 13 trains per day being passed over the line, though doubtful if this could be proved by his experience on the Trans-Siberian, for no longer single line is ever likely to be maintained. The result exceeded all estimates.

Prince Khilkoff.

The construction of the new lines was split up among contractors to an extraordinary extent. The Circum-Baikal line, on which there were 43 tunnels, was let out to 42 separate contractors, many of whom were Italians. Incidentally, one advantage possessed by the Italian workman over native labor was the fact that the former, thanks to their readiness with the knife, were far less subject to interference by Cossacks and others, who obtained a very wholesome respect for them, whereas the average native was prepared to stand a good deal of robbery and ill-treatment. On more than one occasion trains loaded with food for the troops were completely looted by the laborers themselves when short of food or by political prisoners, and it must not be supposed that the leakage of stores and clothing was as small as that of troops. The latter was remarkable indeed, no less than 780,000 to 790,000 troops being transported all these thousands of miles with a loss, attributable to railroad causes, of three or four lives only.

A great deal of work, of course, still remains to be done and, in fact, it has just been decided to build a line from the Baikal to Pokrovskzy, at the junction of the rivers Shilka and Argun. As large numbers of the Russian contractors, who did the previous work, are either bankrupt or disqualified from tendering again, it is quite possible that there is an opening for English capital in this direction, and, in any case, a large quantity of stores and railroad material will undoubtedly be required.

On the whole, Prince Khilkoff did not consider that Russian railroad men are badly paid compared with other classes of workmen. Leading engine drivers receive as much as $75 a month, and others in proportion. But the higher officials do not even nominally receive good pay. Men in charge of sections of 500 to 800 miles having sometimes under $1,000 a year, and that irregularly, it is not surprising that bribery should exist; on the whole, it appears that the only people who have made a good thing out of the Russian railroads have been the contractors, when they have got their money. The Government, however, realizing perhaps the vital importance of keeping the railroad system intact and ready for emergencies, has undertaken to spend a further $10,000,000 a year for the purpose of raising wages and improving the dwelling houses of railroad servants. This appears a large sum, but it will not go very far among the 667,000 railroad employees (including workmen, but excluding military) whose total wages at the present time amount to close on $125,000,000 a year. There is thus, as will be seen, no great opening in Russia for English railroad officials, but there does, on the other hand, appear, in view of the great extension of railroads which will take place as soon as the political horizon clears, a considerable amount of work for English contractors.

At the present time there are two express trains each way every week from St. Petersburg to Vladivostok, it being necessary to change at Irkutsk; they are not, however, as might be expected, very fast, and Prince Khilkoff stated that an enterprising newspaper which was bent upon making a fresh round-the-world record, had recently inquired from the Minister of Railways what would be the price of a special express train from one end of the system to the other, stopping not more than twice a day. The figure was unfortunately prohibitive, even for the enthusiastic journalist.

There ought to be a considerable market for further rolling stock in Russia. Prince Khilkoff said that during the war there was an idea prevalent that a great deal of rolling stock was destroyed at the other end, owing to the impossibility of returning it; as a matter of fact, this was not the case. It accumulated in large quantities at the other end of the line during the war, and during this time was often used as a living abode by officers or men, but excepting in those rare cases where the people were really so hard up for fuel in the cold weather that they did not know what to do, very little of the stock was broken up at the time. Quantities of it, however, were so seriously damaged, either by the long journey or by the treatment it received on arriving at the other end, that they had to be almost entirely reconstructed, and now workshops had been put down at the other end of the line for this purpose.

All kinds of signaling systems were used on the Siberian and on the Russian railroads, hand signaling, lever signaling, and electric, and electric signalling was very much believed in in Russia.

A good many experiments had been made in Russia with oil fuel and with wood fuel, and it was hoped that further experience would have been gained about this on the Trans-Siberian. As a matter of fact, they had no time to make experiments, or to get locomotives fitted for this purpose, and, although a certain amount of wood was burned, they mostly used coal. The Government had found it wise to acquire a very important coal field about half way to Irkutsk, where good coal could be obtained, the coal obtained nearer the other end of the line being of an indifferent quality.

Talking of Russian railroads generally, Prince Khilkoff did not consider that there was any very great likelihood of a general strike, for he thought that the demands of the railroad men were more of an economic nature than of a political one, and the men had suffered so severely in the recent strike that they were hardly

likely to throw up their jobs again. The Prince is a man of practical experience. He recently stated that during his sojourn in America he would spend from 16 to 18 hours a day in the workshop or on the footplate, and throughout that time he was acquiring everything that could be of use to him in connection with railroad operation. In fact, all those connected with Russian railroads are great believers in taking advantage of other countries' experience, and nearly all the leading railroad officials who read English subscribe to the *Railroad Gazette* with this object. Prince Khilkoff carries in his head a mass of figures connected with the operation of the Russian railroads, and is moreover, as is the case with so many of his countrymen, an excellent linguist, our conversation being conducted with equal facility in French or American, both of which he spoke fluently. He is no longer Minister of Railroads, having already had two successors, Mons. Nemjeshajev, who went out with the Witte cabinet, and was succeeded by Maj. Gen. von Schaffhausen-Schonberg-ek-Schaufuss.

## The New Standard Code.

BY H. W. FORMAN.

(*Continued from page* 116.)

In the third line of the first paragraph of Rule 94 (I quote from the committee report) the word "schedule" should be changed to "identity." It may be that an extra will overtake another extra and find it necessary to exchange with it. In that case it would take its identity; extras are not scheduled. The word "identity" should be made use of in place of "right or schedule" in the sixth line. Referring to the second paragraph, it will be conceded that when a day telegraph office is closed for the night it is no longer a telegraph office until the operator comes on duty the next morning. Suppose a train should be tied up at such point and a train comes along having right or schedule which permits it to proceed, and the delayed train precedes it to the next telegraph station. After its departure the following train pulls out the end of a car and is delayed until 7 a.m. The day operator comes on duty and reports to the train despatcher that the train is still at his station; the despatcher sends an order to meet at that station a train which the formerly-tied-up train is running against on the right of this following train. Would not there be a very good chance for a collision if the conductor of the train having the draft rigging out did not fully explain to the despatcher what had been done? Can he be depended upon to do that? The operator might, contrary to rule, notify him he had orders for him, instead of getting signature, and fail to say what kind of orders, and the conductor might neglect to ask. Conductors are likely to assume in such cases that the train using his right has been located and restricted, or has reached the next telegraph station, when such may not be the case. In all such cases the following train should place on the train running ahead of it a flagman to hold all opposing trains until it arrives.

In Rule 95 the words "Two or more sections may be run on the same schedule" are found. This provision is harmless, but unnecessary. After reading the definition for a section, Rule 20 and Form F, it will be seen that it is no more necessary to say that sections may be run than it is to prescribe that regular trains and extras may be. Nor does it appear to be necessary to say that extra trains must not be run without train order authority. Rule 201 and Form G clearly indicate that it must not be done.

Rule 104 should say what is meant by "in charge." Has the rule been complied with when the man who says he will look after closing the switch is some thousand feet distant from it? If the rule read "A switch must not be left turned from its normal position for a following train unless one of the crew of such train is at the switch and has taken charge of it," many doubts would be cleared up. There should be another rule making the engineman responsible for the switch when the train is backed in on a siding, as the front brakeman is then usually some half mile from the train protecting the back-in movement.

Rule 206 does not prescribe the safest practice. It is much better to spell out "second," than to write "2d." The additional time required to do so is not worthy of notice. In my opinion, the Association is making a mistake in recommending that time be stated in figures only. Several years ago a large road changed its rules, which then required time to be spelled out and duplicated by figures, to the code method of stating it in figures only; and this for no other reason than that its officers were loyal supporters of the code and desired to be in harmony with it and with other large roads. In a year or two thereafter a frightful collision occurred on that road through mistaking the figure "2" for a "5," and many persons were killed and injured. I have no doubt many officers adopt certain rules in the code against their judgment for the sake of uniformity. Here is an instance where it may be dangerous, and certainly is of no benefit. Hundreds of orders are turned in at my office daily and I have yet to find one where both the words and the figures representing time are so poorly made as to make both indecipherable, although orders are sometimes found not clear as to a certain word or figure.

The "middle order" authorized by Rule 208 B is becoming popular because it is an additional safeguard. While about one-fourth more time is consumed in fixing a meeting point in this manner it is time well spent. But when it is remembered that the order is sent to the trains interested before the meeting point is reached, I have queried if the operator at the meeting place could not just as well be relieved from having to repeat his copy to the despatcher, thus saving the time taken up in doing so. Such operator can carefully check his copy while it is being repeated by the operator who receives it for the superior train and then reply "Checked," and receive "Complete." Should there be an error in his copy, which is improbable, the train crews would call attention to it and, until such mistake was corrected, would of course be governed by the copy delivered to them before arriving at the meeting point.

Typewritten orders are becoming common. The type usually furnished with typewriters is objectionable because so small that there is too much chance of a figure being misread. Also, the orders are sometimes difficult to decipher by firebox light on engines at night. But if type known as standard large Roman is used an excellent copy can be made in this manner.

There does not appear to be any good reason for despatchers sending the initials of the superintendent every time they "complete" an order; the provision could well be omitted from Rules 210 and 211.

Rule 214 seems a little more strict than is necessary. After an operator has repeated an order to a despatcher addressed to No. 1 to run one hour late, and has received the usual assurance that the despatcher has heard him repeat it, I can see no objection to the operator completing such order if, after the conductor of No. 1 has endorsed his name thereon, it be found that the wires have gone down. To treat the order only as a holding order delays No. 1 and probably other trains. Even though the rules do not require the despatcher to acknowledge having heard the operator repeat the order, they often do so by replying "i" or "o k."

Rule 215 should read: "The operator who receives and delivers a train order must preserve a copy." It is immaterial whether it by the lowest copy, provided he keeps one on which appear the signatures.

There is some risk in connection with Rule 218, and it should be provided against by elaborating the rule, or by requiring the despatcher to advise operators in some way when a schedule is represented by sections and the sections are not stated in either the address or the body of the order. Operators are not mind readers and might deliver the order to the first section, and, not knowing there are more, change their order-signal to "proceed" and allow a following section to pass without receiving a copy. Operators are often so situated that they cannot see the signals on the front of engines, and the rules do not require enginemen to call attention by whistle to such signals for operators' information.

When running orders are annulled, or one section passes another, or when extras receive short running orders and hold other orders that may concern them after receiving new running orders, there is some question as to the standing of orders held by such trains. Do they become void at the time the running orders expire or are annulled, or the section is withdrawn? This point does not appear to have been clearly covered by code rules. An effort has been made to clear up the question in new rules which will be found below under the caption of "governing principles." Rule 220 does not fully provide for such cases.

In the train order forms it will be noticed that there is not uniformity in the references. Sometimes the expression "Under (3)" is used, again it is "Under example (8)." If throughout the code references were made thus, "Under Example 3," the work would look better.

The standard code still lacks a few examples of forms quite commonly used.

The words "For Opposing Trains" do not seem to be necessary in the caption of Form A. In Form B, the explanation of Example 3 is not as clearly stated as is necessary to avoid delay and misunderstanding. Form C is too narrow. It should provide for giving right over another train without regard to direction. There are three conditions necessary to be taken care of under this form: Establishment of the fact that such an order makes a train superior to another, and prescribing how many minutes the train thus made inferior shall clear the other train; giving instructions as to which train shall take the siding at the first and last named stations and also at stations within the designated limits; and providing for identification in case the trains meet within the limits. Failure of the rule to require the train made inferior to stop the superior train and identify itself to it might result in a collision, if the train over which right is given should reach a point within the limits by time-table, or time order, or by flagging with some other train. This can be illustrated by a case where No. 2 is given right over first No. 1 from B to A. Should first No. 1 be able to make B and properly clear the time of No. 2 it may go there. If it does, and is not identified, No. 2, not knowing that the first section of No. 1 has been met, is likely to run from B to A without help against second No. 1, while second No. 1, not being restricted, may closely

follow the first section out of A, and thus cause a collision either between A and B, or at B. Also, not knowing that the train over which right is given has been met, No. 2 is put to the inconvenience of taking the siding at A for nothing, and, should such station be a blind siding and not be provided with a train register, the train might be tied up for No. 1. To allow a condition of this kind to arise may be said to be poor train despatching, but such orders have been given and are likely to be issued in the future.

It is wrong to use an even hour in a "wait" order, as is done in Form E, Example 4. Many roads duplicate time by spelling and in such cases trainmen have been known to misunderstand an order giving them until ten 10 a.m. to make a station, taking it to mean that they had until ten minutes past the hour. Train despatchers should be instructed to express time thus—9.59 a.m., or 10.01 a.m.; and examples given to them should be consistent with this instruction. Example 4 will be burdensome where the "middle order" is used, as operators at the several waiting points must each receive a copy. To avoid this the "Late Schedule" form of order will be found advantageous and will be referred to below. That "the time in the order should be such as can be easily added to the schedule time" does not impress me as being necessary or practicable. If the time of trains at stations always ended with a "5" or "0," or trains could be depended upon to show up an even number of hours late, the principle could be applied, but not under existing conditions.

The heading of Form F could be changed to read, "Form F. Creating and Changing Sections." In this form, Example 8 means that if there be five sections of No. 1 and an order is addressed to all, instructing the second section to take down its signals at D, the following sections must understand that they are thereby made void at D and must not advance beyond such point without train order authority to do so. It would have been better if the code had stated that the following sections could again be created from D by train order, as, in reading the instructions one gets the impression that this must not be done. The plan of instructing a train to take down its signals, instead of sending an order that might be misunderstood, as was provided by the old code, is very good, but it would seem that such sections as are withdrawn should have their running orders annulled or be more explicitly deprived of their authority to run as a train.

In Example 9 too much dependence for safety is placed upon the crews addressed. It is sometimes very necessary to authorize a fourth section to pass the other three and run as first, but the example does not clearly provide for such a movement. In cases of this kind nothing should be left to the imagination of the men as to signals, identity, or any orders the several sections may hold. The running orders should be annulled, instructions given as to how many sections there shall be under the new creation, and if one engine is to pass another, so direct in the order. If there be other orders in effect for such sections they must be renewed. I know of no other way to fully protect this somewhat unusual movement.

The phrase, "The character of a train for which signals are displayed may be stated," would be better made to read, "The character of sections may be stated." It may be desired to specify the character of the section which is displaying the signals, instead of the section for which they are displayed.

Form H is the best practice, but in Example 6 the words "against other trains" in the third line from the bottom of the third paragraph of the explanation should be changed to read "is protecting against them." The paragraph of the instructions, stating that the working limits should be as short as practicable, is of no value. On Sunday, a work train is sometimes given a working order covering an entire branch. It is practicable to keep the operators on duty and extend the working limits from station to station, but this is unnecessary. Matters of this kind must be regulated by the kind of work and number of trains. Work trains should not be delayed getting new working orders every hour or so, when it can be avoided.

As it is sometimes desirable to use the other form of working order, requiring the despatcher to instruct work trains to protect against extra trains, instead of allowing the rules to so prescribe, I suggest such a form below.

Form K would have been strengthened if the day of the week had been added. Often men know that it is Sunday without knowing it is the 24th of June. There is another way in which an annulment order can be made more satisfactory. The despatcher should when possible say that the train has arrived at the station and is annulled beyond. This, of course, refers to cases where a train is annulled from some intermediate station not provided with a train register. Should a section be annulled, the annulling order should state that such section had arrived with no signals.

The 19 and 31 forms do not provide enough space for the address. It is not uncommon to address an order to several trains in different directions. The line in the clearance card reading, "This does not affect any orders you may have received," only serves to confuse and provoke argument and should be omitted. The train may have received orders before arriving at the station where the clearance is handed to it, and may be given orders with such clearance.

In the explanation of the cut which shows red lights to the rear of trains running by night, may be found the words "Rear of train by night while running." As the rear must be thus protected while the train is on a single main track, either standing or running, the explanation should read "Rear of train by night while on main track."

The number of minutes that trains should clear as shown by the train order examples in the summary should of course be changed to harmonize with whatever may be decided upon as to such rules as 88, 89, 91, etc.

## SUMMARY.

### Standard Time.

2. Watches that have been examined and certified to by a designated inspector must be used by conductors, enginemen, brakemen, firemen, train despatchers, operators and ———.

The certificate in prescribed form must be renewed and filed with the Superintendent semi-annually.

Conductors, enginemen, brakemen and firemen must report to an inspector semi-monthly, to have the performance of their watches recorded on form provided.

3. Conductors and enginemen who have access to a clock designated as a Standard Clock must compare their watches with it before starting on each trip. If they have not access to a Standard Clock, they must compare watches daily with those of conductors or enginemen who have Standard Time.

Conductors must compare time with enginemen before starting on each trip, and with brakemen and flagmen as soon thereafter as practicable. Enginemen must compare with firemen before starting.

### Time-Tables.

4. Each time-table, from the moment it takes effect, supersedes the preceding time-table, and its schedules take effect on each division at the leaving time of such schedules at their initial stations on such division. But when a schedule of the old time-table corresponds in number and day of leaving with a schedule of the new time-table, a train represented on the old time-table will retain its train orders and assume the schedule of the corresponding number and date of the new time-table.

Schedules on each division date from their initial stations on such division.

Not more than one schedule of the same number and day shall be in effect on any division.

6 (*a*). Superintendents must require all concerned to acknowledge receipt of new time-table. Notice thereof must be bulletined at least forty-eight hours prior to its taking effect.

### Signal Rules.

7. Employees whose duties require them to give signals must provide themselves with the proper appliances, and keep them in good order and ready for immediate use.

11. A fusee burning red must not be passed until burned out; while burning green, it is a caution signal. Fusees must not be placed on the track, or where fire may be communicated by them.

Add to Rule 12: Hand and lamp signals must be given in a plain and accurate manner. If slow movement is desired, signal slowly.

Add to Rule 14: Should a train fail to answer the 14 (*k*) signal, the train displaying such signal must stop and notify it. In stopping, consider following sections. Failure to acknowledge the signal must be reported.

15. The explosion of one torpedo is a signal to stop; the explosion of two, not more than two rail lengths apart, is a signal to reduce speed, and look out for a stop signal.

Torpedoes must not be placed near stations or crossings where persons might be injured by them.

### Train Signals.

17. The head-light must be displayed at the front of every train by night, but must be concealed when a train turns out to meet another and has stopped clear of main track, or is standing to meet trains at the end of double track or at junctions.

When a train has cleared the main track, a stop-signal may be given to the engineman from the rear by a green lamp.

18. Yard engines will display the head-light at the front and rear by night. When not provided with a headlight at the rear, two white lights must be displayed. Yard engines will not display markers.

By night a red light must be displayed to rear on tenders of road engines being moved between trains and roundhouse.

19. The following signals will be displayed, one on each side of the rear of every train, as markers to indicate the rear of the train: By day, green flags; by night, green lights to the front and side and red lights to the rear, except when the train turns out to be passed by another and is clear of main track, when green lights must be displayed to the front, side and rear.

24. When cars are pushed by an engine, except when shifting or making up trains in yards, a flagman must take a conspicuous position on the front of the leading car. By night, a white light must also be displayed on the front of the leading car.

Cars must not be backed or cut loose and allowed to run over a street, highway or private crossing, in yards or elsewhere, without a flagman on the front of or preceding the leading car.

25. On all trains that carry passengers each car must be connected with the engine by a communicating signal appliance.

26. A blue flag by day and a blue light by night, displayed at one or both ends of an engine, car or train, indicates that workmen are under or about it, when thus protected it must not be coupled to or moved. Workmen will display the blue signals, and the same workmen are alone authorized to remove them. Other cars must not be placed on the same track so as to obstruct the view of the blue signals, without first notifying the workmen.

*(To be continued.)*

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The French railroads in 1905, working on the average 24,644 miles of road, earned on the average $12,313 per mile, which was 3⅛ per cent. more than in 1901. Of the seven great systems, the Northern had much the heaviest earnings, viz., $20,987 per mile, followed by the Paris, Lyons & Mediterranean with $15,643, while the State system earned but $5,718 per mile. These are all large systems, and the six great companies have each some very productive lines and many branches with a very thin traffic. The Paris Interior Belt railroad, which unites the five lines entering the city with each other, and serves as a transfer line, earned no less than $98,017 per mile; but there are only 20 miles of it. The Paris, Lyons & Mediterranean, the greatest French system, worked 5,828 miles of railroad. All but one of the French systems, the Southern, have a terminus in Paris.

### Protecting Piles from the Teredo.

The teredo works along practically the whole coast of the United States, but does the most damage in the southern portion, especially in the Gulf of Mexico and along the whole of the Pacific coast, reaching its worst form in Puget Sound, where there is a combination of limnoria and teredo. In the Gulf of Mexico the worms will honeycomb a green pile and render it useless, as far as construction purposes are concerned, in from 10 months to $2\frac{1}{2}$ years; whereas green piles on the Pacific coast cannot really be counted on to stand longer than 10 months.

The teredo, when it enters a pile, is almost microscopic in size, and leaves a hole in the outside of the pile no larger than a pin head. As soon as it attaches itself to the wood, it immediately begins to burrow and grows very fast. Piles that have only been in the water from two to three years in Florida have been split open and teredo ranging from $\frac{1}{4}$ in. in length to 20 in. in length have been found, reaching a diameter of $\frac{3}{8}$ in.

The work of the teredo impresses the observer as being all the more remarkable after he has seen one. In color they resemble the light colored jelly fish, and are of slightly denser consistency than a jelly fish. They grow as fast as they bore, and at the further end of their furrow are two shells with which they do their destructive work. It is necessary for the teredo to have free access to clean water at all times, and, strange to say, it is not believed that they live on the wood that they cut, but take their food from the water outside. They have two siphons extending out of the wood into the water; one of them serves to take in food, and the other to take off the refuse from their bodies, including the wood which they bore.

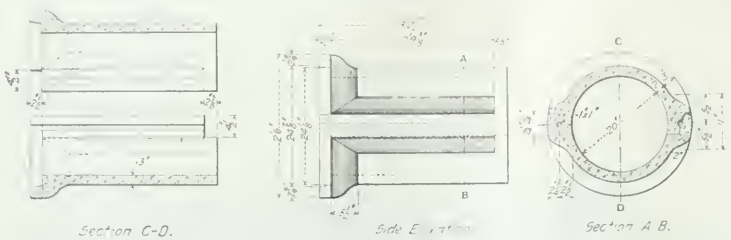
Owing to the great amount of destruction wrought by these sea worms many methods of protection have been devised. Most of these methods are concerned with treating exposed wood with chemicals. Creosote has been found the most practical and most efficient for this purpose of all chemicals, but it has been demonstrated beyond doubt that creosote is not permanent in its protection. In Cuba, for example, creosoted piles have been rendered almost useless in 2 to $2\frac{1}{2}$ years. On the Pacific coast similarly treated piles have been rendered useless in 15 months; a great difficulty with creosote being that it is impossible to tell the life of a pile without trying it, and in many localities piles near each other have been attacked in entirely different ways, some lasting only a very short time and some lasting a comparatively long time.

The Louisville & Nashville Railroad about 12 years ago used vitrified clay pipe and filled the annular space between the pipe and the pile with sand. This method of protection was found to be efficient, except that it was very difficult to put whole sewer pipe on a pile after the bridge had been built. In order to do this,

Concrete Pipe Made and Stored near the Bridge.

Piles Protected from Teredo with Sectional Concrete Pipe, Seaboard Air Line.

It was necessary to remove the caps of the structure. This, of course, ran the expense up. In order to avoid this, the company used split sewer pipe with ordinary butt joints and wired the sections together around piles. The annular space was then filled with sand, the same as with the whole pipe, but it was found that the joints could not be made tight enough to hold sand. Then the space was filled with concrete. This was very effective for a while, but as soon as the currents and tide caused a scour at the mud line the teredo attacked the pile there. In many cases where this protection was used, piles had been eaten away at the mud line,




Elevation and Sections of Concrete Pipe.

and they actually hung to the caps. The trouble with this protection is that the concrete filling makes the pipe and pile adhere. When the scour occurs at the mud line, the pipe is unable to settle, and, therefore, does not protect the pile at a very vulnerable point.

A recently devised pipe, designed by Mr. Philip Aylett, has been put on the market by the Lock Joint Pipe Company, 346 Broadway, New York, for pile protection. This pipe is made of cement, and divided longitudinally into halves, with keyways in each section which, when placed around a pile and keyed, form a scarf joint. This pipe is made in sections of 2 ft. and 3 ft. long, and the diameter varies according to the size of the pile. The pipe is placed around the pile at the top of the water, and section by section lowered until it rests on the bottom. The pipe is then allowed to settle a few inches and the annular space between the pipe and the pile is filled with sand.

For a 12 in. pile an 18 in. pipe is used, leaving a space all around the pile of 3 in. for the sand. For piles above 12 in., 20-in. pipe is used. The 18-in. pipe is 1¾ in. thick and the 20-in. pipe 2 in. thick.

After the pipe has been filled with sand and allowed to settle, the tops of the pipes are sealed. The teredo has never been known to work below the mud line, and this is the principle upon which the lock joint pipe works. By placing the pipe around the pile and keying it, extending from below the mud line to above high water, it more than covers the entire field of work of the teredo, and the fact that the pipe is filled with sand accomplishes the result, as far as the teredo is concerned, of raising the mud line above high water. Piles which have been infested with the teredo and have been protected with lock joint pipe as above have been pulled up after three days, and all the teredo in them have been found to be dead.

This pipe is manufactured on the ground, the company shipping cast-iron moulds and employing labor and materials as near as possible to the site of the work. This saves freight and breakage in transit.

The accompanying cuts show the Seaboard Air Line bridge across Manatee river, Fla., protected with lock joint pipe, and a quantity of pipe stacked up ready to be put on the bridge. The blueprint shows the standard 20-in. pipe. This pipe is keyed with a wooden key and hot tar poured on top of this key so that it goes down through the whole keyway and makes the joint absolutely tight. Tar is also used in the bell and spigot joints.

This same pipe is used for culverts and sewers, and in this construction is laid with broken joints, thereby making a very strong pipe. Instead of the keyways being filled with wood, for sewer purposes a plastic cement key, re-enforced, is used.

## Curve Resistance.

BY WILLIAM G. RAYMOND,
Dean, College of Applied Science, State University of Iowa.

No entirely satisfactory theoretical discussion of curve resistance has been published. Perhaps none is possible. Experiments have been made showing that with high degree curves the resistance is about 0.4 lbs. per ton per degree for American bogie trucks of about 5 ft. wheel base at slow speed; that it is considerable more than this for curves of small degree and long rigid wheel base even reaching 1.5 lbs. per ton per degree. The usual allowance made by locating engineers in America is from 0.8 of a pound to one pound per ton per degree. This is perhaps not much too large for low degree curves, is certainly not too large for a long wheel base on a curve of low degree, but is too large for 5 or 6-ft. trucks on sharp curves. Observation has seemed to show that the resistance per degree is greater on flat curves than on sharp curves. An attempt will be made to discuss the action of a truck on a curve, and to develop a rational theory for curve resistance that shall agree with observation.

The fit of a new wheel and rail is shown in Fig. 1. It is usually said that there is ¾ of an inch play allowed between the gage side of the rails and the flanges of the wheels. The gage side of the rail is a definite vertical surface, but the corresponding gage point of the wheel is an arbitrary point on the fillet curve between tread and flange, and a vertical line through this point falls 1/16 of an inch inside the gage side of the rail when a pair of wheels is centered on the track. Owing to the coning of the wheel and the 12-in. curve of the rail top, the wheel bears on the rail as indicated in the figure, and if moved over toward the rail about 3/32 of an inch, a point in the fillet curve would come into bearing well up on the top of the corner curve of the rail. If the wheel be moved still farther toward the rail until the 5/16 in. play is used up, then the wheel would be lifted about 1/16 in. off the rail top and would be bearing at about the points P and P¹ in the figure. It is doubtful if the gage point in the flange of a new wheel ever comes into bearing on a new rail. With a worn wheel and rail, a very considerable portion of the flange may be bearing on the rail. The forward outside wheel of a truck rounding a curve bears against the outside rail, but the foregoing discussion will show the practical difficulty of determining the point of bearing. The irregularities of track, variable condition of rail

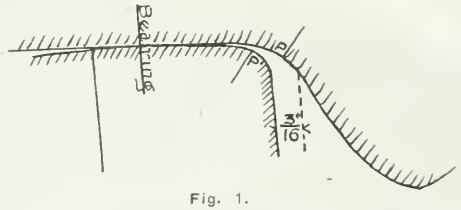



Fig. 1.

and wheel as to wear, and unknown small forces, produce irregularities in the bearing point. The bearing of a wheel on a rail is not in a point or line but in a surface, due to the compressibility of the materials. This surface is small and of irregular shape and variable in size with conditions and characteristics of the materials. As an average the surface does not exceed in area the area

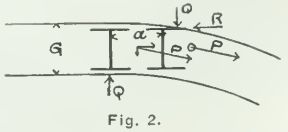



Fig. 2.

of a circle of ⅝ in. diameter, possibly somewhat larger under engine drivers.

*Action of a Truck on a Curve.*—Let a four-wheel truck of length a between axles be considered. The truck pulled by the force P, Fig. 2, acting at the center point approaches the curve. So soon as the drawbar reaches the curve the direction of pull P changes

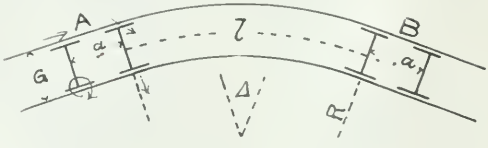



Fig. 3.

to a tangent to the curve at the drawbar. The truck rolls straight ahead, however, until the forward outer flange comes against the outer rail, when the resistance R with an equal force, component of P, at the center pin tends to skew the truck across the track and bring the rear inner wheel against the inner rail. How far over the inner wheel is drawn may not be known; apparently the flange does not wear against the side of the rail. The twisting

movement is resisted by the normal pressures Q. If the truck is short, and the degree of curve small, the whole truck will be on the curve before the outer rail bears on the outer front flange, but if the truck be long, or the curve sharp, the forward wheel will strike the outer rail while the rear wheels are still on the tangent. Assuming that the whole gage play is used up in skewing the truck, and that it varies from $^{7}/_{16}$ in. to $^{5}/_{8}$ in., the angle between the rail and forward wheel will be from 0 deg. 12 min. to 0 deg. 24 min. when a 5-ft. truck is wholly on a 1 deg. curve; about twice these values for a 10 deg. curve, and three times for a 20 deg. curve. The rear axle should stand radial when the angle subtended by a chord of twice the wheel base is sufficient to give a middle ordinate of the gage play at the outer rail, and both outer wheels should bind on the outer rail—the axle of the truck being then a chord to the curve—when the angle subtended by a chord of the wheel base gives a middle ordinate equal to the gage play.

The front and rear trucks probably do not act alike, since the forces applied to their respective center pins probably make different angles with the truck axes. The forward truck only will be considered, and the rear truck assumed to produce an equal resistance. As the truck is advanced by the pull P, it must be turned about some center through the central angle of the curve traversed. It makes no difference what that center is so far as the result of the discussion is concerned, and it will be assumed to be the rear inner wheel. Of course it is the center pin about which the truck turns, but at any instant the center may be assumed to be the rear inner wheel since the center pin is moving with the truck.

If there is no friction between wheel and rail, and if the speed through the curve is that for which the track is canted, there will be no curve resistance, since the canting of the track would counteract the centrifugal force and the truck would roll and slide around the curve. But there is friction, and the truck must be twisted against this friction. This twisting with the losses in transmitting mechanism causes curve resistance.

*Theory of Curve Resistance.*—Curve resistance arises from the slipping of the wheels on the rails. The total slipping from any curve is that due to twisting the truck through an angle equal to the change in direction, i.e., the central angle of the curve. This will produce longitudinal slipping equal to the difference in lengths of the inner and outer rail and the curve, and a lateral slipping depending on the length of the wheel base and the central angle of the curve, and independent of the length of the curve.

In moving from A to B, Fig. 3, the truck frame must move longitudinally through the distance l + a (a may be neglected), and must twist through the angle $\angle$. If it be considered to be at every instant revolving about its rear inner wheel, the rear outer wheel will be sliding longitudinally with reference to the track, the forward outer wheel both longitudinally and laterally (diagonally), and the forward inner wheel only laterally. The rear inner wheel will be twisting on its rail. The force directly responsible for turning the truck is the pressure of the outer rail against the front outer wheel flange, and this force is induced by the pull on the drawbar. What has preceded concerning the fit of wheel and rail, the uncertain gage play, and irregularities of track conditions, will make evident the great difficulty, not to say impossibility, of completely analyzing and following all the forces involved to the final force at the drawbar which may be called curve resistance. The principle of equal work will therefore be used, the work done in sliding the wheels being placed equal to the work done in overcoming curve resistance through the length of the curve, and that resistance determined.

In radians the angle $\triangle = \frac{l}{R}$ and any point moving through an equal angle with a radius of r will move through an arc of $r\,\frac{l}{R}$. The two outer wheels will therefore slip longitudinally through an arc of $G\,\frac{l}{R}$, which is the difference in length of the two rails, and the two forward wheels will slip through an arc of $a\,\frac{l}{R}$. One-half the weight of truck and load, therefore, slips $G\,\frac{l}{R}$ feet, and one-half slips $a\,\frac{l}{R}$ feet. The resistance to slipping is the weight slipped times the coefficient of friction. The coefficient of friction is probably never greater than ¼ in., nor less than $^{1}/_{100}$, and may fairly be taken at ⅕ as an average. For each ton of weight, therefore, a half ton times f, the coefficient of friction, will be the resistance to both longitudinal and lateral slipping, and work being force times distance, the work done in sliding the wheels will be for each ton of 2,000 lbs.

$$1000 \times f \times (G + a\,\frac{l}{R}),$$

If x be the curve resistance at the drawbar due to this sliding, the work done by x in the length l is x × l. Equating these two expressions for work, and solving for x

$$x = \frac{1000\,f\,(G + a)}{R}$$

If $\frac{5730}{D}$ be substituted for R

$$x = \frac{1000\,f\,(G + a)\,D}{5730}.$$

The twisting of the rear inner wheel will increase the work done by perhaps $^{1}/_{10}$ of one per cent., and is neglected.

The distance across the track between wheel bearings which must be used for G is probably 4.73 ft. Using this value and ⅕ for f,

$$x = (0.165 + .035\ a)\ D.$$

If a be 5 ft. x is 0.34D.

But this is not the whole of curve resistance. It is the whole except that due to the friction of what may be called the transmitting mechanism between wheel and drawbar. This friction is practically all at the bearing of flange and rail. The pressure of the flange against the rail is essentially constant and just sufficient to slide the three wheels and hoist the fourth. With the lever arms of these wheels considered, using ⅕ as the coefficient of sliding friction, the pressure will probably vary with the wheel base, and may be from 220 lbs. to 250 lbs. per ton of total load, the smaller pressure for a 20-ft. wheel base. This pressure times some coefficient of friction is a force to be overcome. The sliding here is not longitudinal along the rail, but is vertical, grinding down the corner or side of the rail. Just how much the sliding is cannot be told, but it occurs at a point a little in advance of a vertical through the center of the wheel, and the resisting force may be said to act with a lever arm of this slight advance, and to be overcome by a force acting at the center of the wheel, which force would be almost equivalent to that portion of curve resistance due to this cause. The lever arm of the frictional resistance cannot be exactly determined, nor will it be always the same. It is probably not less than ⅛ in., nor more than ¼ in. with 33-in. wheels. If it is assumed to be $^{2}/_{16}$, and the coefficient of friction be assumed at $^{16}/_{100}$—the slipping is much faster than that across the rail and hence a smaller coefficient should be used—the resulting curve resistance due to this flange friction may be from 0.41 lbs. per ton for a 5-ft. wheel base to 0.38 lbs. per ton for a 20-ft. wheel base. It will be observed that this resistance is independent of the degree of the curve. What may be considered equivalent to an increase of the friction coefficient will probably result from an increase of the angle between wheel and rail. It has been stated that this angle for a 10 deg. curve is about twice that for a 1 deg. curve. If it be estimated that the friction is increased in proportion to the increase in this angle, and the value $^{15}/_{100}$ be used for 1 deg. curves, then for any curve this item of resistance is given by

y for 5-ft. truck = .41 + .041D.

y for 20-ft. truck = .38 + .038D.

In view of the very considerable element of uncertainty in the friction coefficient, and the lever arms of the forces, it will be sufficient to say that for all trucks

$$y = 0.4 + .04D.$$

Summing the two items of curve resistance developed, there results for curve resistance in pounds per ton of total load,

$$R_c = x + y = 0.4 + (0.205 + .035a)\ D\ (A).$$

For several round number wheel bases, closely approximating standard practice, the resistance would be:

| Wheel base, feet. | Resistance, pounds per ton. |
|---|---|
| 5 | 0.4 + 0.380D |
| 6 | 0.4 + 0.415D |
| 7 | 0.4 + 0.460D |
| 8 | 0.4 + 0.485D |
| 9 | 0.4 + 0.520D |
| 12 | 0.4 + 0.625D |
| 13 | 0.4 + 0.660D |
| 15 | 0.4 + 0.730D |
| 16 | 0.4 + 0.765D |
| 20 | 0.4 + 0.905D |

The materially greater resistance of locomotives is seen from this table. It will also be seen from the introduction of the constant term that the resistance per degree is less with sharp than with flat curves.

The formulas omit any increase due to obliquity of traction because there is no such increase from one car to another. It is true that the axes of coupled cars do not lie in the same line, but the junction points of both couplers are moving in the same line which at any instant is a tangent to a curve concentric with the track curve and of slightly greater radius. The pull and resistance here, therefore, are in this tangent line. It is true that this pull acting at the following center pin is not in the line of action of the resistance at the wheel, but this has been considered in the first item of resistance in the equation of work from which the tangential pull was derived, and in the second is presumably included in the friction allowance which increases with the degree of the curve. The larger wheels of the locomotive probably do not reduce the second item of resistance because it is probable that both lever arms are increased in the same ratio.

It is probable that the results of the formulas should be somewhat increased for very slow velocities, and possibly diminished for very high velocities, since the coefficient of sliding friction varies with the velocity of sliding. The sliding represented by the x

term varies in speed with the speed of angular motion, and at a constant speed through the curve, is ten times as fast for a 10 deg. curve as for a 1 deg. curve, and it also varies with the speed through the curve. But its greatest speed is so slow that there is probably not much decrease in friction for any ordinary speed. For high speed passenger trains it may be worth while to affect the formulas given by a coefficient for variation in speed, and the following form is suggested, C being the parenthesis of equation (A) and S the speed in miles per hour.

$$R \text{ (passenger trains)} = (0.4 + C\,D)\left(1 - \frac{S - 20}{200}\right).$$

While the resistance doubtless varies with all trains and with all speed, the variation is thought to be too uncertain to warrant any alteration of the formula for freight trains.

The foregoing seems to give results more nearly agreeing with practice than any published discussion with which the writer is familiar. It agrees with observations both with American bogie trucks and with foreign long rigid wheel bases. It does not agree with the observations of the late Mr. Morley, who thought that he had noticed that the amount of curve compensation was dependent on the rate of the ruling grade, and should be greater as the ruling grade was less. He reasoned that this was because of the longer train handled, seemingly proving experimentally that there is a resistance due to the obliquity of traction. While the writer has no knowledge of the curves on which these observations were made, he thinks that it is reasonable to assume that the curves were flatter on the low grade lines than on the high grade lines, and the foregoing discussion shows that if this were true a larger compensation would appear necessary on the low grade lines. The discussion indicates that curve compensation of 0.04 per degree should be made for 1 deg. curves; about 0.03 per degree for curves of from 2 to 5 degs., and about 0.025 per deg. for curves sharper than 5 degs. While these figures are less than the usual allowances, they seem to be all that such experiments as have been made warrant.

Of course where saving of elevation is of no consequence, a high rate of compensation may be used to cover all uncertainties, but where it is necessary to save every possible foot, as in long developed lines over very high summits, it is believed the values here given may be used with reasonable certainty that trains will be no more likely to stall on curves than they would on steeper grades made necessary by high rate of compensation.

## Early Wooden Railways.

BY W. B. PALEY.

It is not known with any certainty when the first pair of parallel tracks for wheeled traffic was laid down in Great Britain, or whether it was of wood or of stone. Perhaps the former is the more probable, the material being found everywhere and its long shape being much more suggestive of fitness for such a purpose than stone. But so long as each neighborhood produced everything it wanted such things were not needed. At last the destruction of timber near London made the use of coal indispensable. This could only be conveyed by sea, and one of the few places where it could be got with the limited appliances and skill of those days was the valley of the Tyne, just above and below Newcastle. About 300 years ago a considerable trade in coal for shipment began there, which soon led to difficulties as to getting it from the mines into the boats. The distances were small, but the art of road making had died out and in bad weather pack-horses could not carry enough to render their use profitable. Some unknown benefactor to his species at last laid down two parallel lines of timber for carts to run on. Probably they were merely stout planks at first, but the sinking at the joints would soon suggest that other planks should be placed under them, the structure then becoming fairly efficient. When flanges, either on the wheels or the rails, were first invented, or by whom, is not known, but it was apparently towards the end of the seventeenth century. These wooden railroads seem to have survived throughout the greater part of the following century, and even into the nineteenth in some cases. The Middleton colliery railroad at Leeds, for instance, was of wood until it was re-laid for the use of Blenkinsop's rack rail engines. These were started in 1812 and were unquestionably the first commercially successful locomotives. Many other wooden railroads had existed in the same neighborhood for 50 or 60 years previously, and no doubt in other colliery districts as well. One was laid down near Sheffield, for instance, so early as about 1712, from the Duke of Norfolk's colliery at The Manor into the town, nearly 1½ miles down hill. It lasted till 1775, when it was destroyed in a riot. Next year it was reconstructed with the first cast-iron flanged rails of the well-known ⌟⌞ type by James Outram, their inventor. A wooden railroad of particular interest long existed at Bath. It was laid down in 1731 by Ralph Allen, who having gained a fortune by post-office contracts, acquired and developed extensive quarries of the celebrated Bath oolite stone on Combe Down. These being at a great height, and away from any regular mode of transit, it became necessary to devise a means of bringing down such a heavy material. The wooden railroad occupied the site of what is now called Prior Park Road and was laid partly upon low walls and partly on the ground, "like the wagonways belonging to the collieries in the north of England." It is stated to have been a great improvement upon these and must certainly have been pretty massive to stand the brake power necessary for bringing loads down so steep an incline. Distinct marks of old tramways may still be seen up on Combe Down, but of the "main line" nothing is traceable. Looking down Prior Park Road, however, its straightness is very suggestive of an inclined railroad. At the bottom also it keeps straight on, but the gradient eases greatly. The tram road ended on the bank of the River Avon, about where the Kennet Avon Canal now enters. As the canal was finished in 1810 the tramway must have been extinguished, either then or before, but it was in use in 1776 and is not mentioned in the canal company's first act, 1794. That period comprised the palmy days of beautiful Bath, when it basked in the sunshine of royal and aristocratic favor, and nearly all the splendid streets, squares and crescents designed by the two Woods are built of stone brought down by Ralph Allen's wooden tramway.

The trucks used upon it ran on four cast-iron wheels, about 20 in. in diameter, with very broad treads, and flanges said to have been no less than 6 in. deep. The floor was of stout oak planks, 3½ ft. wide by 13 ft. long, and furnished with several transverse rollers for the convenience of arranging the loads. Removable sides could be fitted. Tremendous brake-power being necessary, the brake levers for the hind wheels were drawn down by ropes and small iron rollers at the back of the wagon, each turned by a bar inserted in a series of holes. A hatchet and pawl prevented them from flying back and afforded great facility for unlocking. The brake levers, with the blocks attached to them, were called "jigg poles"; they merely hitched into a loop on the end of a cross-piece and could be taken off to permit of loading or unloading. The fore wheels were locked or spragged, by means of thick square iron bolts, one to each wheel, attached just above the axle to the cross-beam which carried the axle bearings. These bolts were worked by bell cranks, moved by rods under the truck and attached behind to the lower ends of two upright iron levers. These were pivoted on a short shaft placed across the two center longitudinals or soles, and when out of use were kept upright by a loop and ring at the top of the wagon end. To lock the front wheels it was only necessary to take off the ring and pull down the levers, which shot the bolts between the spokes. In this way any one or all the wheels could be braked, but it could only be done from behind, where the brakeman could not get knocked down and run over. The most remarkable peculiarity, however, about these wagons was that one wheel on each side ran loose upon the axle and one turned with it, having a square seat. Linch pins were used at both ends of the axles. The bearings were brass collars fixed in stout cross beams. Springs, of course, were not dreamed of. It required two horses to pull an empty truck back, the line rising nearly 500 ft. in its total length of 1½ miles. In fact, most of the rise is in little more than a mile, equal to a gradient of perhaps 1 in 12 or 1 in 14. Only a single track was laid. A large trade was done on it for many years, for besides the great consumption of stone in Bath itself, the Avon had just before been made navigable down to Bristol, whence the stone was shipped round to London and other places. The trucks often carried about four tons of stone, under which they must have bumped along violently unless the line was kept in very good order. Doubtless the 6 in. flanges were found quite necessary.

The colliery lines about Newcastle used, in the eighteenth century, rails of beech wood, carefully plained on the top and pegged down to cross pieces, which were even then termed "sleepers." Longitudinal timbers in addition were sometimes used, the extra height being of use in enabling the cross sleepers to be well covered up and protected from the action of the horses' feet. There were usuallly two lines of rail, the descending one being called the main-way, the other the bye-way. The cars held a Newcastle chaldron, or 53 hundredweight, 5,936 lbs. They were built of fir planks, strengthened with iron straps, and had oak or ash soles. They sloped forward, having slightly larger wheels at that end, which was found to ease the draught. These wheels were of cast-iron, the rear pair being made solid, of pieces of beech wood dovetailed and cramped together. It was supposed that brakes held better on wood than on iron. Some of these wooden lines ended in a short timber viaduct, where the land sloped much to the river, leading to a "staith" shipping quay, from which the coal could either be discharged at once down a chute into the "keel" or barge which carried it to the ships, or stored if no keels were at hand. The wagons opened below, to effect this.

In going down hill with a loaded wagon, the horse followed behind, so that he might not be knocked down if it got beyond control, which is said to have happened rather frequently. The drivers generally owned the horses, often of a miserable description; and were paid by the trip or "gait." One horse was used

to a wagon, which weighed, empty, about half a ton, 1,120 lbs. Most the Tyne-side wooden railroads were short, half a mile to a mile or so, but a few were somewhat longer. George Stephenson must have been perfectly familiar with these old timber lines, although their career was coming to an end when his was beginning. They were mostly replaced with cast-iron towards the end of the century. He was born in 1781.

## Early Valve-Gears on the Pennsylvania Railroad.

BY C. H. CARUTHERS.

The Pennsylvania was probably the last American railroad to adopt the Stephenson link motion. This may have been owing to the well-known opposition of M. W. Baldwin to that form of valve gear and the preponderance of locomotives of his construction on the road during those early years.

The first locomotive equipment of the company consisted of six engines which were transferred to it from the Harrisburg & Lancaster Railroad on October 16th, 1849, that road having been leased by the Pennsylvania to enable it to form a connection with the Columbia & Philadelphia Railroad at Lancaster, Pa.

Figure 1 will convey a correct idea of the type of valve-gear used on these six engines, although about half of them were built by M. W. Baldwin and the other half by the Norrises. The drawing shows the Norris gear, but the Baldwin gear differed little from it. It was full-stroke only, with "D" hooks and no independent cut-off. Reference to the other drawings will show that its detail was closely followed in most of the full-stroke gears used previous to the adoption of link motion; in fact, the uniting of the eccentric rods to the arms of the reversing shaft by means of eye-bars or hangers was really a crude forerunner of the shifting link.

Figure 2 is drawn from a gear in which an independent half-stroke cut-off is used, the valve of which utilizes the horizontal partition plate which divides the steam chest into an upper and a lower story as a seat, this plate being provided with suitable ports. The cut-off eccentric was rigidly connected to the lower arm of the rocker-shaft, the hook being formed on the end of the valve-rod, and when not in use this was lifted from the pin of the upper arm of the rocker-shaft and held in the inverted V-shaped forging shown above it. Both this gear and the preceding used starting bars to insure proper engaging of the hooks, and also to work the valves independently of the eccentrics in shifting or making couplings. Three passenger engines of the Crampton type built by Baldwin in 1849 and 1850 for the company had this form of gear.

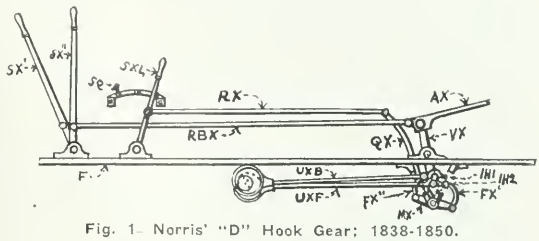



Fig. 1—Norris' "D" Hook Gear; 1838-1850.

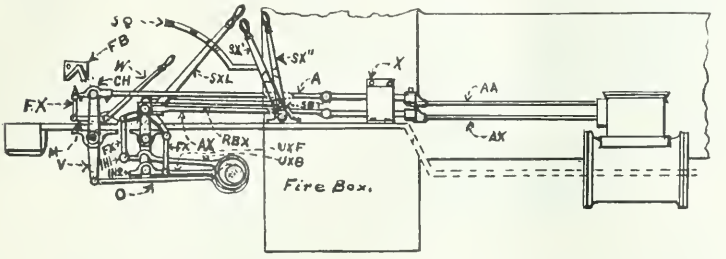



Fig. 2—Baldwin "D" Hook Gear on Crampton of 1849.

The arrangement represented in Fig. 3 was first used on the ninth engine of the company's equipment, which came from the Baldwin Works the latter part of 1849. It will be observed that while the same general lines of Fig. 2 are followed, this type is arranged for use on engines with inclined cylinders and the eccentrics in front of the firebox. There were 23 more engines with this gear built during the next three years and added to the service, and these were followed by 12 large freight engines with a gear differing only in the position of the reversing shaft and its connections. This latter arrangement is shown separately at the right in Fig. 3. One of these 12 engines was sold to the state soon after coming on the road, but again came into the possession of the Pennsylvania with the rest of the state's equipment in 1857.

In Fig. 4 the full-stroke rocker shaft is made hollow, and thus forms the box for the cut-off rocker. This was done to enable the gear to be used on four eight-wheel connected Baldwin freight engines built for the Pennsylvania in 1850, which had the drivers placed so close together as to preclude the arrangement of rocker-shafts followed in Fig. 3.

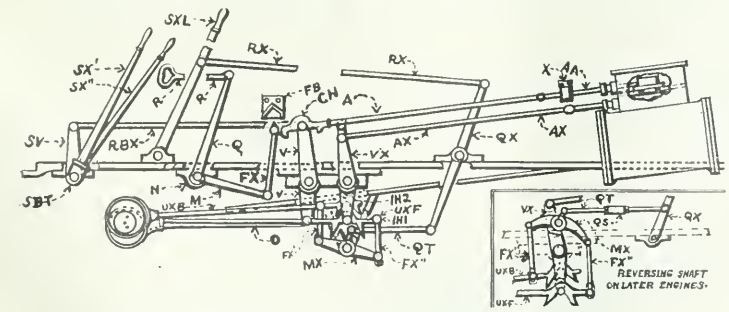



Fig. 3—M. W. Baldwin's "V" Hook Gear; 1850-1853.

Figures 5 and 6 are drawn from gears used on three engines fur-

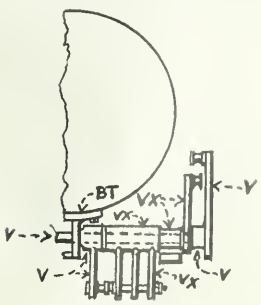



Fig. 4—M. W. Baldwin's Arrangement of Main Rocker Shaft Used as Box for Cut-Off Rocker Shaft; 1850.

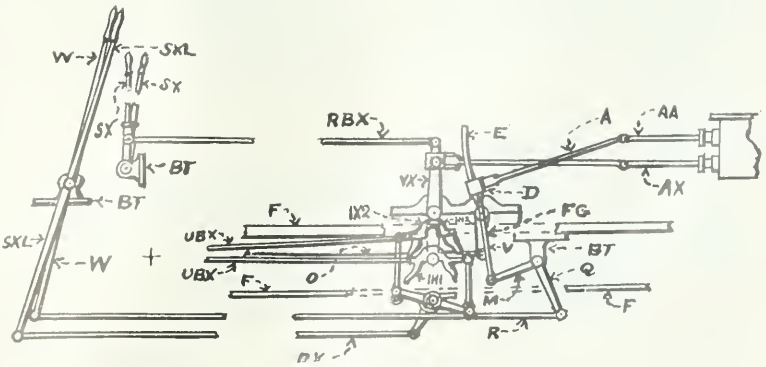



Fig. 5—Form of Cuyahoga Valve Gear Used on Two Seth Wilmarth Locomotives; 1852.

nished the company by Seth Wilmarth from his Union Works at Boston, Mass., in 1852 and 1853. That of Fig. 5 is an adaptation of the Cuyahoga gear, and was on the first two of the engines referred to, although it is probable that they originally used the gear of Fig. 6. It is not likely that two engines for passenger service would be built at the same shops with "V" hooks connected to the reversing shaft, a design much superior to the simpler but less reliable drop hooks, and then be followed by an engine with a device with not only the faults inherent in the drop hooks, but also the additional disadvantage of a cut-off working at only one point of the stroke. A good feature, however, of the gear shown in Fig. 6 is that but one lever was used in the cab to control both the full-stroke and the cut-off hooks, although separate valves were used. This type of gear was also used by the Hinkley people on engines built by them at that period. Incidentally, the writer saw the engine referred to, with the gear shown in Fig. 6. This gear was still in use just previous to its transfer to the Philadelphia & Erie division in the latter part of 1864.

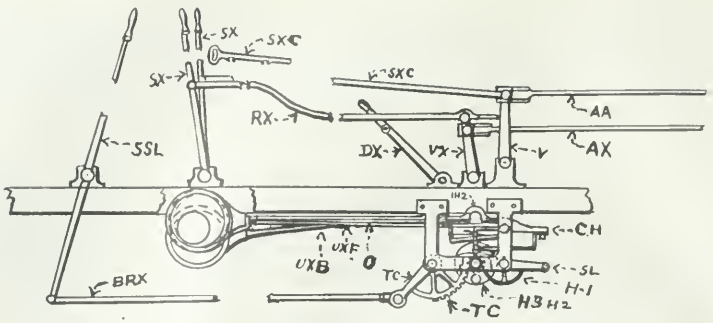



Fig. 6—Seth Wilmarth's "D" Hook Gear with Independent Half Stroke Cut-Off; 1852-1853.

Figure 7 shows a type of valve motion with some of the features of Fig. 6, namely, drop hooks of "D" pattern, "half moons" so placed on the secondary reversing shaft as to bring the hooks into position for full-stroke forward, full stroke backward, or half-stroke cut-off forward, as this shaft might be revolved by the toothed quadrant attached to the main reversing shaft and engaging with the spur wheel on the secondary shaft; and only one lever to control both full-stroke and cut-off hooks. In this gear the rocker-shaft was hollow and formed a box for the main reversing shaft, the toothed quadrant being attached to the shaft between the right and the left-hand rockers. Twelve locomotives with this gear came on the road in 1852 and the two following years, from the shops of the Virginia Locomotive Works, better known as Smith & Perkins, at Alexandria, Va. Doubtless the principal features of this form of valve-gear were suggested to Mr. Thatcher Perkins by that in use upon the Winans "Camel" engines, which is shown in Fig. 8. The Winans gear, it will be noted, has the main reversing shaft set behind the rockers, and connects to a toothed rack placed horizontally under the spur-wheel with which it engages. The chief difference consists in the use of heart-shaped cams to drive the cut-off hooks of the Winans engines. In practice these were found to be objectionable and were soon taken off and replaced by eccentrics. Both the Winans and the Perkins gear gave some trouble in snowy weather because snow became packed in the spaces between the cogs of the reversing gear and thus prevented proper handling of the hooks. The first "Camel" with the Winans gear furnished to the Pennsylvania came on the road in January, 1853, and was followed during the next three years by ten more of the same type.

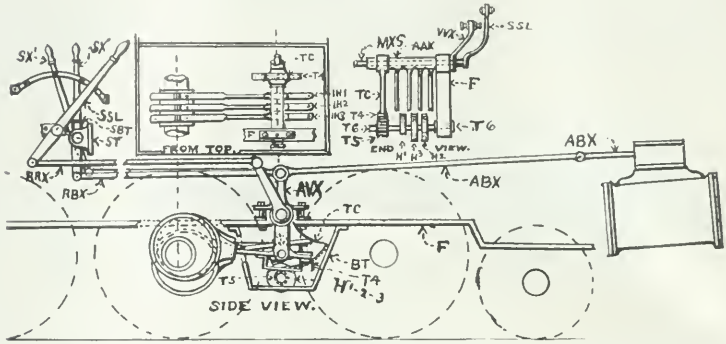



Fig. 7—Smith and Perkins Drop Hook Gear with Independent Half Stroke Cut-Off; 1853-1854.

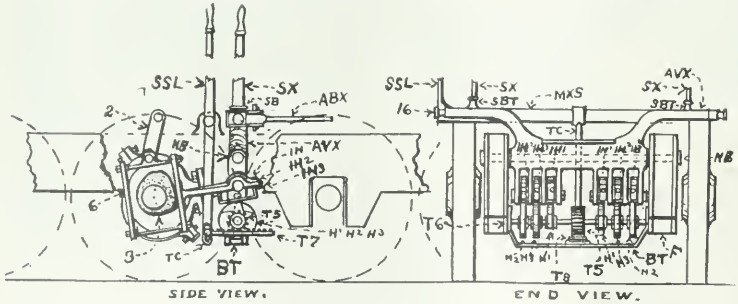



Fig. 8—Ross Winans' Drop-Hook Gear With Independent Half Stroke Cut-Off 1853-1856.

Figure 9 illustrates the improved form of R. Norris & Son's valve motion with "V" hooks and independent half-stroke cut-off, as it appeared on the fifty-fourth engine of the Pennsylvania, and on the next 21 Norris engines, whose numbers fell between 54 and 97, as well as on four built for the state, but which came into the company's possession by purchase in 1857. All of these 26 engines were built in 1853 and 1854. While the full-stroke features differ very little from those of Fig. 1, the cut-off differs from any yet referred to in having a double "V" hook on the end of the valve-stem. The upper part of this hook when lowered engages with the cut-off rocker, and when raised with a pin on the main or full-stroke rocker, and thus holds the valves together when working full. No partition is used in the steam chest, the full-stroke valve having the cut-off ports made in it, and its top serves as the seat for the cut-off valve.

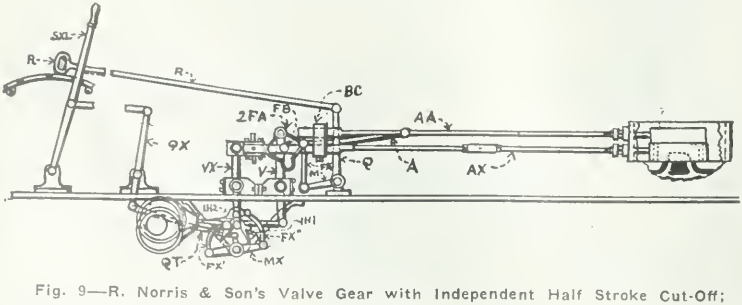



Fig. 9—R. Norris & Son's Valve Gear with Independent Half Stroke Cut-Off; 1853-1854.

This type of valve-gear and cut-off had been used by the Norrises for many years previous to the building of the 26 engines in 1853 and 1854, but the parts were somewhat

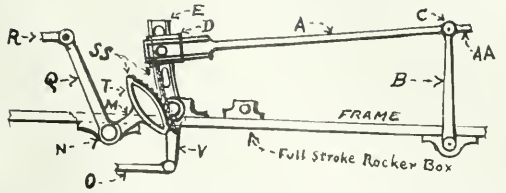



Fig. 10—M. W. Baldwin's Variable Cut-Off of 1853. Full-Stroke Gear (Not Shown) Same as in Later Form of Fig. 3.

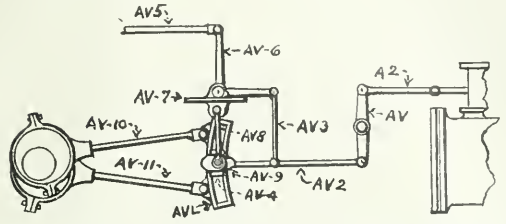



Fig. 11—Gooch Link as Used by Smith & Perkins; 1856-1857.

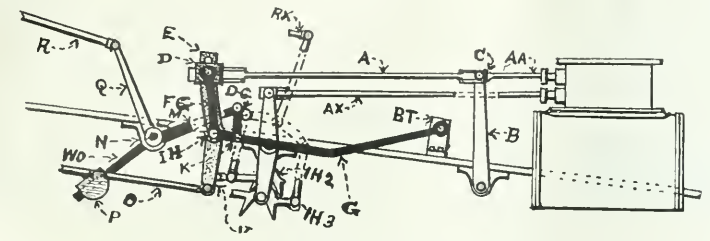



Fig. 12—M. W. Baldwin's Variable Cut-Off of 1857.

differently arranged. The company's ninth engine had this earlier form, and it was also thus used on 18 Norris engines built for the State railroads and bought by the Pennsylvania in 1857 with the other State engines already mentioned.

Somewhat later in 1853, the first Pennsylvania engine built with M. W. Baldwin's variable cut-off (Fig. 10) was put in service. Thirty-nine more followed during the ensuing three years, as well as six more originally built for the State. Two of the latter of the 39 used steel straps instead of the sprocket chains, to unite the quadrant and the sliding block, but the tendency of these straps to break soon caused them to be replaced by chains, as on the other engines of the type.

Early in 1856 the first engines with link motion entered the company's service. There were three, built by Smith & Perkins, and they had the Gooch, or suspended link, Fig. 11. Two years later these engines were transferred to the Steubenville & Indiana Railroad, now part of the Pittsburg, Cincinnati, Chicago & St. Louis. One of them was still in service in 1880 and retained the Gooch links. These were followed within a few months by two Norris passenger engines, each of which had Stephenson links, and early in 1857 four new Baldwin passenger engines on the road were fitted with similar valve gear.

Mr. Baldwin's antipathy to link-motion appears to have enabled him to follow these with four freight engines fitted with hooks and a new type of variable cut-off shown in Fig.12 , and also two shifting engines with hook-motion but no cut-off. Again in 1858, he furnished the company with four large eight-wheel connected freight engines for mountain service, each of which tried the patience of the enginemen with another style of cut-off in connection with their full-stroke "V" hooks. Figure 13 shows this cut-off to be of the variable type with many of the features common to those of Figs. 10 and 12, but having the block on the end of the valve-rod connected to the arm of the reversing shaft by two eye-bars through the medium of a second block sliding in a guide attached to the frame near the bottom of the lower arm of the rockershaft. These were the last engines built for the company with hook motion. All subsequent equipment had the Stephenson links until 1889, when the Webb Compound No. 1320 came from England with the Joy gear, and no change of consequence in valve gear was made after that time until the present experiments with the Walschaert link, which had proved so satisfactory in Continental Europe.

This article would be incomplete without mention of the gears of Figs. 14 and 15. That of Fig. 14 is a Baldwin idea in which a single eccentric is used for both back and forward motions, and that of Fig. 15 is novel in having a cut-off worked from the cross-head. It was the invention of one of the Norrises and was on two engines built by that firm in 1848 for the State. The Baldwin gear was also on an engine built for the State at a much earlier period. All three came to the Pennsylvania in 1857.

In conclusion, it may be mentioned that the link motion is shown by the preceding record to have been applied to all of the company's new engines built after 1858. About 1861, the substitution of links for hooks was begun on all of the older engines which came in for general repairs, and this was so thoroughly done that by 1868 only a few with the old types of valve gear were running, yet up to the latter part of 1874 two used in shifting service still retained the Smith & Perkins hooks. These were soon after retired and cut up—the last of the ancient valve-gear on the road.

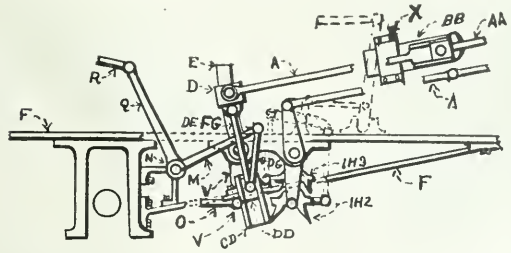



Fig.13—M. W. Baldwin's Variable Cut-Off of 1857-1858.

## The Principle of Lubrication.

BY ERNEST J. M'VEIGH.
Storekeeper Grand Trunk Railway.

The question of lubrication is such a live one that this generation will not see the time when the last word has been said on the subject, but there has been so much said and written in this connection that to the average shop, car or engine man further discussion may seem unnecessary and altogether superfluous. Is it superfluous, and have railroad men generally been educated on this line to the point where there is nothing more to be learned? I thing not; in fact, I think the reverse is the case, and while the leaders have given the matter a great deal of careful attention and

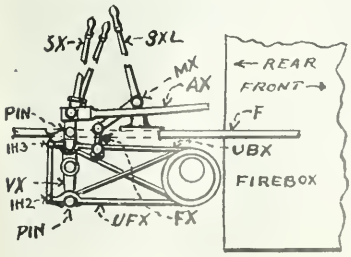



Fig. 14—M. W. Baldwin's Full Stroke Valve Gear with Single Eccentric; 1835.

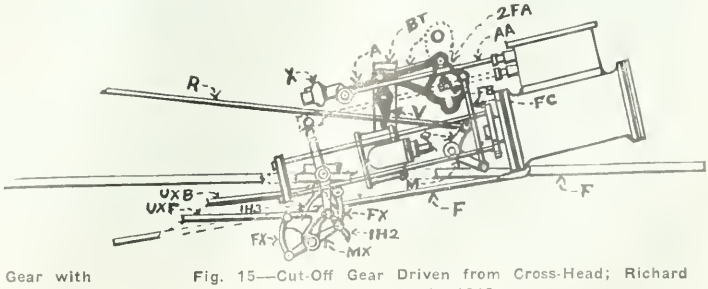



Fig. 15—Cut-Off Gear Driven from Cross-Head; Richard Norris, 1848.

study, the education of the flank and file has been to a great extent neglected, and abuses exist to-day that are supposed to have been eliminated many years ago.

To illustrate: Twenty-five years ago I came in contact with a shop foreman or leading fitter who was responsible for the bearings on the locomotives running on his division, and my first recollection of him was his coming to the stores for a box of brown soap to doctor a journal that was running hot. These things were new to me in those days and I was so interested in this new idea that I asked him a great many questions about it, and he, with a great many winks and sly nods, told me all about it, and how instead of going to considerable trouble to humor the old girl when there was really nothing the matter with her, he just slipped in five cents' worth of brown soap and fooled her.

I was younger in those days than I am now, and I thought him pretty cute, but I owe to him my first lesson in how *not* to lubricate an engine journal. I have known this same man ever since, and though not now with the same company as myself he is not far away, and still in charge of running repairs, and to-day he came to me with the same old wink for the same old bar of soap to be used in the same old way. It took me back twenty-five years in one jump. He got the soap; it was worth more than one bar of brown, and they are only worth three cents now anyway.

How about his education? And remember he has been 40 years engaged in running repairs on locomotives, and three years foreman in the erecting shop.

Here is another case: We had a coal plant for handling coal from steamers, and the power for the elam buckets was furnished by small Lidgerwood hoisting engines, the business being under the supervision of the locomotive foreman at that point. These engines were away up in a tower and not on very steady foundation and they began giving trouble by running hot, and for two months the foreman kept an extra man with an oil can, pouring oil on the bearings to keep them cool. Finally, he left to accept a much better position and a younger man took his place. The first thing the younger man did was to take down the engines, true up the foundations and smooth the cut bearings. The trouble was at an end, and the man with the oil can lost his job.

Would it not have paid to educate these men to the point where they would undersand that the first principle of lubrication is mechanical correctness of the journals and bearings to be lubricated? I think it would, and while the two cases I have mentioned may seem exceptional, I find that there are still far too many men looking in the dope box and oil barrel for the trouble, when a little more knowledge of their own business would teach them that there is one chance in ten thousand that they will find it there.

## The Salton Sea.

The Salton Sink is an area of many hundred square miles of desert land in the southeastern corner of California, which is 200 ft. or more below the level of the sea, and its gradual flooding, during the past year or two by the waters of the Colorado river, in consequence of carelessness in making an irrigation ditch has been the occasion of numerous newspaper articles which were not very illuminating. Finally, however, the *North American Review* has published an article by Edmund Mitchell, a Los Angeles editor, which describes the loss, the dangers and the probable distress in vivid language. From this article we take the following paragraphs:

Yuma, close to the State border-line between Arizona and California, is 140 ft. above sea-level. Past this town the Colorado River flows south toward the Gulf of California, a course of about seventy miles, with the gradual descent, therefore, of but two feet to the mile. But, from Yuma westward, the dip of the land is both deeper and more abrupt, so that at Salton, ninety-three miles distant, the depression is no less than 263 ft. below sea level, the gradient being thus over four feet to the mile. From this lowest point, as we still move west, the country rises, and now at a sharper angle, for Indio, only twenty-five miles from Salton, is but twenty feet below sea-level, while Palm Springs, nineteen miles further on, has an elevation above sea-level of 584 ft. It is just beyond Palm Springs that the Southern Pacific Railroad emerges, through the grim San Gorgonio Pass, from the desert region into the fertile agricultural belt of Southern California.

This great saucer-like hollow is 137 miles across from Yuma to Palm Springs, with some sixty-five miles of the distance actually below the level of the sea. Imperial Valley, where for some years past a great irrigation project has been in progress, rises southward at a sharp pitch out of the Salton Sink, for Calexico, on the Mexican border, just forty miles south of Salton, is at sea-level. This is the limit of the United States lands, but the physical features of the country continue to be identical across the border-line, there being a steady uplift toward the Cocopah Mountains on the southern horizon. The Lower Colorado River has been flowing south along the rim of a deep hollow that lies to the west of its course. For a distance of about twelve miles below Yuma, a barrier of sand-hills prevents the current from taking the direction of the Salton Sink, its natural destination, as being the lowest point of depression. But, after passing this sand-hill ridge, the river, in the bed it occupied until recently, continued on its way through Mexico, a sluggish stream, depositing its heavy burden of silt scoured from a thousand miles of canons. To the right lay old and disused channels, into which some water spilled at flood time. But the river had dug its main bed from north to south through its own silt accumulations, and with only occasional changes, due to the caving-in of banks or the forming of new sand-bars, was content to keep to this course until the hand of man came to interfere with the delicately balanced condition of things.

Five years ago, the California Development Company set itself to supply irrigation water to the Imperial Valley. The Colorado River was the natural source of water-supply. But, owing to the sand-hill barrier above referred to, a canal was dug by a sweeping curve through Mexican territory, entering the Imperial country on its southern boundary. The necessary right of way through these Mexican lands was acquired from the owners, and the canal was dug, an old disused channel of the Colorado, known as the Alamo River, being largely taken advantage of in the engineering operations.

The intake was on United States soil. No head-gates were put into the canal; the river water was simply allowed to flow in, just as into an open ditch. The first few miles of the ungated canal has but a very slight fall, and, there being no settling basin provided above the intake, the channel became clogged up with silt. In the summer of 1904 the ditch was not carrying enough water to supply the wants of the Imperial Valley lands already under cultivation, and to prevent the danger of ruined crops the company decided upon taking a quick (and cheap) method of supplying its necessities. Four miles below the original intake, and therefore in Mexican territory, it scooped out a cross-ditch connecting the river directly at this second point with the canal. Once again no headgates were put in, and through this aperture, scoured deep and wide by a succession of floods, the entire waters of the Colorado River, instead of passing gently south to the Gulf of California, are now rushing down impetuously and uncontrollably into the Salton Sink. In other words, the Imperial Canal is now the Colorado River, restored to its ancient bed, the Alamo watercourse.

The winter of 1904-05 proved to be a season of abnormal rainfall and floods began the process of scouring out the narrow emergency ditch. The regular summer floods of 1905 continued the work, and, when the danger came to be realized, the breach was practically beyond repair. * * * The Southern Pacific Railway Company was virtually compelled to come to the financial assistance of the California Development Company, and all through the fall months of 1905 desperate and continuous efforts were put forth to turn back the Colorado into its old channel, but finally a mighty flood on November 30, the second highest ever recorded on the Colorado River, and once again caused by abnormal rains in Arizona, turned the whole plan into ridicule. The effect was not so much to break down the dam which had been made as to cut everything away around it; for there are no rocks to serve as foundations and abutments in this land of silt.

The water in the sink now covers 400 square miles. The Southern Pacific has had to move its track five times. A train now skirts the shores of the lake two hours in a trip from east to west. At Salton the water is 30 ft. deep. The channel where the river flows into Imperial Valley is now ten miles wide, and a waterfall, where the Colorado river washes its channel 30 ft. deeper, is receding up stream at the rate of a mile a day, endangering the whole country up to Yuma, and possibly endangering the Government irrigation dam, a mile long, now being built above Yuma. The lake level is still 220 ft. below the Pacific Ocean and so great is the evaporation by the torrid sun it is estimated that it will take 30 or 40 years to fill the sink to sea level. The only hope of staying this great work of nature, in defiance of the puny efforts of man, is the Laguna dam, above Yuma, where is a natural barrier, but this work is beset by some uncertainties. Mr. Mitchell gives an interesting account of the irrigation projects, and of the possible international complications due to the rise in the United States of water which by nature and by treaty ought to flow down the river into Mexico.

## The New Canadian Pacific Steamers.

Supplementing the information given in the *Railroad Gazette* of Dec. 1, 1905, the following notes on the new Canadian Pacific twin screw steamers, "Empress of Britain" and "Empress of Ireland," are of interest. It will be remembered that these vessels are to be used on the Atlantic, bringing up the Canadian Pacific's Atlantic service to the standard of the trans-Atlantic lines to New York. By the Canadian Pacific route via Montreal and Vancouver the distance from England to Yokohama is 10,223 miles, and via Halifax and Montreal and Vancouver 10,488 miles, Halifax being the winter port for the new ships. By way of the Suez Canal the distance to Yokohama is 11,787 miles.

The new vessels have a gross tonnage of 14,155 tons and a

length over all of 570 ft. They are built on the double-bottom system and are divided transversely by ten bulkheads, so that at the normal draft of 27 ft. 6 in. any two adjoining compartments can be flooded without endangering the safety of the vessel. The weight of steel worked into the construction of each vessel was 7,200 tons, necessitating the use of over 1,000,000 rivets. In spite of this fact, the first ship was launched within eight months of the laying of its keel, construction having been begun on March 16, 1905, and the vessel being afloat on November 11 of the same year. Five months more sufficed for completion, the trial trip taking place on April 13, 1906. The vessel left on her first voyage on May 5, 1906, or within fourteen months of the laying of her keel. The vessels were built by the Fairfield Shipbuilding & Engineering Company, of Glasgow. Each vessel has eight decks, named as follows, beginning at the bottom: orlop, lower, main, upper, shelter, lower promenade, upper promenade and boat deck, the latter being 44 ft. above the load water line. The total area of the decks is four acres. The passenger accommodations are for 310 first-class, 468 second-class, 494 third-class and 270 fourth-class passengers. Officers, engineers, stewards and crew include 373 persons, making the total capacity of the vessel 1,915. As in the Canadian service, on the voyage from England a large number of passengers rather than cargo, and on the voyage from Canada, cargo rather than passengers are carried, portable cabins, which may be fitted up in a short time on the lower deck, thereby increasing the accommodations for emigrants are carried. When loaded to their mean service draft—27 ft. 6 in.—the vessels are required to carry a load of 6,500 tons, including stores. As a matter of fact, it has been found possible to carry 400 tons more. On the trial trips the "Empress of Britain" steamed 19.78 knots, with the engines indicating 18,750 h.p., and the "Empress of Ireland" 20 knots with the engines developing 19,200 h.p. These new boats have already succeeded in lowering the Atlantic record to Canada.

## Acetylene Generating Plant for the Lackawanna.

The accompanying illustrations show the exterior and interior views of an acetylene generating plant equipped by the Commercial Acetylene Co., New York, for the Lackawanna Railroad at its Hoboken terminal. The equipment consists of two 200 lb. acetylene generators, four driers, one scrubber, one three-stage compressor, one 5,000 cu. ft. gas holder and five storage tanks of 2,000 cu. ft. capacity each from which the gas is delivered to the storage tanks on the cars. This plant, as it now stands, will take care of 750 cars a month, but with the addition of another compressor, arrangements for which were made when the plant was built, the capacity can be doubled. Part of the upper story of the generating house is used to store the drums containing the calcium carbide from which the acetylene is generated and part is devoted to the hoppers of the generators, over which is placed a small traveler for handling the drums of calcium carbide. The hoppers of the generators are filled with 200 lbs. of calcium carbide each. The carbide used comes in small pieces, measuring about one-half inch by two inches. These are mechanically dropped at suitable intervals into the water in the lower portion of the generator. As fast as the gas is generated it oozes through the water and flows through a pipe line to the gas holder placed at a convenient distance from the generating house. The gas returns to the generating building and passes through four small cylinders, filled loosely with coarse pieces of calcium carbide, called driers. The gas after passing through these driers reaches the purifier or scrubber absolutely dry, and in this state all traces of sulphur and phosphorus compounds are easily removed. From

Exterior of Acetylene Generating Plant—Lackawanna Railroad.

the purifier the gas enters the compressor, which delivers it to the high pressure storage reservoir at about 150 lbs. pressure per sq. in. These storage cylinders or reservoirs are made of sheet steel, having a tensile strength of 65,000 lbs. per sq. in.

The tanks of the Safety Storage System are tested at a pressure of 1,200 lbs. per sq. in. One of these cylinders is shown in the accompanying illustration with a portion of its side cut away, showing the method of filling with asbestos. Before the head is finally

Safety Storage Gas Tank, Showing Asbestos Packing.

brazed in the cylinder is filled with perfectly fitting discs of asbestos, briquetted or held in shape with silicate of soda. These discs have a 20 per cent. solidity, or a porosity of 80 per cent., and are put into the cylinder under slight pressure. The head is then brazed on and suitable stud valves are fitted and it is connected to an air pump and a vacuum created. When a vacuum from 20 to 25 lbs. is reached the stud valves are closed, and the end of a pipe is attached to the stud valve with its other end immersed in a volume of acetone, equal to 43 per cent. of the cylinder's volume. The stud valve is then opened and the acetone drawn in by the vacuum previously created. The acetone is absorbed by the asbestos, and is evenly distributed throughout the entire mass. Acetone is a product of the destructive distillation of wood, and is similar to wood alcohol. It has the property of dissolving many times its own volume of acetylene, and of giving it off when the pressure is released. The cylinder is next charged with acetylene to about two atmospheres, or 30 lbs. The stud valve is then closed and the cylinder allowed to stand until the acetone is completely saturated with the gas. When this saturation is complete the stud valve is opened and the gas allowed to blow off, only retaining the amount of acetylene that the acetone will dissolve at atmospheric pressure. The cylinders, after being treated in this manner, are ready to be charged for service. To facilitate rapid charging, the storage reservoirs at the compressing plant have two inlets for the gas, one at each end, so that the acetone is dissolving gas from supply points at the same time, and the set of five cylinders forming the reservoir are connected to each other by one main pipe line and a branch pipe line to each end of each cylinder, so that there are ten openings to discharge the gas into the acetone. This also applies to the discharge from the reservoir to the pipe line, where the cylinder or cylinders are to be charged, and insures such a low rate of discharge from each opening that the

Interior of Acetylene Generating and Compressing Plant—Lackawanna Railroad.

gas passes away without carrying any appreciable quantity of acetone with it. As the acetone is the dissolvent of the gas, very little will pass away, and in case it does, it is taken up by the asbestos in the cylinder or cylinders being charged, thus keeping the cylinders in service up to the standard, and leaving only the storage reservoir to be replenished. Acetone has a greater capacity for dissolving acetylene at a low temperature. For that reason, acetone which is charged at a pressure of 150 lbs. at a low temperature will give off gas when the temperature rises, and the pressure in the cylinder will increase. Conversely, when the temperature falls the pressure will also fall, as the acetone will redissolve the acetylene. Acetylene thus stored in a porous substance, like asbestos, and held in solution by acetone, cannot explode while in the cylinder.

The Delaware, Lackawanna & Western plant has been in operation since October, 1904. Special lamps for burning acetylene are recommended, but Pintsch lamps from which the superheaters have been removed and in which special acetylene burners have been fitted in the globes give good results. These are known as converted Pintsch lamps. The car tanks furnished with this system measure 114 in. long x 20 in. in diameter, and have a storage capacity of 2,000 cu. ft. of acetylene gas which represents 100,000 c.p. hrs. of available light for each car.

### Steel Passenger Car for the Pennsylvania.

The Pennsylvania Railroad has designed and built at Altoona an experimental steel passenger car which is now in service on the main line between Philadelphia and Lancaster, Pa. The underframe consists of a central box girder 24 in. wide and 19 in. deep, extending from end to end of the car, including the platforms and four cantilevers on each side between the bolsters supporting the deep plate girder sides. The vestibules and end construction of the body have been designed to resist telescoping. The end door posts are riveted at the bottom to the central girder and at the top to a heavy horizontal reinforcing plate. In the vestibule the ceiling consists of a wide horizontal steel plate reinforced in such a manner that it forms a strongly braced girder under the roof framing. Steel posts of heavy section and spaced 6 ft. apart support the main steel roof carlines, the side plates being heavy angles. The floor consists of corrugated plates riveted to the underframe and covered with a layer of plastic fireproof material resembling stone when hardened.

The inside lining consists of steel plates, except directly under the roof, where a composite board will be retained. The outside sheathing of the roof is also steel, so that the whole outside of the car presents one unbroken expanse of steel plate with openings for the windows. The doors are composed of steel plates pressed into a shape imitating wooden doors used in other cars, and filled with cork to deaden the sound. The seats have steel frames covered with fireproof plush. The footrests are of steel; in fact, no wood or inflammable material has been used, except the top of the seat arm, which was made of wood for comfort of passengers, steel being considered cold to the touch. Experiments will be made with seat arms made of metal to determine the amount of discomfort and also whether it would be advisable to substitute metal.

The car is equipped for electric lighting only. The wires have been carefully insulated, and are carried in metal conduits. The storage batteries are in steel boxes, which are hung from the underframe of the car.

The brake arrangement is of the latest and most improved type, and special care has been given to the design of the draft gear to provide exceptional strength and a maximum amount of flexibility to avoid strains due to curving of car. The P. R. R. standard ventilating system and four-pipe heating system are used.

The trucks are of special design, made necessary by the depth of the central box girder. They have 36-in. wheels and are entirely of steel. The principal dimensions of the car are as follows:

| | |
|---|---|
| Length over buffers | 67 ft. 5¾ in. |
| Length inside | 57 ft. 10½ in. |
| Width at eaves | 10 ft. 1 in. |
| Height to top of car | 14 ft. ½ in. |
| Height to floor | 4 ft. 4 in. |
| Truck centers | 45 ft. 3 in. |
| Window centers | 2 ft. 11½ in. |

Interior of Steel Passenger Car, Pennsylvania Railroad.

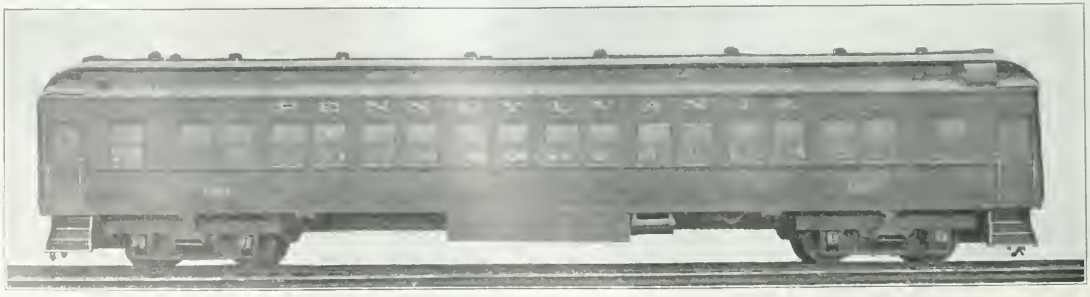
### Mistakes in Waterproofing.*

The majority of engineers and architects still follow old-school methods, believe that concrete is waterproof—especially if it be reinforced—and give no special attention to the importance of design. A faulty design will invalidate the best methods and materials. This is particularly so in bridge work. If the bridge be not properly designed to receive waterproofing, it is almost impossible to make the deck or floor watertight.

It is a mistake to use a set design or specification for general work. Each condition has its characteristics, and should be carefully considered, especially with reference to the nature of the climate, water, soil, rock, water-pressure, use of the structure, etc.

A prominent New York architect made the mistake of using on the exterior surfaces of the walls of a 22-story office building a waterproofing material simply because it had been used fairly suc-

*From a paper read before the American Society for Testing Materials by Edward W. De Knight, Manager of the Hydrex Felt & Engineering Co., New York.



Steel Passenger Car, Pennsylvania Railroad.

cessfully on the bottom of a reservoir. His mistake was in the end costly.

In another mistake the floors in a cold storage building, with a constant temperature near zero, were designed to be waterproofed with materials similar to those used in an ordinary warehouse where the temperature ranged from near zero to 90 deg. F. There had been no thought of making the method and consistency of the products suit the conditions, and the materials used in the cold storage floors turned, in time, almost to powder. In another mistake, an engineer used a reservoir design and method for the foundations of a 12-story office building near tide water. The design being radically inappropriate, the sub-basement floor and its waterproofing were broken through when the building was up seven floors. Within 24 hours the water was 15 ft. high in the basement. It cost $10,000 to remedy this mistake.

In another mistake the design was faulty in improperly grading the surface carrying the waterproofing, which, by missing the outlets by a fraction, allowed sufficient backwater to find its way inside, instead of outside a magnificent granite structure. This mistake will likely cost nearly $40,000. A waterproofing engineer who would have, at a glance, noticed the error in the drawings, would certainly in that case have been worthy of his fee.

In another mistake, a wrong design for concrete arch viaduct waterproofing caused the reservoirs to be filled with water which could not escape through deep pipes stopped by cementation. The freezing of the water burst the concrete. After four years it was necessary, to save the viaduct, to properly waterproof it. This mistake was exceedingly costly.

In mill protected property—factories, warehouses, etc.—the losses from water are far greater than the losses directly from the fire. The mistakes in designing floor waterproofing have, in this respect, cost hundreds of thousands of dollars. Yet it is practically a simple thing to design a floor so that it will perfectly retain water to the depth of several inches, and make it independent of and also a protection to every other floor.

The writer firmly believes that no material should be used for waterproofing which is not elastic. He also as firmly believes that no material should be used for waterproofing which becomes hard or vitreous. These two facts seem so self-evident that they will in time, no doubt, be taken as accepted principles. It is a serious mistake, therefore, to attempt to waterproof concrete by hardening the surface, or by using thereon a cement-plaster. We know that this method of attempting to waterproof possesses attractive features which appeal to many engineers and architects; but notwithstanding this fact, our personal opinion is that these features are misleading. The writer is a representative of the school of elastic waterproofing as opposed to the school of hard, vitreous or rigid waterproofing.

The fact that the method may have in certain cases served well for several years misleads one into using it for permanent work. By the very nature of a hard surface that surface must serve for a time, but also by that very hardness will the waterproof value of the surface be destroyed. The value of waterproofing lies not in what it is to-day, but in what it is many years hence.

We are told that the hardening process or the cement-plaster method must be applied to the inside surface of the wall, where it can be easily reached and the cracks patched. Patching is not perfection. Waterproofing must not crack; if elastic, it will not crack. Anyone recommending the application of waterproofing on the interior surface of a foundation wall certainly knows little of the right theory of waterproofing. It is against common sense and the logic of things to place the waterproofing in front (where in time it can be shoved off) of the line of resistance (the wall) instead of behind it. One of the chief uses of waterproofing is to keep water entirely from the wall—instead of allowing it to come to and through it—and by capillarity work up and saturate the entire wall —and in the course of years press off the hardened cement, or even paint, coating on the other side which it must finally do by the very law of nature.

Another thing—water should not be fought. It must be led. Waterproofing is part of the general scheme of drainage. Its purpose is to check water, to lead it, and direct its flow naturally to some point where it can be disposed of through properly arranged drains. Water will always find the weakest spot in the strongest cement, though it may travel a long way and take a long time to do it. The cement-plaster theory seems to have no bearing whatever on drainage. It means the fighting of water—and from the wrong side of the wall. The hardness of the plaster may keep back water for several years, but it must in time come through and the cement come off.

Even though the coating or the cement be placed on the outside of the wall, where it then cannot be readily reached to patch cracks, it will, in the majority of cases, eventually crack because, being set, hard and rigid, it cannot accommodate itself to contraction and expansion, etc. It could not possibly be used on a bridge floor. The vibration would destroy it. Nor can it be used on a roof.

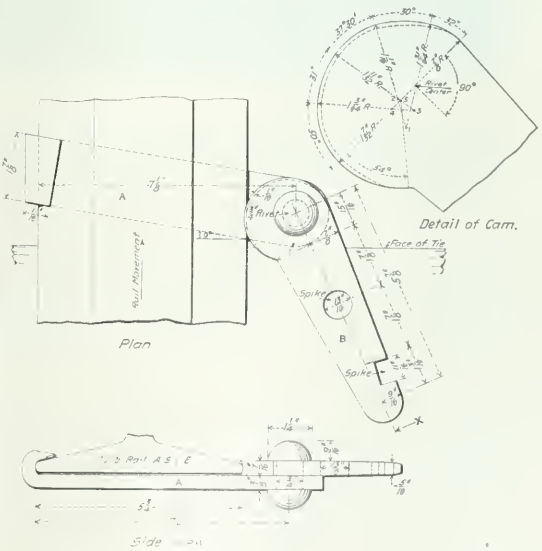
An elastic waterproofing is not confined to one suitable material, but may be composed of many. It may be described as follows: It should resemble a membrane or skin—be, in itself, i.e., in one sheet, absolutely impervious to water; be flexible, tough and elastic; be made of materials specially made to withstand the injurious action of water and all underground conditions. As many sheets or layers of this impervious membrane or skin should be cemented or veneered together as the conditions require. This stratum of waterproofing when in place must be independent of—a thing apart from—the surface or thing waterproofed, which may vibrate or settle, twist or crack, expand and contract, without in the least affecting it, exactly as is the hide of a horse or the skin of one's hand free and independent of the surrounding tissue so that it may readily and naturally yield to every move of the body or the hand. This principle of elasticity, coupled with independence of movement, in waterproofing was termed by the writer some time ago as the "improved membrane method," to distinguish it from the old-school process of sticking the waterproofing fast to everything to be waterproofed.

It is a question of method, and, as can be readily observed, is diametrically the opposite of the principle of rigidity in waterproofing—no matter what may be the materials.

A common and serious mistake is in attempting to do waterproofing with incompetent, inexperienced men. The average contractor will try to do the work with his own men, usually ordinary laborers, or will sublet it to a roofer. Roofing is not waterproofing. The average roofer thinks he knows how to waterproof, but unless he has many times had the actual experience he knows really little of good waterproofing. It takes more time and patience than roofing—the method of applying the materials is quite different—and if rightly done should receive much higher pay than roofing, which is ordinarily a very simple and easy operation. Waterproofing, however, especially water-pressure work, requires not alone skilled labor, but frequently considerable engineering skill.

## The Prentice Rail Anchor.

George H. Prentice, roadmaster of the Lake Shore & Michigan Southern, at Painesville, Ohio, has designed and patented an "anti-creeper"—to prevent the rails of a track from sliding down hill, or in the direction of traffic—which is made fast to the rail by a cam and a lever without boring or punching the rail. The design of this




The Prentice Rail Anchor.

anchor and the dimensions of one made for 100-lb. rails of the A. S. C. E. section are shown in the accompanying drawing. The anchor is to be fastened to the tie on the inside of the rail. It is made of soft steel and the two parts are held together by a rivet ¾ in. in diameter. In applying, the arm B is driven in the direction of the arrow $x$ until the rail is held securely, and when thus driven it should lie at an angle of about 25 deg. with the rail, as shown in the drawing. With a rail that has a base wider or narrower than that shown in the drawing, the distance between the bearing at the left and the center of the rivet (7⅛ in.) should be made greater or

less accordingly. The piece marked A has to be made in two forms, one for the left hand rail and one for the right-hand.

Being placed on the inside of the rail, the anchor aids in holding the track to gage.

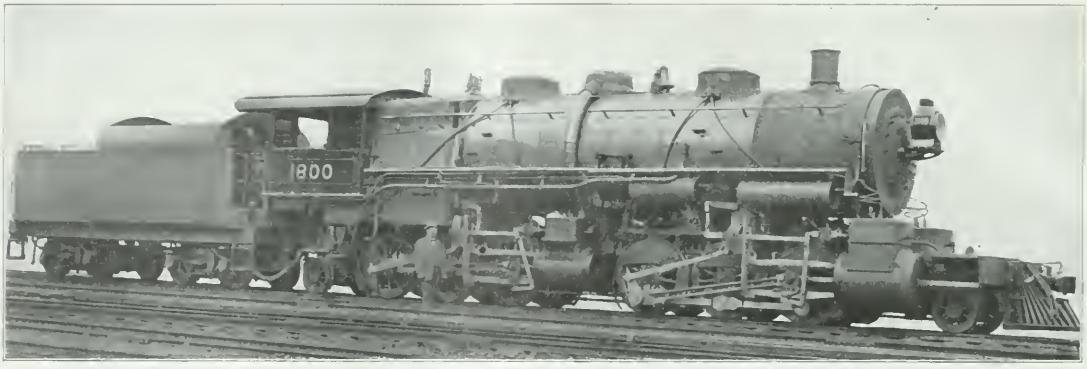
Mr. Prentice has used several hundred of the rail anchors on his division, and they are to be put in use on the other divisions of the main line of the Lake Shore. They are also to be tried on the steep grades of the Boston & Albany between Pittsfield and Springfield. Mr. Prentice estimates that, in practice, where automatic signals are in use, and where, consequently, switches must be kept accurately adjusted in order to prevent disturbance of the electrical connections in the switch boxes, the use of anchors to keep the rails from sliding will save the labor of one man on a section, which may be estimated as equal to $60 per year per mile of track.

## Mallet Compound Locomotive for the Great Northern.

The accompanying illustration shows one of five Mallet compound locomotives, recently built by the Baldwin Locomotive Works for the Great Northern. These engines are the heaviest thus far built by this company, and exceed in total weight the Mallet compound on the B. & O., which weighs 334,500 lbs., all of which is on the drivers. They are intended for freight service, and are designed to pass 10-degree curves. The tractive power working compound is 71,600 lbs.

These locomotives are provided with two-wheel front and rear trucks, which are equalized with the front and rear groups of driving-wheels respectively. The front truck has a center bearing, while the rear truck has side bearings. This arrangement should reduce flange wear on the driving-wheels and enable the engines to curve readily and ride smoothly.

| | |
|---|---|
| Weight on trailing truck | 29,000 lbs. |
| Weight, total | 355,000 lbs. |
| Weight, engine and tender | 503,000 lbs. |
| *General Dimensions* | |
| Wheel base, driving, each group | 10 ft. |
| Wheel base, total engine | 44 ft. 10 in. |
| Wheel base, total engine and tender | 73 ft. 2¼ in. |
| Heating surface, firebox | 225 sq. ft. |
| Heating surface, tubes | 5,133 sq. ft. |
| Heating surface, total | 5,658 sq. ft. |
| Grate area | 78 sq. ft. |
| *Wheels and Journals* | |
| Drivers, number | 12 |
| Drivers, diameter | 55 in. |
| Truck wheels, diameter | 30 in. |
| Journals, driving axles | 10 in. x 12 in. |
| Journals, truck axles | 6 in. x 12 in. |
| *Cylinders* | |
| Cylinders, diameter | 21½ in. & 33 in. |
| Piston, stroke | 32 in. |
| Valves, type | Balanced slide. |
| *Boiler* | |
| Type | Belpaire |
| Working steam pressure | 200 lbs. |
| Diameter | 84 in. |
| Thickness of sheets | ⅞ in. |
| Staying | Vertical crown stays |
| Crown sheet, thickness | ⅜ in. |
| Tube sheet, thickness | ½ in. |
| *Firebox* | |
| Length | 117 in. |
| Width | 96 in. |
| Depth, front | 79½ in. |
| Depth, back | 76⅝ in. |
| Thickness of sheets | ⅜ in. |
| Water space—Front, 6 in.; sides, 5 in.; back, | 5 in. |




Mallet Articulated Compound Locomotive. Built by the Baldwin Locomotive Works for the Great Northern.

All four cylinders are provided with balanced slide valves driven by Walschaert valve gear, the McCarroll air reversing mechanism being used. The high pressure cylinders which drive the rear group of wheels are cast separately from their saddle, which is bolted to the upper frame rails. The low pressure cylinder castings meet on the center line of the engine and are bolted together. The steam pipe connection between the high and low pressure cylinders has a ball joint at the rear end and a slip joint with a packed gland at the front end. The exhaust connection between the low pressure cylinder and smoke box has a ball joint at each end and a slip joint in the middle.

The frames are of cast steel and are 5 in. wide throughout. The rear frames have double front rails cast in one piece with the main sections. The front frames have separate top rails, which pass over the low pressure cylinder castings. The frames are strongly braced transversely by heavy castings, which serve at the same time as boiler supports. The saddle under the smokebox is provided with coiled springs, which help to bring the front group of wheels in line after rounding a curve.

The principal dimensions of the engine are as follows:

| | |
|---|---|
| Kind of fuel | Soft coal |
| Weight on drivers | 316,000 lbs. |
| Weight on front truck | 19,000 lbs. |
| Weight on trailing truck | 29,000 lbs. |
| Weight, total | 355,000 lbs. |
| Weight, engine and tender | 503,000 lbs. |
| *General Dimensions* | |
| Wheel base, driving, each group | 10 ft. |
| Wheel base, total engine | 44 ft. 10 in. |
| Wheel base, total engine and tender | 73 ft. 2¼ in. |
| Heating surface, firebox | 225 sq. ft. |
| Heating surface, tubes | 5,133 sq. ft. |
| Heating surface, total | 5,658 sq. ft. |
| Grate area | 78 sq. ft. |
| *Wheels and Journals* | |
| Drivers, number | 12 |
| Drivers, diameter | 55 in. |
| Truck wheels, diameter | 30 in. |
| Journals, driving axles | 10 in. x 12 in. |
| Journals, truck axles | 6 in. x 12 in. |
| *Cylinders* | |
| Cylinders, diameter | 21½ in. & 33 in. |
| Piston, stroke | 32 in. |
| Valves, type | Balanced slide. |
| *Boiler* | |
| Type | Belpaire |
| Working steam pressure | 200 lbs. |
| Diameter | 84 in. |
| Thickness of sheets | ⅞ in. |
| Staying | Vertical crown stays |
| Crown sheet, thickness | ⅜ in. |
| Tube sheet, thickness | ½ in. |
| *Firebox* | |
| Length | 117 in. |
| Width | 96 in. |
| Depth, front | 79½ in. |
| Depth, back | 76⅝ in. |
| Thickness of sheets | ⅜ in. |
| Water space—Front, 6 in.; sides, 5 in.; back, | 5 in. |
| *Tubes.* | |
| Number | 441 |
| Material | Steel, No. 11 gage |
| Length | 21 ft. |
| Diameter | 2¼ in. |
| *Tender.* | |
| Water capacity | 8,000 gals. |
| Coal capacity | 13 tons |
| Wheels, diameter | 36 in. |
| Journals | 5½ in. x 10 in. |

## Chicago Grain Elevators.

Some eastern railroads own elevators and operate them as transfer plants only, for the benefit of the shippers. Some western roads own elevators and lease them. Others do not own any. In no case is a railroad in the elevator business commercially. Grain is free to go from any western road to any elevator without tax, the reconsigning charge of $2 per car having been abolished by all lines last year. Nowhere else has grain freer movement than in Chicago.

The large elevator interests own and lease their elevators. Nor is there any combination among elevator interests to regulate prices of grain. Elevator competition is the sharpest known in the grain trade.

Chicago's elevator capacity is between 65,000,000 and 70,000,000 bushels, or about 5,000,000 less than a few years ago—loss due to fires. There is so much competition it does not pay to run the existing elevators. There is more elevator capacity than business. As conducted to-day, the elevator business will not, with a few exceptions, permit of private ownership and allow a profit. Originally the railroads owned all the elevators. In some states they must provide them at stations as well as at terminals.

One disadvantage local elevator interests labor under is the limited term of six months during which they have the transit privilege in freight rates. Grain stored longer has to take the turn of local rates, if it moves east all-rail.

Some abuses have crept into the elevator business, but they have been such as carried their own correction with them, as a rule.—*Wall Street Journal.*

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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We understand that the Union Railroad of Pittsburg has signed the per diem agreement, and that a number of other railroads controlled by the United States Steel Corporation have taken the same course. Soon after the per diem arrangement took effect, some four years ago, we called attention to the fact that while some of the Steel Corporation railroads, such as the Bessemer & Lake Erie and the Elgin, Joliet & Eastern, had signed the agreement, this adhesion to the scheme was by no means universal with the Steel Corporation railroads. The impression was given that the Steel Corporation was picking and choosing, and only signing the per diem agreement when it was to the direct advantage of the line interested. It is gratifying to find that a more general adhesion to the scheme now appears to have been adopted, as it rounds out some pretty bad gaps in the per diem structure.

Roughly speaking, the New York, New Haven and Hartford Railroad Company now owns or controls some 800 miles of street railway track representing total market values of probably not less than $50,000,000—perhaps $10,000,000 more—of which say two-thirds are in Connecticut and about one-third in Massachusetts with a small outlying portion in suburban New York. Some newspaper reports now aver that the whole of this great property has been transferred to a "voluntary" association located at Boston, other reports say that the transfer only includes the Massachusetts properties—the Berkshire, Springfield and Worcester systems. There may be a sense in which both reports are true and the shifting of the Massachusetts properties be an immediate thing, while the transfer of the other properties is a remoter one contingent on future complications. However that may be, it is the situation in Massachusetts that commands attention and it is a most interesting one whether viewed practically or legally. The law of the State prohibits ownership directly or indirectly of street railway lines by steam railroad companies. To evade this law the New Haven corporation has thrown up three lines of intrenchment. It has (1) its big holding company, the Consolidated Railway Corporation, under an "omnibus" Connecticut charter; (2) local holding companies in Massachusetts, and (3) the new "voluntary" association at Boston. The spirit and intention of the law have been plain enough, but the State lax and dilatory in enforcing it. On the other hand, the technicalities of the case form a kind of statutory jungle and before the legal underbrush is cut through there are endless propositions to be tried out, some of which may have to go to the federal tribunals. The power of the State must be determined not merely in its bearing on a foreign holding corporation outside the State, but on local holding bodies inside the State, one of them consisting of just that kind of voluntary group whose legal status has so vexed the courts and which the State of Massachusetts herself, as represented by her railroad commission, has recognized as in the nature of an independent and private stockholder. If all the legal questions involved could, within reasonable time, be searched, sifted and expounded by the Massachusetts tribunals—saying nothing of higher courts—the rulings would have national values as throwing light on the standing before the law of holding corporations and of unchartered bodies. As the case stands, with grey beards likely to grow white before the mixed train reaches its legal terminus, the best guess is that in a year or two Massachusetts through the eyes of her legislature will see the impending invasion of steam by electricity and bow to the higher law of a physical fact.

## NEW CAPITAL FOR GRANGER ROADS.

Among the important financial developments of the past week has been the announcement of capital stock increases by the two most prominent Chicago granger roads, the Chicago, Milwaukee & St. Paul and the Chicago & North-Western. For more than a year, or since the announcement of its determination to build a Pacific Coast extension, the plans of the St. Paul road for financing the 1,500 or more miles of new line have been the subject of continued interest. As conditions are not at present particularly favorable for a sale of bonds, while there is at the moment a boom under way in the stock market, the St. Paul has apparently concluded to delay the announcement of a complete plan for its new needs in the West and to finance immediate needs by the issue of new stock. On October 4, 1902, there was authorized $25,000,000 additional common stock. This action was at the time supposed to be taken largely as a threat to the Union Pacific, with which the St. Paul interchanges Pacific coast traffic at Omaha, in retaliation for an attempt on the part of the Union Pacific to lower the St. Paul's share of the through rate. The threat apparently had its desired

effect, it appeared that satisfactory arrangements were made with the Harriman line and the new stock issue has for the years since been held in the treasury. Under the announcement made on Thursday of last week, there is to be issued to the stockholders at par $24,802,809 of the new stock, which will cover perhaps a year's work on the new extension. Within that time the road would have the opportunity, on improvement of the market for bonds, to make a large issue covering all future needs, or at the end of that time would be in an equally strong position as now to proceed with any plan then desirable. Thus the present issue tides the company over for a period of a year or more in its financial plans. The fact that this amount of stock was readily available and that final decision as to the financing of the new extension could thus be postponed, and not a determination to abandon part of the new project accounts for the smallness of the new increase in capital.

The Chicago & North-Western has called upon its shareholders to authorize new capital stock which will a little more than double the amount now outstanding by bringing up the capital stock to $200,000,000. The purpose for which this large increase is intended is not specified in the circular, but according to it the stock is to be issued from time to time in the discretion of the directors. The only way now that the management of the North-Western can prove to the public that there is to be no extension of the road to the Pacific Coast, will be not to build any. Denials surely cannot be taken to mean anything. The St. Paul's Pacific extension was again and again flatly denied by the highest officers of the road. Mr. Hughitt's characterization some time ago of the story of a Pacific extension for the North-Western as absurd, gains no strength from the fact that the circulars announcing the new stock increase must have been in the press at the time he characterized the report of a new stock issue also as absurd. Technically, perhaps, he had a ground of escape, because the rumor which he denied coupled the news of the new issue with the plan to buy up the minority shares in the Chicago, St. Paul, Minneapolis & Omaha. The advantage of a through line to the Pacific for a local road like the Chicago & North-Western has often been explained in these columns and attention has been more than once directed to the North-Western's line which is creeping west through Wyoming, being just about to be opened to a point little east of directly north of the eastern line of Utah. Certainly, if a Pacific extension is to be built, a good start has been made in the new Wyoming line. If not to the coast, it is at least more than likely that this line is to be extended westward to a connection with the Harriman lines in Idaho or Utah, thus giving the North-Western a 1,000-mile longer haul on through traffic.

There is another and quite a different connection in which the North-Western's new stock issue is of interest. It will be remembered that the dream of the Wall street enthusiasts which had probably the largest share in the bull market of 1905 was a New York Central-Chicago & North-Western-Union Pacific consolidation, giving a through line, probably under control of Mr. Harriman, from the Atlantic to the Pacific. It is fairly clear that these three roads are not far apart even at the present time. The New York Central and the Chicago & North-Western are, of course, already related through the holdings of the Vanderbilt family, a considerable share of whose holdings are believed to have come into possession of the Standard Oil party, which is so well represented on the Union Pacific directorate. Whether or not such a plan for consolidation is under way we are not prepared to say, but it is interesting to note that within the year the Union Pacific has authorized an increase of $100,000,000 in its preferred stock, yet unissued; the New York Central an increase of $100,000,000 in its common stock, yet unissued; and, on October 18, the Chicago & North-Western will vote on an increase of $100,000,000 in its stock. Each of the three roads in question, therefore, is well supplied with funds for the carrying out of any such plan.

## THE BETTERMENT OF RAILROAD COMMISSIONS.

The full platform of the Lincoln Republican party of New Hampshire with what may be styled its specific railroad programme — anti-free pass, full taxation and popular election of the State railroad commission—has come to hand. We note that the movement has the strong support of the Hanover, N. H., *Gazette*, published at the seat of Dartmouth College; that a prominent professor of that institution is an active leader of the new organization; and, we presume, that the historic and venerable college, with her faculty of course acting as individual citizens, is lending her aid to the cause, as is perfectly fit and proper in any movement for civic and economic betterment. Criticism of the New Hampshire railroad commission system and the proposed change coming from so high an academic source lifts the general subject to a fresh, intellectual and, for that matter, practical level. It may fitly serve as a text for discussion of the possible directions for betterment of State railroad commissions in general—a discussion which, while it cannot be in any sense very exhaustive, is very timely in these days when, as it would almost seem in rivalry with the interstate commerce body, the State commissions are showing fresh vigor.

At the annual national meetings of the various state commissions the subject of their co-ordination of powers and functions has been discussed, but without any very visible results save as betterments have passed from one State into another by the slow force of example. The commissions now existing in about three-quarters of the States of the Union are still extremely heterogeneous. In the form of the blanks to be filled there is a sluggish but positive approach to uniformity. But in commission powers, duties and statutory responsibilities State commissions differ, if we may use the sounding metaphor of the Rev. Joe Cook "by celestial diameters." There are commissions of one member and commissions of several members; commissions made strong by statute, but weak in spite of it and commissions made weak by statute, but—now and then—strong in spite of it; commissions partisan and non-partisan, political and non-political; commissions that rush vastly into undue responsibilities and other commissions without higher thought than the lunch hour on the semi-annual observation car. In these days a railroad train in a run of a few hours may pass through as many States each with its varying statutes to be enforced—permissively or otherwise—by different bodies of commissioners. The divergencies of Sunday statutes, often giving special powers to railroad commissions, may be cited as one example. There are others much more important, but too numerous even for curt mention.

Constructive criticism when it fronts the problem of making these divergent commissions homogeneous has no easy task even though that task goes no further than suggestion. One can only follow certain general ideas of policy aimed at the evils to be corrected. In the unifying of State Commission methods the Interstate Commission has, in a purely advisory capacity, done something, and can, if it will, do much more. We should have more confidence, as to this branch of the problem, in the federal body if it were more conservative and less radical. We may at least offer the gentle query whether the federal commission cannot find time, amid rates and rebates, to push so far as may be and along reasonable lines of advice the co-ordination of the State bodies at least so far as local conditions allow.

It goes with the saying that the State commissions which are hampered by weak statutes should be braced into potential energy by positive and fresh legislation. But it is equally true that the purview of subjects in charge of many of the State commissions, particularly as the West, and in less degree at the South, have been most unduly enlarged. When we find single commissions in expansive and rich commonwealths shouldering not only steam and electric lines, but express charges, corporate taxation, warehousing —in one case also the telephones—one may well doubt human capacity for a task which, while nominally carried, can never be really administered. The problems and processes of rail transportation have during the last few years vastly increased, especially if we include in them those of the street railways. Surely in these rapid days of evolution the legal regulation of steam and electric roads alone, even in a small State, challenges the full intelligence of any commission not composed of sinecurists. We are fully aware of the evil custom of many States of increasing commissions merely to add to the dividend of party and political spoils. But, bad as the practice is, that of "overloading" a commission that otherwise might be efficient and, when overloaded, cannot possibly be so, is worse. As a general and broad proposition, with few local exceptions, if any, the limitation of the functions of the State railroad commission to land transportation by steam and electricity, squares with common sense.

There is another limitation more strictly of a legal quality. Many States make the decisions of the railroad commissions in certain important cases final. Hence arise not only litigations resting on questions of common law or constitutionality, but a tendency on the part of commissions, often untrained in law, to an irresponsibility resting on the statute that confers finality. The partial remedy is the explicit statute providing for appeal and judicial review. Denial of such a statute implies lack of confidence of the legislature and the people in their own tribunals and, *per contra*,

its existence drives home responsibility on the State Commission. Let us illustrate the point by an outside case. Not many years ago in one of the New England States the boards of county commissioners, acting as boards of excise, were given final power in granting saloon licenses. Abuse of that power resulted in a new statute giving appeal for both sides—applicants and resistants—to the courts and a decided abatement of the evil. The bearing of such an experience on the question of arbitrary and excessive powers of State railroad commissions is obvious. If stronger light is needed on the subject one may seek it in the recent congressional debates bearing on the judicial review features of the rate bill. The power of State commissions ought, then, to rest on explicit rather than indeterminate statutes, and when the change is compassed we shall at least find the commissions acting with clearer and more responsible conception of law instead of blundering in the morass of "final" jurisprudence.

In the way of minor suggestion for the betterment of State commissions salaries now ranging from $1,500 to $5,000 or more a year should be more nearly equalized with probably about $3,000 as a minimum. The statutory selection of commissioners from certain classes should be abrogated with, possibly, the reservation that one of the commission must be a skilled engineer. Appointive commissions, on the whole, average better, the country through, than the elective bodies; and, spite of the theory of somewhat higher personal responsibility of the single headed commission, the large diversity of commission duties, if well performed, argues in favor of commissions of at least three members. Finally the archaic and strange system prevalent in some states of levying the cost for the commission as a special tax on railroad corporations should end and the commissions, as an added guarantee of independence, be paid directly by the State. But when all the foregoing betterments, major and minor, of what we may call the mechanism of the State railroad commissions come to pass—if they do—the final test is, after all, the *personnel* of the commission itself. There is the *crux* of the whole problem. The mechanism may be good and yet the commission be bad, the mechanism weak—as in Massachusetts—yet the commission the best in the land. The genuine improvement will arrive when the intelligent citizen, under the sway neither of the railroad corporation on the one hand nor demagogism on the other, carries his work beyond the polls demands for the commission men trained, acute, fearless and honest, and when the civic ardor of such reformers as those in New Hampshire becomes an enduring flame and not a flash.

## THE HARRIMAN DIVIDENDS.

"The amount credited as the gain by E. H. Harriman alone is placed at not less than $10,000,000 by many brokers." *Wall Street Journal*, Aug. 17.

By far the most important event of a week unusually rich in financial happenings—notably so for the summer months—was the announcement of dividends on the common stocks of the Union Pacific and the Southern Pacific railroads. The Union Pacific was making returns to its shareholders at the rate of 6 per cent. annually, while no dividend was being paid on Southern Pacific stock. On last Wednesday the boards of directors of the two roads met and, it now appears, authorized action on the dividends by the executive committees. The executive committees met at 3 o'clock Thursday afternoon, but at the close of the meeting those who had supposed that action would be taken on the dividends were disappointed by the bare announcement of the results of the year's operation on the Union Pacific, and, what was of more interest, since on account of the San Francisco disaster or for other reasons no official figures of earnings have been given out for the road since those for the month of February, the Southern Pacific earnings. Following this supposed failure of the directors of the two companies to take action on the dividends, on Friday morning it was announced that a semi-annual dividend of 2½ per cent. had been declared on Southern Pacific common stock and a semi-annual dividend of 5 per cent. —3 per cent. out of the earnings of the railroad and 2 per cent. out of other income—on Union Pacific common. The stock market was immediately thrown into a furore, and with sales for the day amounting to over 2,500,000 shares, then the high record for both this year and last, the price of Union Pacific, which on Wednesday had been 159 and on Thursday, following the failure of the directors to announce action on the dividend, 163, shot up more than 15 points. Southern Pacific at the same time rose from 82 on Thursday to 89 on Friday.

The official statements of earnings of the two roads show clearly that the rate of distribution thus established on the two common stocks is not unreasonably high. The Southern Pacific, with gross earnings of $105,619,114, now takes its place, with the Pennsylvania, as the second hundred-million-dollar-a-year railroad. When it is considered that these earnings, in spite of the San Francisco disaster, in connection with which the road is estimated to have performed one million dollars' worth of service free, are more than $10,000,000 greater than the figure for the preceding year; that net earnings (over $35,000,000) are $5,500,000 larger than in 1905, and that there has been a reconstruction of the road in which it is estimated that more than $150,000,000 has been spent on betterments without any return whatever to the common stockholder, a 5 per cent. annual dividend is seen to be well justified by present earnings. As for the Union Pacific, gross earnings from transportation increased from $59,000,000 in 1905 to $67,000,000, and net earnings from $27,000,000 to $30,000,000, which, considering the wonderfully favorable results achieved in 1905, is surely a notable increase. But when it is considered that with the beginning of 5 per cent. annual payments on Southern Pacific common stock, of which the Union Pacific, through the Oregon Short Line, holds $90,000,000, there is a new annual return of $4,500,000 on its Southern Pacific investment, it is plain that an annual rate of 10 per cent. on Union Pacific common is for the present also justified. There is, then, so far as the earnings of the two roads are concerned, no reason why dividends at these rates should not be paid.

The manner of declaration of these dividends, however, is an instance of wrongful use of corporate power. The natural and fair way to fix such rates of payment is to lead up to them gradually step by step. Annual payments of as little as 2 per cent. might first have been begun on Southern Pacific leading up, as the property and earnings expanded, to the now declared rate of 5 per cent. In this way, without in any way endangering the credit or prosperity of the company, the stockholders could have had their fair share in the growing prosperity of the company. As it is, not only have the common stockholders received no return on their investment for years, but they have been left entirely in the dark as to when it might please the interests in control to give them any return. The attitude of the management, as expressed in the last annual report, was extremely discouraging as to dividends. The same thing is true, in certain respects in greater degree, in the case of the Union Pacific. It has, of course, been known that the company was making large earnings and, as a result of its fortunate investment in stock of the Northern Securities Company, had an immense surplus at its command. The opinion has, however, been allowed to obtain that it was the policy of the company to make only moderate, if any, increases in the dividend rate and to conserve the strength of the central member of the Harriman group against any extension of railroads or control which might be necessary. The dividend rate, up to October, 1905, was 4 per cent.; at that time a semi-annual payment of 2½ per cent. was made and in April of this year by a semi-annual disbursement of 3 per cent. the rate was increased to 6 per cent. annually. In accord with this policy of gradual increases, it was supposed that, since earnings were favorable, the rate of distribution would at the meeting of the directors this week be increased to 7 per cent. annually. Instead of this, the large increase of 4 per cent. a year over the existing rate was made, raising the rate to 10 per cent., the highest amount paid regularly on any unguaranteed railroad stock, with the exception of Delaware, Lackawanna & Western. Thus both dividend declarations suddenly and unexpectedly increased the rate of payment on both stocks far above the amount which could possibly have been expected from the previous attitude and policy of the management. But even if there was an out-and-out change of policy in the executive committee, there was a clear abuse of power in the delayed announcement of the dividend declaration. It is the general custom in a case like this, where advance information is of tremendous value, to announce the result of a meeting at its close, thus giving, as far as possible, a fair chance to every one to act on the news. Instead of announcing the action which had been taken in regard to dividends, a mere statement of earnings of the two companies was given out, thus naturally giving the impression that, as might easily have been possible, action on the dividends had been deferred. It was not until the next morning that the announcement was made of the dividends which had actually been declared.

The practical opportunities presented to the interests in control as a result of the dividend declarations may be summed up in the quotation from the *Wall Street Journal* at the head of this

article. The dividends, it has been officially announced, were decided upon by the executive committees. The executive committees of these two companies, earning together some $172,000,000 a year, are, practically speaking, E. H. Harriman. His absolute control may be illustrated by the fact that a director of the Union Pacific has since stated that the dividends were as much of a surprise to him as to the rest of the financial community, when he learned of them through a news bureau. It is, of course, impossible to prove that Mr. Harriman, or any of Mr. Harriman's friends, made any gains on the stock market in connection with the dividend declaration. But whether they did or did not, it is interesting to observe the possibilities. On May 2, Union Pacific sold at 138½ and on July 12 at 140. A 10 per cent. stock is exceedingly cheap at those prices. Without considering the opportunity which the interests in control had to acquire Union Pacific during 1905 at between 151 and 113, the year's high and low prices, or between 117 and 71 in 1904, the possibilities of profit within the last five weeks, between 140 and 185, around which Union Pacific is now selling, are worth considering. To a prudent soul knowledge of a 16-point rise which is to take place within twenty-four hours furnishes an opportunity hardly to be neglected, and, as a side issue, with equal knowledge beforehand of the event, there were tidy profits to be taken in Southern Pacific stock. The wonderful efficiency of the arrangement from the standpoint of the insider is that, unlike the operations of a corner, which, though it may be successful by its operation in making a high market price for a stock, invariably finds that the process of profit taking depresses the market to an extent sometimes even greater than the boost, here the high prices can be made permanent, for a 10 per cent. stock of an immensely powerful railroad is by no means expensive around 200. As long as a great railroad leader has the chance *and takes it* to make millions of dollars at the expense of his stockholders, who are themselves helpless to foresee the future, depending alone upon his individual will, so long will hostility to corporations be rampant. A peaceful solution of the corporation question can only come when loaded dice are eliminated from corporation management.

## The Brotherhood of Trainmen Again.

The action of the Brotherhood of Railroad Trainmen in supporting the management of the New York, New Haven & Hartford against a body of its own members who were on strike was referred to in last week's issue of the *Railroad Gazette*. There has now come to hand the complete circular issued by the brotherhood in connection with the strike of the switchmen at New Haven, and it is worth quoting as a remarkable and wonderfully encouraging exception to the usual course of trade union disputes. Following a telegram sent to the chairman of each local committee on the New Haven system, which was printed in these columns last week, a circular was issued to all members of the brotherhood on the road, signed by two of the Vice Grand Masters of the order and the General Grievance Committee for the system. The following are quotations from the circular.

To All Members of the B. of R. T., Employees of the New York, New Haven and Hartford System:

Dear Sirs and Brothers:—The undersigned officers found that at the time the men struck, and previous thereto, there had been no complaints or grievances presented to any of the officers of the company. Consequently, if there was anything that would justify a strike, the officers of the company were not given an opportunity to correct it. The strike was not even the result of a united and concerted movement among the yardmen. Any knowledge of the impending trouble was confined to about six men who at midnight struck and then went from crew to crew advising them to do likewise, which they did, consequently when the men who worked the shift between 8 a. m. and 4 p. m. reported for work, they found the yard tied up and they were stampeded into striking, and as a result all of the men went on strike except those working in the passenger yard. The Bridgeport yardmen went on strike out of sympathy for New Haven men, but realizing their mistake they returned to work a few hours later. At our meeting with the men, it was admitted their actions were unjustifiable and they regretted their hasty action. Therefore it was unanimously voted to return to work if it was possible to obtain their positions, and they requested us, the General Grievance Committee and a committee of four members, to call on the General Manager and if possible arrange for them to return to work. In accordance therewith we had a meeting with Mr. Higgins, General Manager, who positively declined to reinstate any of the strikers at this time, and called upon us to see that the contract was maintained and our members properly disciplined for their unauthorized action. We told Mr. Higgins without any evasion that the contract would be protected and that we did not believe the men on the system would tolerate or countenance such actions as the New Haven men had taken. We found that some of our members had misrepresented the situation at New Haven and gone to other points on the system endeavoring to prevail upon the members to join in the strike. Therefore in order to acquaint our members with the situation we sent a telegram to the chairman of each local committee stating that the influence of our organization would be thrown on the side of the company. As a result of this telegram, our members understood the situation better and without hesitancy showed a disposition to protect the contract by sending brotherhood men to New Haven to accept positions. This also prevented the company from importing men who might at some future time prove detrimental to our organization.

It is a well-known fact that for some time past a few of the New Haven yardmen have been constantly threatening to strike. Just what for, no one seemed to know. Within the last three years there have been several illegal strikes in the New Haven yard, which were condemned by the Brotherhood of Railroad Trainmen and the members repeatedly warned that such actions could not be longer tolerated, and on the occasion of a recent visit to Elm City Lodge, No. 201, by the Fourth Vice Grand Master, he found a few of the men eager for a strike, and he counseled, advised and instructed them to present their grievances or complaints to the proper officers of the company in accordance with the laws of the brotherhood and not indulge in any wrong actions, because the brotherhood would not tolerate it and would punish those responsible for any violation of the law. The members at this meeting assured him that they would comply with the laws in every respect and take up their complaints in the regular way. This they finally refused to do, and repudiating instructions and their organization, which their action plainly indicates, permitted a few radical individuals to lead them into a strike, thereby jeopardizing their positions and membership in the organization, which action many of the participants deeply regret.

The conduct of our New Haven members is outrageous, and not in keeping with the well defined policy of the brotherhood, or its laws, or in fact the policy of well guided labor organizations. And it is such action that brings to labor organizations condemnation. The Brotherhood of Trainmen has maintained an honest and fearless policy in handling questions between employer and employee, and now that our members have done wrong we are not going to condone it and permit a couple of hundred men to bring censure and reproach upon an organization of 84,000 members, who want to live in peace and harmony with their employer, and handle questions in dispute in an honest and business-like way.

Many of our New Haven members openly assert there is no contract between the New Haven railroad and its men. This is not a fact, as a contract was made by the joint General Grievance Committee of the O. R. C. and B. R. T. on March 31, 1906, and duly signed by the officers representing the railroad and the officers of the committee representing the conductors, train and yardmen, which contains therein this stipulation and agreement: "The rates of pay and rules herein contained constitute an agreement between the New York, New Haven & Hartford Railroad Company and its conductors, trainmen and yardmen, and will not be departed from without first giving thirty (30) days' notice from either party to the other." This should show beyond any question of a doubt that there is a contract which our members are in duty bound to respect and fulfill.

Our New Haven members have violated their obligation and brought disgrace to the organization which will take some time for us to overcome, therefore they must pay the penalty for their transgression which, according to the law, is expulsion. In concluding this statement we wish to say that this should be a very dear lesson to our members and show to them the necessity of complying with the laws of the brotherhood, and keeping inviolate the contract which exists between them and the New York, New Haven & Hartford Railroad, and beware of those who come in your midst condemning the action which the brotherhood has taken.

The third paragraph as outlined above is a remarkable denunciation of members of its own organization by a trade union body. *Outrageous* is a word which we have been accustomed to hear applied by unions to employers. In this case it is directed against members of the organization by the executive officers in control. The honesty and manly attitude of the whole organization in expelling its own members and in supporting its contract agreements with the road is highly notable. The words used should be printed large in the records and meeting places of every trade union in the country, for it snms up the heart of the trade union problem. The average employer is more than willing that his employees should receive a fair rate of pay and would be willing, in most cases, to treat with union bodies on the subject if the past history of unionism were not so filled with instances of bad faith on the part of the labor organizations. The action of the Brotherhood of Trainmen in the New Haven case is an example of the sort of policy which will go far to give the union the power and authority which it should have as representing the real interest of the employee.

### Buffalo, Rochester & Pittsburg.

The Buffalo, Rochester & Pittsburg, for the year ended June 30, 1906, operated 568 miles of line, an increase over the previous year of 29 miles, 11 miles of which was new line, and 18, additional trackage rights. Of the total, 348 miles are owned, 94 miles are leased and 126 miles are operated under trackage rights. There are five subsidiary companies controlled, whose mileage is included in this total, the principal of which, the Allegheny & Western, operates 148 miles of line, including trackage rights over which it gives the B., R. & P. entrancee into Pittsburg.

The road is essentially a bituminous coal road, operating in the Indiana, Jefferson and Cambria coal fields of Pennsylvania, and carrying large quantities of coal from this region north to its northern terminals at Buffalo and Rochester. It consequently felt severely the strike of miners along its lines, as a result of which most of its tributary collieries were idle for four months, from April 1st to July 23, 1906. The decrease in coal traffic from this cause is estimated at 1,500,000 tons, representing a loss of some $1,000,000 in gross earnings, and the reduction of a year's total coal traffic which otherwise would have been the largest in the company's history. The decrease in earnings from coal was $646,550, and the year's loss in freight earnings was $467,000, but owing to an increase of about $112,000 in passenger earnings, the loss in total gross earnings was less than $332,000. Operating expenses were at the same time cut down about $500,000, so that the net earnings for the year ($3,270,000) show an actual increase of $168,000. These were obtained from gross earnings of $7,829,000.

There was spent on extraordinary betterments $93,253, on car trusts $59,000, and in construction expenses $241,889, all of which were charged to income. The last sum was part of the year's total of $1,159,885 expenses for additions and betterments; the balance, $917,996, representing principally payments for second track, new lines to mines, additional shops and the new general office building at Rochester opened in June, 1906, was charged to capital account. The largest items among the construction expenditures are $142,000 for yards, buildings, shops and machinery at DuBois, Pa., $75,000 for sidings and yard extensions, $283,000 for the general office building at Rochester, and $411,000 for second track, Ashford, N. Y., to Punxsutawney, Pa. There was on increase during the year of 12 miles of double track owned.

Equipment account was charged with $495,201 for 22 locomotives, 10 passenger cars, 2 combination cars, 1 baggage car, 43 freight cars and 45 service cars, as well as sundry betterments. Of the new cars 29 freight cars and 11 company cars were built at the company's own shops. On account of equipment sold, transferred or destroyed, car trust bonds paid off, and sinking funds of equipment bonds, $432,654 was credited to equipment account, making a decrease in that account for the year of $62,547. Equipment account is charged with the cost when rolling stock is purchased or rebuilt, and credited when rolling stock having been destroyed or sold, operating expenses are charged with the amount.

The revenue tonnage carried was 8,377,375 tons, a decrease of 889,357 tons, or 9.6 per cent. from 1905. The decrease in bituminous coal alone amounted to 1,029,823 tons, but there was an increase of 143,925 tons in general merchandise. Both train loading and engine loading again show an increase over any previous year. Train load, following an increase of 66 tons in 1905, increased 18 tons more, being 525 tons for 1906. The engine load was 357 tons in 1904, 374 tons in 1905 and 418 tons in 1906. The number of revenue tons carried has increased from 3,775,504 in 1896 to 8,377,375 in 1906, and the freight revenue from $2,595,678 in 1896 to 6,305,187 last year. At the same time the ton mile rate has risen from 0.478 cents to 0.508 cents, and the profit per ton mile from 0.154 cents to 0.216 cents. It is evident that the Buffalo, Rochester & Pittsburg has greatly benefited from the stability in the bituminous coal trade.

No detailed figures are given for the operating expense accounts, but as a whole maintenance of way increased $6,961 and general expenses $175,000, while maintenance of equipment decreased $215,039 and conducting transportation $291,797. The percentage of conducting transportation to gross earnings was 33.29 per cent., against 35.51 per cent. in 1905. The total operating ratio was 58.23 per cent., against 61.99 per cent. in 1905, owing partly to the fact that owing to the light traffic during the coal strike repairs to rolling stock and other work could be done more economically than usually.

A step taken during the year toward extension of the company's influence has been an arrangement with the Grand Trunk by which the two companies have jointly organized the Ontario Car Ferry Co., Ltd., which is to operate a car ferry from Charlotte, N. Y., the lake port of Rochester, across Lake Ontario to Port Hope or Coburg, Ont. This will serve as a further outlet for the company's coal tonnage, and it is also anticipated that considerable general traffic and some passenger traffic will be interchanged. A car ferry with a capacity of 25 loaded cars is now being built by the Canadian Ship Building Company, of Toronto, and is to be delivered within a year. The following are the principal statistics of the year's operation:

| | 1905. | 1906. |
|---|---|---|
| Mileage worked | 568 | 538 |
| Passenger earnings | $1,154,089 | $1,042,241 |
| Freight earnings | 6,603,112 | 7,070,150 |
| Gross earnings | 7,829,452 | 8,161,080 |
| Maint. way and structures | 683,158 | 676,198 |
| Maint. of equipment | 1,099,368 | 1,314,407 |
| Conducting transportation | 2,606,693 | 2,898,490 |
| Operating expenses | 4,559,113 | 5,058,813 |
| Net earnings | 3,270,339 | 3,102,267 |

## NEW PUBLICATIONS.

*The Analysis and Softening of Boiler Feed Water.* By Edmund Wehrenfennig, in collaboration with Fritz Wehrenfennig. Translated by D. W. Patterson. New York: John Wiley & Sons. 200 pages; 6 in. x 9 in. 171 illustrations. Price, $4.00.

The author of this book is a mechanical engineer and the chief inspector of the Austrian Northwestern Railway, and his collaborator is an analytical chemist, and director of factories in Eggenberg. The result of their collaboration is a book that should prove of great value to the chemist or water commissioner upon whom rests the responsibility for the selection and purification of the waters to be used in locomotive boilers. It is not a book for the layman, but is essentially a chemical treatise on water purification and demands a knowledge of chemistry in order that it may be read or even studied intelligently. The earlier chapters are occupied with a discussion of the subject from this point of view. Starting with the impurities of water it first shows how water becomes impregnated with impurities, and then the methods by which they can be removed.

Minute details are given as to the analysis of waters, to which a preliminary caution is added to the effect that "the analysis of water for scale-forming matter, of determining the total hardness, the permanent and temporary hardness, the lime and manganese contents, may be obtained by the engineer himself with the aid of this treatise; the determination of the corrosive matter, on the other hand, must continue to be turned over to the chemical laboratory."

Throughout, the book is naturally tinged with Austrian practice and Austrian water is used as examples of practice, a natural result of the sources from which the information is drawn and which does not detract from the value of the book to any chemist.

While other methods of purification such as filtration and heating are touched upon and described, the main stress is put upon chemical purification. The subject is handled in detail, showing not only the quantities and nature of the reagents that are to be used, but the way in which they act and the methods to be followed in their application. The principles of water purification is set forth by means of diagrammatic apparatus, and this is followed by brief descriptions of the appliances in actual service. The brevity with which each is treated is such that only a general idea of the details are obtained, and but just enough to indicate the sources of more precise and special information. The book closes with a long chapter on the installation and management of water purifying plants that can well serve as a guide for any one engaged in such work.

*Executive Officers and Directors of American Railways.* A group plate suitable for framing, published by William Ten Eyck Hardenbrook, 288 Fifth Avenue, New York. Edition limited to 200 impressions. Price, $50.

As may be judged from the title, a very full collection is given of excellent portraits of American railroad executive officers and directors. The work has been well done and the result is to all intents and purposes an artist's proof of much excellence. As a current record of the personnel of the departments which it covers in the year 1906 it could hardly be surpassed, and will, no doubt, find its way to the wall of many a president's office. Many, if not most of the men shown on the plate, are so busy making a record for themselves and for their companies in this era of great railroad and industrial prosperity in the United States that they have scarcely had time to view themselves and their neighbors in a historic light. The value of this collection, therefore, may fairly be expected to increase year by year, as the older men in the group drop out and younger ones take their places.

# CONTRIBUTIONS

### Reminiscences of the Great Northern.

Binghamton, N. Y., Aug. 15, 1906.

*To the Editor of the Railroad Gazette:*

When reading the interesting article entitled "Diamond Jubilee of the Great Northern Railway," appearing on page 117 of your impression of 10th inst., I was pleasantly reminded of my youthful days, which were spent in the neighborhood of the London end of the railroad in question.

I send you herewith a pencil sketch of a tunnel and a photo-

graph of one of the historical locomotives of the Great Northern Railway.

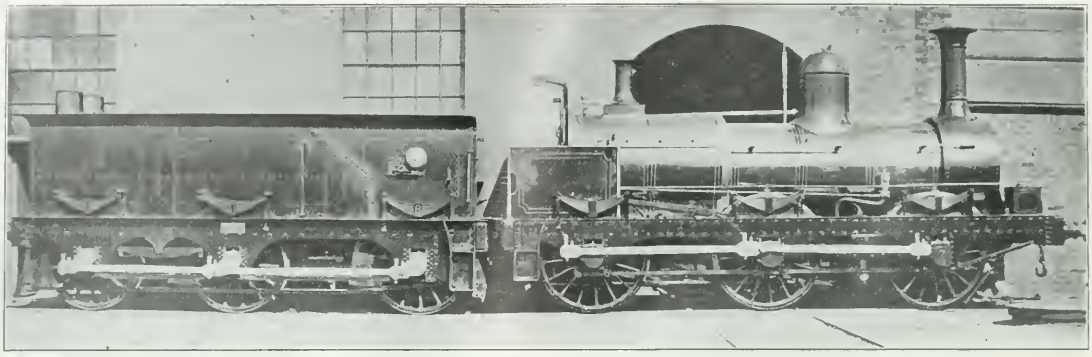
The sketch is one of many made during my rambles in the northern outskirts of London, which at that time were noted for their beauty, but now, doubtless, they are covered with bricks and mortar. The tunnel shown is near Barnet, and was sketched near its northern entrance. I was told at the time that this tunnel was built by Robert Stephenson, but think it possible my informant was in error.

This is one of the seven tunnels within 12 miles of King's Cross, cut in the London clay, as stated in Mr. Paley's article. It will be noticed in the drawing that the left-hand bank was shored up by heavy balks of timber, probably to prevent slipping of the clayey soil. The box-like structure on the right is a "plate-layer's hut," the usual form of section men's shelter in those days. It was made of old ties and rough boards, the roof being covered with earth, which produced an abundant crop of grass and weeds in the summer time. The tall signals need no description, except that they were manually operated.

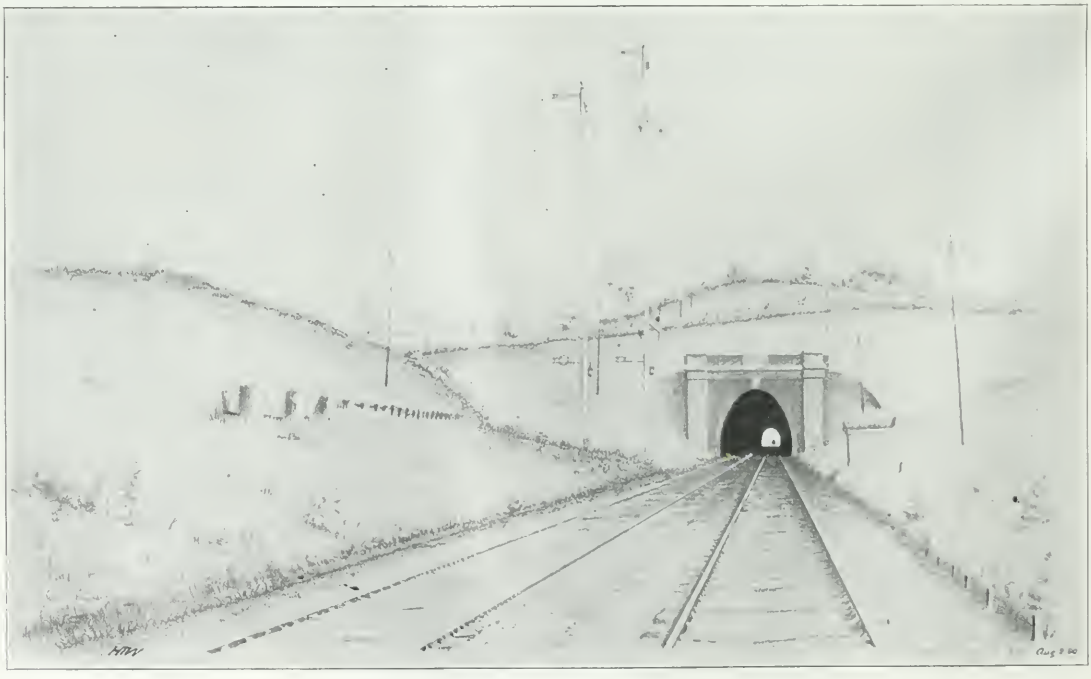
The sketch is of interest, as it shows a part of the Great Northern as originally built. It probably looks very different now since the road has been widened. The drawing is almost as accurate as a photograph, as I measured the principal objects with a pair of compasses, held at arm's length.

As far as I remember, the early locomotives of this railroad were of no special interest, except Mr. Archibald Sturrock's steam tender freight engines. A photograph of one of these, given to me by Mr. Sturrock, is here presented. The middle axle of the tender wheels was cranked and driven by a pair of inside cylinders 12 inches diameter by 17 inches stroke, located between the leading and middle axle. These cylinders drew their steam by a flexible pipe from the main engine boiler which was made extra large for the purpose. The exhaust steam was delivered into a tubular condenser surrounded by the water in the tank, and what remained uncondensed passed away through two short outlet pipes at the rear of the tender as seen in the photograph. The tender wheels were coupled, and it thus made a second locomotive of considerable power, weighing about 37 tons. I saw many of these steam tender engines at work, their long trains being very noticeable, as they sometimes hauled 60 wagons, the ordinary trains consisting of only about 35 wagons; in fact, the trains were too long to handle with convenience, as their length exceeded that of many of the side tracks, and on down grades they were difficult to control with the miserable braking power of the period.

These engines were put in service about 1865, but they did not last many years, for they were, in a sense, in advance of their time, and their repair bills were found to be heavy, as the working parts of the tender caught the dust and grit from the engine.



Archibald Sturrock's Steam Tender Engine, Great Northern Railway, 1865.



Barnet Tunnel (North Entrance), Great Northern Railway, 1880.

Furthermore, the engine men complained that they had practically two engines to care for instead of one, and their disfavor doubtless contributed to the want of success of these tenders, which, as Zerah Colburn says, "deserve to be remembered as a contribution to the practice of auxiliary power."

HERBERT T. WALKER.

## The New Standard Code.

BY H. W. FORMAN.

(*Continued from page 136.*)

USE OF SIGNALS.

27. A signal imperfectly displayed, or the absence of a signal at a place where one is usually shown, must be regarded as a stop signal, and the fact reported to the Superintendent.

28. A combined green and white signal may be used to stop a train at flag stations indicated on its schedule. Should a combined green and white signal not be available at a point where a train is required to stop on signal to receive passengers or freight, a signal given by any means must be respected.

When it is necessary to stop a train at a point that is not a flag station for it, a red signal must be used.

29. A stop signal given by a flagman by hand must be acknowledged by Rule 14 (*g*).

Except as prescribed by Rule 14 (*h*) or (*n*), a stop, caution or proceed signal given by a fixed signal, flag-stop signal, air-whistle, bell-cord, torpedoes, fusees, or lamps or flags placed on or near the track, will not be acknowledged by whistle.

If necessary to call for the clearing of a fixed signal, use the bell.

32. The unnecessary use of either the whistle or bell is prohibited. They will be used only as prescribed by rule or law, or to prevent accident.

In passing or being passed by passenger trains, as far as practicable avoid using the whistle in such manner as to annoy passengers.

MOVEMENT OF TRAINS.

82. Time-table schedules, unless fulfilled, are in effect until twelve hours after their leaving time at each station.

Where only leaving time is given, regular trains lose their schedule and their train orders become void when they are twelve hours behind such time at any station; where arriving and leaving time are given, they lose their schedule and their train orders become void when they are twelve hours behind their arriving time if at that time they have failed to arrive; and they can thereafter proceed only as authorized by train order.

83. A train must not leave its initial station on any division, or a junction, or pass from double to single track, until it has been ascertained whether all trains due, which are superior, or of the same class, have arrived or left.

A train must not leave its initial station on any division without a Clearance Card, Form A.

84. A train must not start until the proper signal is given.

A freight train must not go through any station without its engineman receiving a "proceed" signal from the rear end, except when weather conditions prevent such signal from being seen.

85. When a train of one schedule is on the time of another schedule of the same class in the same direction, it may proceed on its own schedule, except that a train scheduled to be passed by another of the same class must not go beyond the passing point in advance of the train which is to pass it, unless directed by train order to do so.

Trains of one schedule may pass trains of another schedule of the same class, and extras may pass and run ahead of extras and class trains.

86. A train failing to clear the main track by the time required by rule or order must be protected as prescribed by Rule 99.

87. Inferior trains must keep out of the way of superior trains in the opposite direction, clearing their time as required by rule, and in meeting them must, when practicable, pull into the siding at the initial switch. If necessary to pass at this point, pull in or to back in, the train must first be protected, as prescribed by Rule 99, unless otherwise provided.

At meeting points between extra trains, the extra in the inferior time-table direction must take siding in the same manner, unless otherwise provided.

Inferior trains must clear the time of superior trains in the same direction at least five minutes, and as prescribed by Rule 91.

Extra trains must clear time of regular trains at least five minutes, except as prescribed by Rules 85 and 91.

88. At meeting points between trains of the same class, the inferior train must clear the main track at least ——— minutes before the leaving time of the superior train.

89. At meeting points between trains of different classes, the inferior train must clear the main track at least five minutes before the leaving time of the superior train.

90. Trains must stop clear of the switch used by the train to be met in going on the siding.

Until all overdue trains of the same class have been met, the superior train must approach all stations under control, except where there is an unobstructed view from both directions, and the track is seen to be clear.

When trains run in company, all stations must be approached carefully and a proper outlook kept for the train ahead, but this in no way relieves the preceding train from protecting as the circumstances may require.

91. Passenger trains in the same direction must keep at least ten minutes apart, and no train may precede or follow such trains closer than ten minutes, unless some form of block signal is used.

All other trains must keep at least five minutes apart, except in closing up at stations, unless some form of block signal is used.

91 (*c*). Where the block system is not in effect operators will keep trains the required distance apart by displaying the train order signal at stop after the rear of a train has reached a point three hundred feet beyond such signal.

92. A train must not arrive at a station in advance of its schedule arriving time, except to properly clear at schedule meeting and passing points.

A first-class train must not arrive at a station where only the leaving time is shown, more than five minutes in advance of such time.

A train must not leave a station in advance of its schedule leaving time.

94. A train which overtakes another train so disabled that it cannot proceed, will pass it, if practicable, and if necessary will assume the identity and take the train orders of the disabled train, proceed to the next open telegraph office, and there report to the train despatcher. The disabled train will assume the identity and take the train orders of the last train with which it has exchanged, and will when able proceed to and report from the next open telegraph office.

95. A train must not display signals for a following section unless directed by train order to do so, except that at certain stations designated on the time-table operators may, over the initials of the chief train despatcher, authorize trains to run in sections. Such instructions shall be written in manifold on white paper, and must be signed by the conductor, who will deliver a copy to each of his enginemen.

Each section of a schedule has equal time-table authority.

96. When signals displayed for a section are taken down at any point before that section arrives, the conductor will, if there be no other provision, arrange in writing with the operator, or, if there be no operator with the switchtender, or, in the absence of both, with a flagman left there for the purpose, to manifold all opposite trains that the section for which the signals displayed has not arrived.

The employee thus arranged with must at once display atop signal and allow no opposing train to pass without the required notice until the section for which signals were displayed has arrived.

When practicable, train despatchers should advise opposing interested trains before they reach the station where signals were taken down.

99. When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals a sufficient distance to insure full protection, at which point he must place two torpedoes on the rail, two rail lengths apart. He may then return to such distance from his train as will admit of a stop signal being observed by an approaching train in time to prevent collision, where he will place one torpedo on the rail. When recalled, he may return to his train, first removing the single torpedo.

If, while returning to his train, flagman should hear or see a train approaching, he must go back and make every effort to stop it in time to prevent accident.

Should a train be seen approaching before flagman has been able to get back the required distance, he must place one torpedo on the rail if engineman fails to acknowledge his other stop signals before reaching him.

When a train is flagged, the engineman must obtain a thorough explanation of the cause, stopping if necessary.

The front of a train must be protected in the same way by the front brakeman. If the front brakeman is unable to go, the fireman must go.

99 (*a*). On double track, when a train crosses over to or obstructs the other track, unless otherwise provided, it must first be protected, as prescribed by Rule 99, in both directions on that track.

101. If a train parts, care must be taken to prevent damage to the detached portions. The signals prescribed by Rules 12 (*d*) and 14 (*f*) must be given.

The detached portion must not be moved or passed until the front portion comes back.

102. Special instructions may be issued by proper authority, and must be observed, whether in conflict with the Book of Rules or not. Should a bulletin notice be issued conflicting with either the Book of Rules or special instructions, such bulletin will govern.

Bulletins will be posted from time to time in books provided for that purpose at designated points. Conductors, enginemen and ——— must examine bulletins before starting on each trip, and acknowledge notice by signing their names in the places provided therefor.

104. Switches must be left in proper position after having been used. Conductors are responsible for the position of the switches used by their trains, except where switchtenders are stationed.

A switch must not be left turned from its normal position for a following train, unless a trainman of such train is at the switch and has taken charge of it.

Unless there be ample time to do so without risk of accident, do not attempt to throw switch until the train has stopped. Do not remain within twenty feet of the switch-stand while a train is passing over the switch.

104 (*a*). When a train backs in on a siding to be met or passed by another train, the engineman, when engine is in to clear, must see that the switch is set for the main track.

Enginemen must know that derails and other switches are properly set before passing over them.

After locking a switch jerk the chain to insure that the switch is locked, and see that the points are up.

106. Run no risks; in case of doubt take the safe side.

MOVEMENT BY TRAIN ORDERS.

204. Train orders must be addressed to those who are to execute them, naming the place at which each is to receive his copy. Those for a train must be addressed to the conductor and engineman, and also to any one who acts as its pilot. A copy for each person addressed must be supplied by the operator.

Orders addressed to operators restricting trains must be respected by conductors and enginemen the same as if addressed to them.

205. Each train order must be written in full in a book provided for the purpose at the office of the train dispatcher; and with it recorded the names of those who have signed for the order; the time and the signals which show when and from what offices the order was repeated; the responses transmitted; and the train dispatcher's initials. These records must be made at once, and never from memory or memoranda.

206. Regular trains will be designated in train orders by their numbers, as "No. 10," or "Second No. 10," adding engine numbers when practicable and necessary, to further identify trains. Extra trains will be designated by engine numbers, and the direction as "Extra 20, 'North' or 'South.'" Other numbers and time will be denoted as illustrated by the train order examples.

NOTE.—Typewriters may be used for copying train orders if type similar to standard large Roman is used. Orders should be punctuated as transmitted by the train dispatcher, and indicated by the examples. Only the copy retained by operator may be underscored. Figures must stand out boldly and not be run together or surrounded by circles.

207. To transmit a train order, the signal "31" or "19" must be given to each office addressed, the number of copies being stated, if more or less than three—thus, "31 copy 5," or "19 copy 2."

208. A train order to be sent to two or more offices must be transmitted simultaneously to as many of them as practicable.

The several addresses must be in the order of superiority of trains, and when practicable must include the operator at the meeting or waiting point, each office taking its proper address.

When not sent simultaneously to all, the order must be sent first to the superior train.

Copies of the order addressed to the operator at the meeting or waiting point must be delivered to all trains affected until all have arrived from one direction, when, if not also addressed to trains in the opposite direction, or there are no other orders in effect at that station, the train order signal must be changed to "proceed."

209. Operators receiving train orders must write them in manifold during transmission, and if they cannot at one writing make the requisite number of copies, must trace others from one of the copies first made. Additional orders made by tracing must be compared with a copy which was transmitted by the train dispatcher.

210. When a "31" train order has been transmitted, operators must (unless otherwise directed) repeat it at once from the manifold copy in the succession in which the several offices have been addressed, and then write the time of repetition on the order. Each operator receiving the order should observe whether the others repeat correctly.

Those to whom the order is addressed, except enginemen, must read it aloud to the operator, and then sign it, and the operator will send their signatures preceded by the number of the order to the train dispatcher. The response "complete," and the time will then be given by the train dispatcher. Each operator receiving this response will then write on each copy the word "complete," the time, and his last name in full, and then deliver a copy to each person addressed, except enginemen. The copy for each engineman will be delivered to him personally by conductor or brakeman.

211. When a "19" train order has been transmitted, operators must (unless otherwise directed) repeat it at once from the manifold copy in the succession in which the several offices have been addressed. Each operator receiving the order should observe whether the others repeat correctly. When the order has been repeated correctly by an operator, the response "complete," and the time, will be given by the train dispatcher. The operator receiving this response will then write on each copy the word "complete," the time, and his last name in full, and personally deliver a copy to each person addressed without taking his signature. But when delivery to engineman will take the operator from the immediate vicinity of his office, the engineman's copy will be delivered by conductor or brakeman.

When a "19" train order restricting the superiority of a train is issued for it at the point where such superiority is restricted, the train must be brought to a stop before delivery of the order.

NOTE.—The "19" form of train order must not be used to restrict a superior train for an inferior train in the opposite direction, unless sent to

the operator at the meeting or waiting point and issued for the superior train before it reaches such station.

214 (e). Operators must furnish conductors and enginemen a Clearance Card, Form A, with all train orders.

On passenger trains, conductors must show all train orders to flagmen, and enginemen must show to firemen. On other trains, conductors must show to rear brakemen, and enginemen must show to firemen and front brakemen.

Each engineman must receive copies of all train orders, but only the leading engine of a train need be referred to in train orders.*

215. The operator who receives and delivers a train order must preserve a copy.

218. When a train is named in a train order by its schedule number alone, all sections of that schedule are included, and each must have copies delivered to it. Sections should be specified when practicable.

When sections are not specified, operators who are to deliver orders to them must be advised as to the number running on the schedule.

NOTE TO RULE 219. In case a train order signal be at stop when a train arrives at a station, operators may continue to accept orders for the train after the engine has passed by such signal, the same as if it had not, provided they do not change the signal. There would be no objection to adding the words "at proceed" after the word "signal" in the fourth line but there seems to be no necessity therefor.

220. Train orders once in effect continue so until fulfilled, superseded or annulled. Any part of an order specifying a particular movement may be either superseded or annulled.

Orders, or any part of an order, held by, issued for, or relating to a regular train, become void when such train loses its schedule as prescribed by Rules 4 and 82, or is annulled.

221. A fixed signal must be used at each train-order office, which shall indicate "stop" when trains are to be stopped for train orders. When there are no orders the signal must indicate "proceed."

When an operator receives the address of an order he must immediately display the "stop signal," and before repeating or "X-ing" the order must reply "stop displayed," adding the direction; and until the order has been delivered, annulled or becomes void the signal must not be restored to "proceed." While "stop" is indicated, trains must not proceed without a Clearance Card, Form A.

Operators must have the proper appliances for hand signaling ready for immediate use if the fixed signal should fail to work properly. If a signal is not displayed at a night office, trains which have not been notified must stop and ascertain the cause, and report the facts to the Superintendent from the next open telegraph office.

When the semaphore is used, the arm indicates "stop" when horizontal and "proceed" when parallel with the post.†

222. Operators will promptly record and report to the train dispatcher the time of arrival and departure of trains, and the direction of extra trains.

At points where train registers are provided, the signals registered by sections must be reported.

GOVERNING PRINCIPLES RELATING TO TRAIN ORDERS.

250. The word "meet" is positive in meaning and cannot be qualified. A train is not met until its markers arrive, or their absence is accounted for. Unless met, do not leave the designated place of meeting until the train has lost its schedule, as prescribed by Rules 4 and 82; or is annulled; or the meeting order is annulled; or another order is received against the train in which the words "instead of" appear.

251. When necessary to direct superior trains to take the siding for inferior trains, the instructions must be given specifically for each meeting point in each order; otherwise, the superior trains will hold the main track.

252. It is not necessary to receive the annulment of a train more than once for the date and between the points named in the order annulling it.

253. The identity of a train must be made known at stations by the men in charge of the train, except when a train register or other circumstance gives such positive evidence of its arrival as to leave no doubt whatever. Ordinarily engine numbers may be depended upon to identify trains, but when Rule 94 is considered, it will be seen that care must be exercised. Also, do not be misled by the fact that the rules require orders to be addressed in duplicate to the operator at the meeting or waiting point: While the order-signal at such station may indicate "proceed," a train similar to that directed to be met may be on the siding, and a hand-signal to proceed given, still the train which must be waited for may not have arrived. The train observed may have made that station by time-table authority, or otherwise; the hand-signal may have been given through error, or intended for some other train; the office may not have been open when the meeting point was fixed, or the operator may have failed to display his stop-signal as required. It must be known that the train has arrived.

254. Trains must be governed strictly by the terms of orders addressed to them, bearing in mind that all orders are in effect until fulfilled, superseded or annulled, or they become void. A later order must never be understood as superseding a former order with which it conflicts, unless the words "instead of" are inserted in connection with the movement which it is intended to supersede. When an order has been superseded it becomes void, and cannot again be used. A part of an order may be either superseded or annulled without in any way affecting the remaining instructions contained in such order. An order may in certain particulars qualify another without superseding it, as illustrated by the following example: A work extra is given an order to work until 6:30 p. m., protecting against third class trains, while the same or a later order may give it right over such trains until 10:30 a. m. Under these instructions the work extra is not required to protect against third-class trains until 10:25 a. m.

255. Operators must not destroy or place on file an order which is addressed to a train while such train exists, unless instructions are given by train order to do so.

Train dispatchers should prevent the delivery of unnecessary orders to a train by annulling such orders after the object for which they were issued has been accomplished.

256. When the last named station in their running orders is reached, sections and extra trains must pull into the siding at the nearest end if trains are to be met at such station. If no train is due, they may go to the train-order signal on the main track, provided the view is not obstructed and they properly protect against opposing trains which may be coming to that station in the same manner and of which no previous notice was given. When a section or an extra train reaches the end of its then authorized run, and when this authority is annulled, or runs from it, all train orders held by such train thereupon become void and must not again be used. All orders held by work extras become void at the time their working orders expire, or are annulled. Helper-engines lose authority to occupy the main track, and all of their orders become void when they detach from the train they are helping; except in cases where a helper holds separate orders creating it as another train after performing the helper service.

257. A "first" order affects the train thus restricted only within the limits named; and right to use the additional time is conferred upon other trains addressed while within such limits, but not beyond. "Run-late" or "wait" orders must be cleared five minutes, and also as prescribed by Rule 91.

258. A regular train may be created at its initial station by a clearance card, but at other points it must be created by train order. When schedule is given to a train by clearance card or otherwise it retains such schedule between the stations mentioned, or, in absence of designation, to the end of its run on that division, unless taken away from it by train order.

259. Orders not in prescribed forms and which are not clear, or will admit of different interpretations, if accepted, must be understood to have no further effect than as holding orders. Be governed by Rule 106 in such cases and clear the train in question as prescribed by rule, if there be any doubt whatever as to authority to move against it.

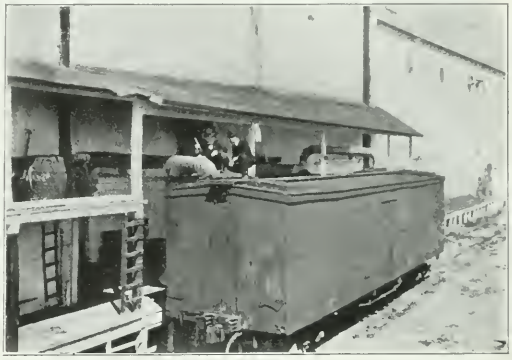
*(To be continued.)*

*NOTE.—If desired, operators may be directed to deliver enough copies of orders to a train to also supply the fireman and rear brakeman, so they can have a copy to constantly refer to.

†NOTE TO RULE 221. The code or rule requires the order signal to be displayed at "stop" immediately upon receipt of the signal, "31" or "19." As several minutes often elapse before the operator is given the address, on account of dispatcher calling other offices, this provision is likely to cause a disinterested train to be held unnecessarily.

## Cooling Fruit for Shipment.

The year book of the United States Department of Agriculture for 1905 has a chapter on the handling of fruit for transportation which takes up the recent growth of fruit shipments, the causes of loss in transit, and the present methods of handling. Cool, dry, pure air is held to be the principal factor that favorably influences keeping quality. In this connection is mentioned a system of cooling fruit after being loaded in cars from a cold storage plant by forcing cold air through the fruit in the car. The accompanying photograph shows this method as used by the Los Angeles Ice & Cold Storage Company in cooling oranges for the shipping experiments of the Department of Agriculture. Cold air was blown through a large insulated tube leading from a bunker room in the storage plant to the ice trap in one end of the car. From a trap at the opposite end of the car another tube led back to the warehouse. The cold air was blown into the car at a temperature of 32 deg. Fahr., and after passing through the car was drawn back by an exhaust fan to the warehouse, where the moisture and gases from the fruit were frozen on the refrigerator pipes. The direction of the air current through the car could be changed. With a powerful air current it took from 30 to 50 hours to cool the fruit in the center of the packages to 40 deg. Fahr. A large cold storage plant



Cooling Oranges in Car by Cold Air at Los Angeles.

operated on the same principle has been built at Springfield, Mo., by the St. Louis & San Francisco to cool bananas in cars in transit. This plant consists of four tracks inside a shed, each track holding 10 cars. The same plant may be used in winter to raise the temperature of the fruit when desired.

## A Projected Transcontinental Railroad in Australia.

According to *Engineering* there is some likelihood that a north and south railroad will be built across Australia. There are, of course, railroads in the southern part of the continent, the longest north and south line at present being from Adelaide on the southern coast north to Oodnadatta, 688 miles. To carry this line the rest of the way across the continent to Port Darwin on the north coast would require 1,063 miles of new line, which it is estimated would cost about $25,000,000 to build. As the government of this territory is at present rather hard put to it financially and besides has pledged itself to building a line from Port Augusta, which is near Adelaide, to Kalgoorlie in Western Australia, which would cost another $25,000,000, it is not probable that this line will be built as a government venture. As an alternative means of building the government line, the Parliament of South Australia in 1902 passed a Transcontinental Railway Act in order to provide for building the line on the land grant system. Pursuant to the act, tenders were invited for the construction of the line, offering a maximum of 75,000 acres in alternate blocks for each mile of road built. No acceptable tender was, however, submitted, and the whole matter was allowed to drop.

The Northern Territory of South Australia, which occupies the north central part of the continent, has an area of 523,000 square miles, 335,116,800 acres, or approximately one-sixth of the whole Australian continent. It has many safe and spacious harbors and three fine rivers, and is rich in mineral, agricultural and grazing resources. However, although it has been a British possession for more than a hundred years, it has a population of barely 3,000, only about 800 of whom are Europeans. It is believed that railroad communication will open up the country to general settlement.

## The N. Y., N. H. & H.'s New Haven Improvement.

New Haven is, so to speak, the throat of the New York, New Haven & Hartford system, for it is here that the through line from New York branches into the wide territory so completely occupied to the eastward. On the eastern edge of the city of New Haven, the Shore Line, which under the present policy has become the most important through line beyond New Haven, the Air Line, now little used, but for which there are important improvement plans under consideration, and the Hartford line, which runs to the important Boston and Albany connection at Springfield, diverge. The Northampton division also leaves the main line at a point about half a mile east of the New Haven station, which is at the eastern side of the city. All traffic, therefore, destined beyond New Haven has to pass through the New Haven cut, which leads through the city to Cedar Hill, about a mile and a half east of the New Haven station and a little way short of the junction point where the three eastern through lines separate.

The maximum clearance at present allowed between New Haven and Cedar Hill for any car is 14 ft. 2 in. above top of rail for a maximum width of 7 ft.; 13 ft. above top of rail for a maximum width of 9 ft.; 12 ft. 6 in. above top of rail for a maximum width of 10 ft., and 12 ft. above top of rail for a maximum width of 10 ft. 3 in., which is the maximum width allowed through the cut. Unlike many clearance figures, these clearances really are the maximum for the cut, for at certain points with cars measuring up to maximum clearance the space between the car and the obstructions of the cut is less than 1 inch. These clearance limits are obviously much too small for many cars, both freight and passenger, now in common use. The problem of increasing the capacity of the cut is one which has long been before the New Haven management and with increase in size of cars has become more and more necessary of solution. It is a handicap to the railroad which naturally should have been done away with long ago, but like many other improvements was left to President Mellen to carry out.

Plan of Old and New Tracks in New Haven Cut—N. Y., N. H. & H.

It was on April 10, 1904, that the news was published in the New Haven papers that extensive plans were under way for the reconstruction of the railroad cut through the city. Previous to this announcement the road had made large purchases of property necessary for widening the cut. The first plan proposed, which was approved by the Connecticut Railroad Commission, was for widening the cut by paralleling the old tracks with two or more additional tracks between Water street, just east of the New Haven station, and Cedar Hill, at the further end of the cut. When the railroad company announced what it was going to do, there was great outcry in the city of New Haven against permitting the plan to be carried out, on the ground that it would raise the grade of all the streets over the cut, which were already objectionably steep. With this there opened a period of discussion and hostility between the city and the railroad which lasted for considerably over a year.

On the objection of the city to the first plan announced by the railroad, the company, in an endeavor to settle the question in a way satisfactory to both parties, investigated a number of other plans for getting the traffic through New Haven. Five different plans were presented with the understanding that the railroad would carry out any one of these which the city selected. These were, first, the plan already mentioned to parallel the present tracks in the widened cut; second, to follow the present location of the tracks on an elevated structure; third, to shift the tracks north of Water street somewhat to the east and carry Union street, under which they would then run, on a bridge; fourth, to abandon the cut and run east from the New Haven station along the water front, parallel to Water street to a junction with the present Belle Dock branch at Belle Dock, thence over the Belle Dock branch to Cedar Hill, this line to be an elevated viaduct east of Belle Dock, and, fifth, a plan for a line on this same new location by way of the water front at Belle Dock, but with the streets carried over instead of under the tracks. The fourth and fifth plans were accompanied by an offer from the railroad company to deed to the city all its holdings in the present cut, if the city would in return provide it with a right of way along Water street (part of this, where the land was already owned, to be contributed by the road), and in addition pay as its share of the work $300,000. This sum the city, under these terms, would be liable for under the State grade crossing act. There were two other plans proposed during the long discussion of the question which were of some slight importance; one to abandon the cut and carry the railroad straight across the city over a new location from the present station to Cedar Hill, and the other to make a new line by filling in a section of the harbor parallel to the water front and making a junction with the Belle Dock branch by this line, which would run outside the docks instead of between the docks and the city as in the fourth and fifth plans.

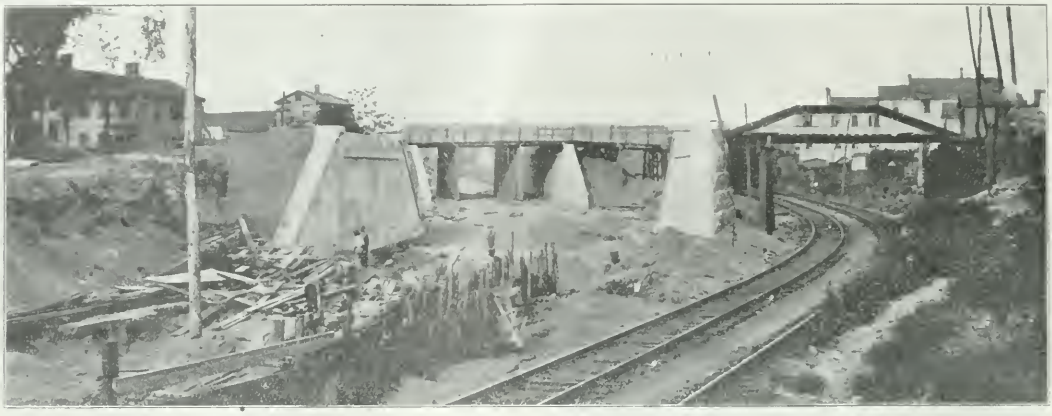
Of the five plans presented none was satisfactory, for the city refused to set its approval on any one of them. There was, at the same time, much public discussion of the question and a good deal of feeling aroused against the railroad company, some of it unjustly. For example, photographs were published in the local papers which appeared to show that the railroad's original plan for widening the cut would raise the grade of the streets two or three times the amount it really would. As time passed and there seemed to be no likelihood of the city's agreeing to any plan, and as the cut was more and more of an unbearable hindrance to traffic, the railroad management decided to go ahead with the originally announced plan of widening the existing cut for additional tracks. The beginning of work was met by the city with an appeal to the local court for an injunction to prevent the railroad from carrying out its plan. A temporary injunction was granted, which was later upheld by the Superior Court of Connecticut. This suit was brought on May 12, 1905, and the injunction granted on July 6. The appeal of the city was granted on the basis of a provision in the original charter of the New Haven & Northampton Railroad Company, based on an act of the Common Council of the city of New Haven passed on February 14, 1846, granting the privilege of building through the city to the New Haven & Northampton Railroad, now the Northampton division, and at the same time providing that the road should be operated under the regulation of the Common Council.

To understand the legal grounds for the injunction it should be understood that when the company which controlled the old canal connecting New Haven and Northampton failed, the New Haven & Northampton Railroad was organized and built its railroad in the bed of the old canal, where it runs to-day. It enters New Haven from the north, and joins the main line through the cut at Grand avenue, running south through the cut to the water front. Its original station, the foundation walls of which are yet to be torn down for the new cut, was at Chapel street, the main street of the city, two blocks south of Grand avenue. When the Hartford & New Haven Railroad built its line to New Haven from Hartford, Belle Dock was its terminus and the steamers running

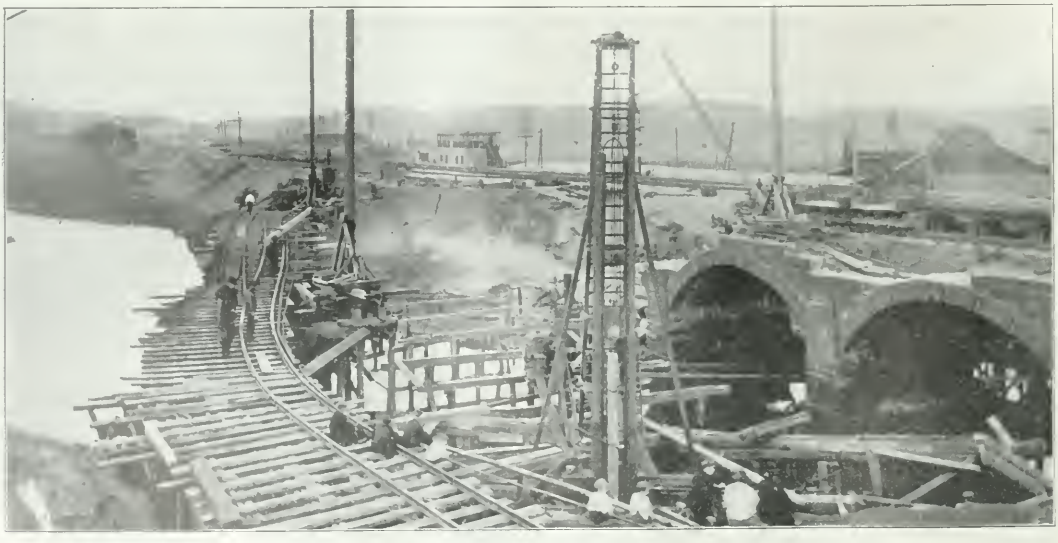
from there, its New York connection. Later when the New York & New Haven Railroad was built from New York to New Haven, it secured trackage rights over the New Haven & Northampton from the water front north to Chapel street, and also the right to use its station at Chapel street. Soon after, in order to get railroad connection to New York, the Hartford & New Haven company built a line from Cedar Hill on the east side of the city to a connection with the New Haven & Northampton Railroad at Grand avenue, where it enters the cut, the new line being the eastern end of the present cut. Thus the original ownership of the cut was vested in the New Haven & Northampton and the Hartford & New Haven companies. It was on this account that the city was successful in its suit based on the act passed by the city granting to the New Haven & Northampton company the right to build its railroad through the city.

The city's injunction was granted, as already mentioned, on July 6, 1905. During the summer of 1905 there was considerable manœuvering between the city and the railroad, President Mellen at one time stating at a hearing before the State legislature that the road was not compelled to send its traffic through New Haven, and would, if prevented from carrying out its improvement plans there, arrange to send its traffic around New Haven by way of the Naugatuck division, Waterbury and the Highland division. Finally on August 15, a commission, consisting of the Mayor and two aldermen, was appointed to represent the city and confer with President Mellen, the limiting condition being placed on their decision, however, by vote of the Board of Aldermen, that the city must neither be bonded nor put to any expense in carrying out the railroad's improvement work. Through this commission a compromise was, on September 10, made public, under which the terms of which the railroad company is now carrying out the work of widening the cut.

This compromise plan was a modification of the first plan of the road for paralleling the original tracks through the cut. It was, however, more satisfactory to the city because it did not involve increasing the grades of the streets over the cut and to the railroad because it gave more head room and very much better alinement than the original plan. The plan as agreed on by the city and the railroad is shown in a general way on the acompanying sketch map, showing the location of the old and new tracks in the cut. It provides for shifting the tracks some distance east of their present location for more than half of the length of the cut on the southern end and on the eastern half for straightening and shortening the line. The new cut, especially on the southern end, will be much wider than the old one. Union street, which runs parallel to the present tracks as far as Grand avenue, is to be abandoned for most of its length, and its site added to the width of the cut. From Water street to Grand avenue there will be six, and from Grand avenue to Cedar Hill four tracks. In addition, between Water street and Chapel street there will be room for a number of switching and industry tracks next to the property line on the west side of State street. Over these tracks on a viaduct a double track trolley line will carry from Chapel street to the station the electric street cars now running on State street. This carrying of the trolley tracks over the right of way of the



Abutments for Street Bridges on New Alinement at Mill River End of New Haven Improvement—N. Y., N. H. & H.



New Bridge Site at Mill River; Old Bridge Being Torn Down and Temporary Trestle on the Right—New Haven Improvement, N. Y., N. H. & H.

steam road is interesting in connection with the present policy of the road of bringing into closer relation its steam and electric lines.

The compromise plan made it necessary for the road to buy much additional real estate, as the location of the widened cut on the south end ran directly through the wholesale district of the city, and on the east end took in much new property. A number of large buildings, including the Masonic Temple, and most of the wholesale meat houses, were purchased and torn down, as well as a great many smaller buildings. The accompanying photograph shows the cut north from Water street as it appears at present. The ground in the center of the picture was formerly occupied by a number of large wholesale houses. The site of the Masonic Temple is to the right of and beyond the pile driver. The building standing some distance back of the pile driver is on Chapel

business section of the city, where steep grades would be particularly objectionable for heavy teaming, can be lowered to 3 per cent. by extending them, that is, by making them longer but the slope more gradual. The reason why it was not possible under the first plan to simply lower the tracks to a level deep enough to give the necessary head room without increasing the grades was that the cut as it now exists is little above high-water level in the Sound. For this reason it was not believed possible to lower the level of the cut, especially because in times of high water and heavy rains the rails are often entirely under water under existing conditions. It has proved to be possible, however, to get 18 ft. instead of 16 ft. head room, without any increase in the street grades. This is to be accomplished by a new drainage system which has been devised under the direction of Mr. E. H. McHenry, Vice-President in charge of engineering. It has been found that the cut

New Haven Cut Looking South from Above Olive Street Showing New Curving Abutment for Olive Street Bridge. Bottom of Old Masonry Abutment, at Left of Present Tracks, Shows Width of Old Cut.

street. It is now owned by the railroad company, but, although it stands in the middle of the new cut, it will have to be left standing for the present on account of an obstinate lessee. On the left are shown the two present main line tracks, and on the left of them the Northampton division track, with sidings to wholesale houses on the extreme left.

The great problem in planning for the cut, the one which stirred up the trouble with the city, and was in the beginning the compelling cause of undertaking the work, was the necessity of getting more head room above the tracks. In order to get sufficient head room in the original plan it would have been necessary, as was claimed by the city, to raise the present grade of the streets over the tracks, which is about 5 per cent. Under the present plan of widening the southern part of the cut, the street grades in the

is not likely to be flooded by tide water, but that there is a great deal of surface water just below the ground level, which must be carried off. The drainage system is to drain the cut south of Franklin street, nearly three-quarters of its length. North of Franklin street the water will drain directly into Mill river. On the southern part it is arranged that the cut normally drains into the Sound at low water. When the water in the Sound rises above the height of the discharge pipe, it closes a gate at the mouth of the pipe, and the drainage from the cut, instead of flowing out into the Sound, is carried into a concrete sump, which is 15 ft. below high-water level. When the water rises to a certain height in the sump, a centrifugal pump, worked by an electric motor, is set in action by a float, and enough water is pumped out to bring the water in the sump to a safe level. By means of this system of drainage and the widening of the cut the road is

New Haven Cut Looking North from Water Street. Excavated Space in Foreground Was Site of Principal Wholesale Houses of the City; Site of Masonic Temple in Background; Eagles' Building on Chapel Street (Back of Pile Driver) in Center of Excavation at That Point.

enabled to get 18 ft. head room instead of the present 14 ft. 2 in., and at the same time to lower the maximum grade of the streets from 5 per cent. to about 3 per cent.

A good idea of the character of the work on the New Haven improvement can be gained from the photographs. These show clearly the contrast between the old and the new location of the tracks, and the types of concrete walls and abutments which are being built. The conditions of working have been in many respects exceptionally favorable. All materials for the concrete, except the cement, are directly at hand. Sand and gravel are dug out of a bank in the excavation, screened and dumped into the concrete mixture. Stones from the old masonry abutments are swung around by a derrick and dropped into the concrete as keystones, and water for mixing is found in almost every excavation below ground level. South of and including Grand avenue all the streets are to be carried over the railroad on reinforced concrete arch bridges averaging 30 feet to an opening, with two tracks in each opening. North of Grand avenue, truss girder bridges are to be put in. One of the photographs shows the present conditions at Mill river. The old double track arch bridge with four openings is being torn down. On the right is the temporary double-track bridge held on 50-ft. piles, which now carries the traffic. On the left the sheathing is in place to a depth of 16 ft., preparatory to driving piles for the foundation of a new two-span, six-track concrete bridge which is to be built. The solidity of the old construction can be judged from the fact that even after the old keystone had been knocked out, dynamite had to be used to tear down the arch of the old bridge.

The New Haven improvement is the first case in which concrete has been largely used by the New York, New Haven & Hartford, which has, up to a comparatively recent date, used masonry exclusively. For the work in the cut concrete is cheaper and can be put in place faster, especially because the work has to be done where material is difficult to handle. The comparative costs of concrete and masonry may be shown roughly as follows:

It is estimated that the four-track concrete bridge at Mill river, for instance, will cost only about 60 per cent. as much in concrete as in second-class masonry, and the 16 ft. concrete retaining walls only about 70 per cent. as much. The concrete mixtures used are: For foundation, 1-3-5; for body, 1-3-5, and for parapets and bridge seats, 1-2-4. Abutments, bridge seats and parapet blocks are all of concrete. There is an expansion joint every 30 ft. in the walls, and two expansion joints in the rings of the arches. A shield inside the form holds the heavy concrete 2 in. away from the outside of the wall. The whole wall is done at once without any seams, and the concrete forms taken off after 36 hours. The outside surface is then gone over with a wash to give a uniform cement color.

Excavation for the cut is almost entirely by steam shovel, for which conditions are ideal, two Marion steam shovels, each with 2½-yard bucket, being used. There are 102 deg. of curvature on the new as against 161 deg. on the old location. One particularly bad curve has been done away with at the eastern end of the work, where a 5-deg. curve reversing into a 7-deg. curve is to be replaced by a 4-deg. curve. Four degrees will be the maximum on the new location. Another curve, at East street, at present averages 7 deg., with 8 deg. maximum. This is to be brought down to 4 degrees. There are 33 deg. of curvature saved on the long tangent from Fair street, the next street north of Water street, to a point north and east of Grand avenue. Between Water street and Cedar Hill the cut intersects 12 city streets, over each of which new bridges are to be built. This work is being done by closing every other street.

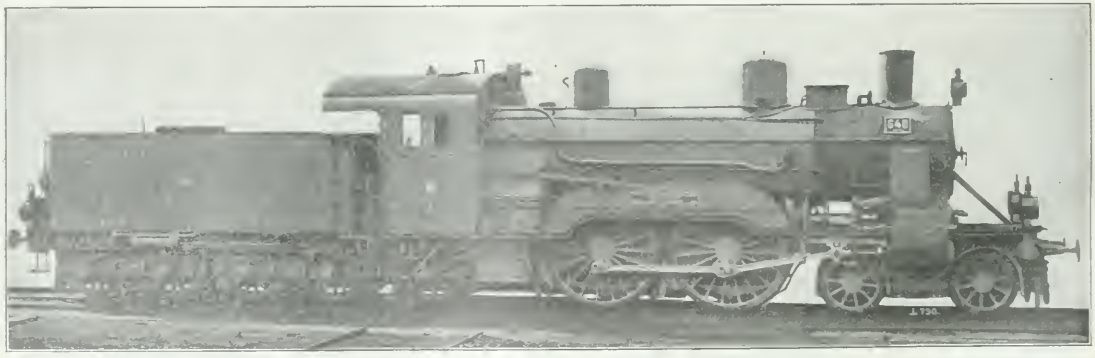
It is expected that the eastern part of the cut improvement work from Water street north to Grand avenue will be finished by the first of next year. The whole work in all its details will probably require until the summer of 1908. It is estimated that, including cost of property bought, the improvement will cost the railroad between four and five million dollars. Its completion will, however, be of immense value to the road, as it will not only make it possible to take any car through the cut, but, through the additional tracks and facilities provided, will make the whole New Haven system much easier to operate than at present.

## Four Cylinder Compound Express Locomotive for the Prussian State Railways.

The Hannoversche Machinenbau Actien Gesellschaft has now built about 140 locomotives of the four-cylinder compound type for the Prussian State Railways. Recently an engine was built and exhibited at the Milan Exposition that was fitted with Lentz's patent valve gear using poppet valves. The general dimensions of the engine are as follows:

| | |
|---|---|
| Diameter of cylinder | 14⅜"—22" |
| Stroke of piston | 23⅝" |
| Diameter of driving wheels | 6' 6" |
| Diameter of trailing wheels | 3' 3⅞"—3' 7" |
| Coupled wheel base | 6' 10¾" |
| Bogie wheel base | 6' 6¾" |
| Total wheel base | 29' 6⅜" |
| Working pressure | 200 lbs. |
| Gate area | 29 sq. ft. |
| Heating surface in fire box | 106 sq. ft. |
| Heating surface in tubes | 2,414 sq. ft. |
| Total heating surface at fire side | 2,520 sq. ft. |
| Number of tubes (serve) | 138 |
| Diameter of tubes (outside) | 2⅝" |
| Length between tube plates | 14' 7¼" |
| Weight empty | 56 t 14 cwt. |
| Weight in working order | 61 t |
| Adhesive weight | 29 t 18 cwt. |
| Capacity for water of tender | 4,400 imp. gallons |
| Capacity for fuel of tender | 6 tons |
| Weight of tender empty | 21 t 7 cwt. |
| Weight of tender in working order | 46 t 19 cwt. |

Contrary to the usual method of construction, the high-pressure



Atlantic Type 4-Cylinder Compound Locomotive with Lentz Valve Gear; Prussian State Railways.

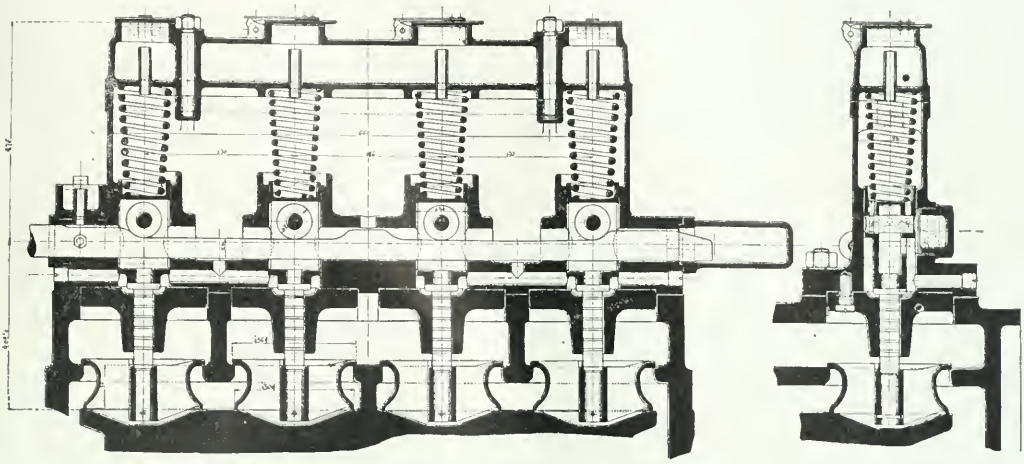
cylinders were placed outside and the low-pressure between the frames, as a better balancing of the engine could thereby be obtained. The cylinders are cast with half saddles so that a high and low-pressure cylinder with the valve chest is contained in a single casting. The four cylinders are thus set across the locomotive on the center line of the leading truck.

The connecting rods for all cylinders are coupled to the forward axle, the cranks of the high and low pressure cylinders on one side being set at 180 deg. to each other, while the cranks of the two high-pressure and of the two low-pressure cylinders are set at an angle of 90 deg. to each other. By this means an almost perfect balancing of the masses of the alternating parts is attained, so that the locomotive is distinguished by extremely steady running even at the highest speeds. During the speed tests held in the year 1905 by the Prussian State Railways on the line between Hanover and Spandau a speed of 90 miles per hour was reached by an empty locomotive of this type. According to the statement of the director of these tests "the locomotive ran so smoothly even at this high speed that the latter might have still been increased without hesitation."

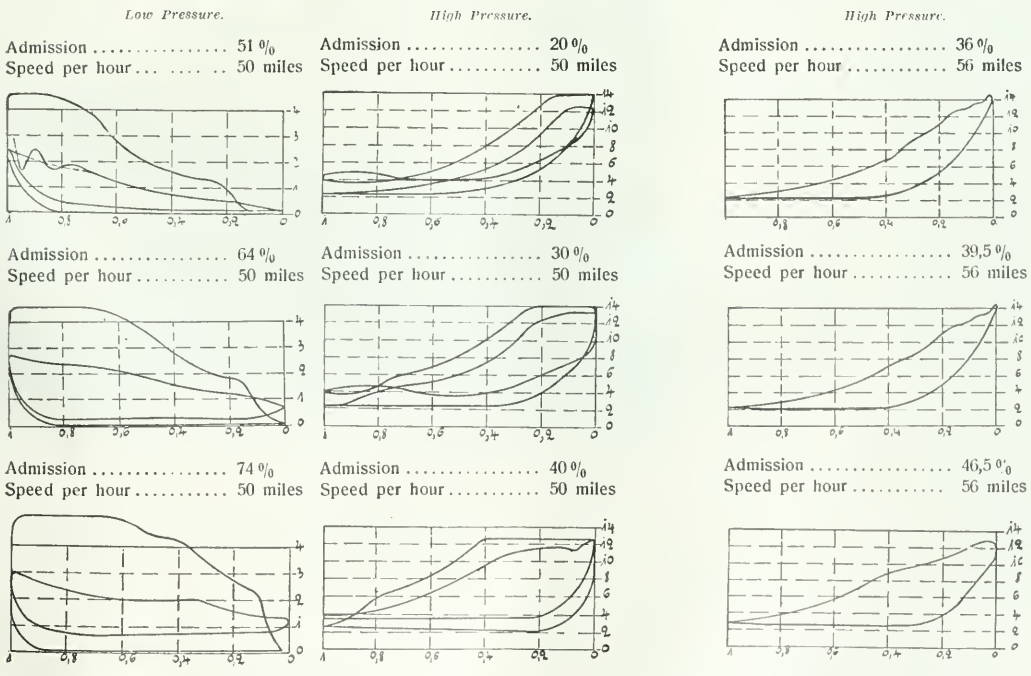
The valve gear is of the Heusinger type, von Borries' patent, in which each pair of slide valves on one side of the engine is driven by a single eccentric between the frames and the motion of the valves for the outside cylinders is taken from that of the neighboring inner cylinder. The valve motion has in principle re-

mained unaltered from the existing construction of this class of locomotive, with the difference that in place of the valve-rod of a high-pressure cylinder, a rod with curved projections for actuating the valves is attached. Some of the dimensions of the distributing valve motion has, of course, been modified, because, as has been explained above, the low-pressure cylinders have been placed inside the frames. The position of the valve motions of the high and low-pressure cylinders towards each other has been so arranged

valve is opened, steam enters by an aperture through a special tube into the receiver. A connecting tube fitted with a return valve is, however, attached to this steam inlet pipe and enters the high-pressure cylinder at the center of the latter. The high-pressure cylinder is consequently still supplied with steam behind the piston even when the poppet-valves have already been cut off. By this means the troublesome counter-pressure of the steam emanating from the receiver and getting in front of the piston is done away



Poppet Valves for 4-Cylinder Compound Locomotive; Prussian State Railways.


Low Pressure.
High Pressure.
High Pressure.
Admission ..... 51 %
Speed per hour ..... 50 miles
Admission ..... 20 %
Speed per hour ..... 50 miles
Admission ..... 36 %
Speed per hour ..... 56 miles
Admission ..... 64 %
Speed per hour ..... 50 miles
Admission ..... 30 %
Speed per hour ..... 50 miles
Admission ..... 39,5 %
Speed per hour ..... 56 miles
Admission ..... 74 %
Speed per hour ..... 50 miles
Admission ..... 40 %
Speed per hour ..... 50 miles
Admission ..... 46,5 %
Speed per hour ..... 56 miles
with Poppet valve distributing gear.
with slide valve distributing gear.

Indicator Diagrams from Four-Cylinder Balanced Compound, Locomotive of the Prussian State Railways.

by suitable dimensions of the transmitting lever that a steam admission of 40 per cent. in the high-pressure cylinder corresponds to an admission of 74 per cent. in the low-pressure cylinder. The greatest admission in the high-pressure cylinder is 68 per cent., that in the low-pressure cylinder 89 to 90 per cent.

For starting, the oldest well-known starting device, von Borries' system, has been chosen. The working of this is as follows: The throttle-valve has two flat valves, one on top of the other, after the Continental style. As soon as the small regulating slide

with. The locomotive therefore always starts with the low-pressure cylinders, without the high-pressure pistons being able to exercise a counter-pressure. This starting mechanism has splendidly stood the test of a 14 days' trial to which it was submitted before being sent to Milan. During these trials the locomotive started unhesitatingly, even with the heaviest loads without giving the least trouble even once out of 500 to 600 attempts.

The illustrations show the arrangement of the valve-gear for the high-pressure cylinders. The four valves, two for the inlet

towards the center and two for the outlet towards the ends lie in a plane and are worked by means of the rod with lifting projections already mentioned.

An exact calculation of the degrees of acceleration pressure arising shows that comparatively weak springs suffice to promptly close the valves, which weigh less than 10 lbs., even at 300 to 350 revolutions. One of the most important advantages of this valve motion is that it reduces the speed of the steam while passing through the admission. Diagrams of this velocity of the steam, taken with the point of cut-off at about 40 per cent. of the stroke which can be taken as being about normal, shows that the rate of flow is about 40 per cent. less than with the ordinary valve gear which gives less wire drawing during admission.

The indicator diagrams shown, which seem to substantiate this claim, were taken when the locomotive with poppet-valve motion was running at a speed of 50 miles per hour and for the sake of comparison a series of diagrams taken at the testing plant of the St. Louis Exposition on the same locomotive fitted with slide-valve motion are added.

## The Spokane & Inland Electric Railroad.

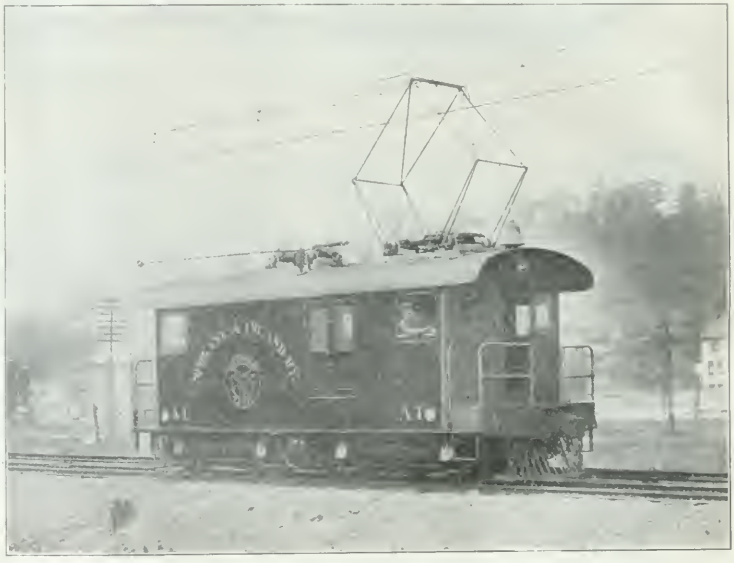
Some months ago announcement was made of a new single-phase railroad called the Spokane & Inland, which was projected to run between Spokane, Wash., and several neighboring cities. The road was originally incorporated under the name of the Spokane Interurban System, with a capital of $3,500,000, the incorporators being local capitalists. The principal terminal of the road is Spokane, from which the line runs south through Waverly, Rosalia and Thornton to Colfax, which is the southern terminus at present, although the line has been surveyed and will eventually be extended to Penawawa, Wash., or Lewiston, Idaho. A branch leaves the main line midway between Spokane and Colfax, and runs to Palouse City. The Y-shaped system between Spokane, Colfax and Palouse City covers about 106 miles in length. The roadway and overhead construction have already been finished.

The country traversed by this road, which now has no railroads, produces large quantities of wheat and fruit. The road is receiving the hearty support of the farmers along its route. There are three classes of service to be maintained—passenger, mail and express, and car-load freight.

The Westinghouse single-phase, alternating-current system has been adopted for the operation of the road. Six electric locomotives, six express cars and 15 passenger cars have been ordered. Power from the Washington Water Power Company is to be used for operation, to be delivered in a 4,000-volt, three-phase current of 7,200 alternations to a frequency-changing station about 10 miles south of Spokane. The 2,200-volt, 25-cycle current is stepped up to 45,000 volts, and at this pressure is transmitted to 15 static transformer sub-stations. Each sub-station is equipped with two transformers which step down the current from 45,000 volts to 6,600 volts, which is the trolley line voltage. The cars and locomotives operate under three different potentials; 6,600 volts on alternating current in the country, 700 volts on alternating current in the small towns, and 600 volts on direct current in the city of Spokane.

The trolley line is of the Westinghouse standard catenary construction. The electrical equipment of both passenger and express cars is identical and consists of four Westinghouse 100 h.p., alternating-current railroad motors per car. The schedule speed is to be from 35 to 40 m.p.h. The locomotives are equipped with the same type of motors, but the latter are each of 150 h.p. capacity. Both the motor cars and the locomotives are operated on the Westinghouse multiple-unit control system. The locomotives, one of which, operating on alternating-current, is shown in the accompanying photograph, are designed to handle a general carload freight business, and are capable of hauling seven standard freight cars fully loaded at about 30 m.p.h. on a level track. The cab of the locomotive serves to enclose the auxiliary apparatus and is constructed entirely of steel. Its total weight is 49 tons, and its length over bumpers is 29 ft. It has two swivel trucks with 38-in. driving wheels. Two motors are mounted on each truck and are geared to the axles. Both straight and automatic air-brakes are used, the compressed air for which is supplied by two Westinghouse compressors, each driven by a 5 h.p. single-phase motor.

The cars of the Spokane & Inland enter Spokane over the tracks of the Spokane Traction Company, which operates a 600-volt, direct-current system, and this requires the use of both direct and alternating-current on the interurban cars. The only mechanical operation in changing from alternating-current to direct-current is to change the trolleys, an ordinary wheel trolley pole instead of the pantagraph trolley being used on direct-current. The two trolleys are shown in the illustration. The control is changed automatically by the commutating switch, which is a small pneumatically operated drum for shifting the control circuits.



Spokane & Inland Electric Locomotive Operating on Alternating Current.

## Another Open Letter from President Ripley.

Following his first letter to the people of Kansas, protesting against a reduction of passenger fares in Kansas, published on page 125 of the *Railroad Gazette* of August 19, President Ripley of the Atchison, Topeka & Santa Fe has written the following letter, dated August 21:

To the People of Kansas:

Since the publication of my first letter I have received a very large number of communications, of which about one-half are in approval, one-quarter in criticism, and the rest asking for information. Finding it out of the question to answer each letter, I have decided to answer all at once so far as is practicable. Those who take issue with the first letter mainly dwell on these points:

1. Alleged over-capitalization.
2. The taxation of railway property.
3. The issue of free passes.
4. The alleged interference of the railroad in politics.

As to the first: I stated that the Santa Fe was worth all it is capitalized for. I am asked if the stockholders who bought the stock ten years ago at, say, $13 a share, have not made money. Of course they have, but has that anything to do with the case? They had courage enough to buy an interest in a discredited concern, just emerging from bankruptcy—only a few had the courage to do it. The great bulk of our common stock was held by those who owned it when the bankruptcy occurred; who held it throughout the receivership and who paid an assessment of $10 per share in cash in order to keep it. How about those people, most of whom paid par or more for the stock in the '80's, and who not only got no returns between 1889 and 1899, but paid an assessment besides?

Among the letters received is one from which I quote as follows:

"On March 11, 1889, I bought Santa Fe stock, paying $55 for each share. On July 11, 1895, I paid on each share of stock a cash assessment of $10. Fifty-five dollars, with interest at six per cent. compounded annually for seventeen years, amounts to $147.95, and ten dollars compounded at the same rate for eleven years amounts to $18.90. And there has been no time in the last seventeen years that I could not compound at that rate semi-annually instead of annually. My stock should to-day represent to me $166.85 per share. I have received on each share dividends to the amount of $21.50. Deducting this from the above amount would leave each share standing me at $145.35. The stock is selling at 93, and I am a loser

of $53.35 on each share. And yet, according to the (Topeka) Capital, because stock sold at 13 eight years ago, I am not a loser at all, but am a gainer by 300 per cent. No doubt but that most of the stockholders stand about in the same position I do."

The above letter is from a citizen of Kansas whom I do not know and never heard of before, but he was fortunate in only having paid $55 per share—many of the present stockholders paid $120. I repeat that, whether we consider what the property has cost (including in the cost the interest on investment), or whether we consider its reproduction value, it is not over-capitalized.

Second, taxation: The Santa Fe desires to pay its fair share of the taxes levied for the support of the state; it will not be heard to murmur so long as its property is assessed at the same proportion of its real value as is the property of other citizens; there is no reason why it should be favored in this respect on the one hand or oppressed on the other. (I may say that, in my opinion, a strict and honest application of this principle would considerably reduce the taxes we now pay.)

Third, as to passes: It is almost universal custom in every part of the country to transport free of charge national, state and county officers; it was originally meant as a courtesy, and I have never felt that it gave the railroad any claim on the conscience of the official receiving it, nor have I known of any case where a legislator has voted or been expected to vote against his convictions because of holding a pass. If the people of Kansas desire that this courtesy shall cease to be extended to their officers, there will be no objection raised by this company. But the prohibition of passes to other than railway employees will not materially increase the passenger receipts.

Fourth, the railroad in politics: We have the same interest in good government as has any other citizen and the same right to display that interest. As the largest corporation in the state and the largest taxpayer, we have a vital interest in sane and conservative legislation—and when (as has too often been the case) there is danger that the state will be swept off its feet by appeal to passion and prejudice made by designing demagogues for their own personal ends, it becomes a duty to oppose those men by fair and legal means—in such cases, and in such cases only, will the Santa Fe be found in politics. Individual employees are unrestricted; they may hold and express such views as they think proper, but their action is not to be taken as that of the company, nor is the latter responsible for their political opinions or utterances.

I realize fully that such prosperity as the Santa Fe has enjoyed is due largely to the energy and thrift of the Kansas people, but they should also recognize that we have done our share. Each is necessary to the welfare of the other; and if, in the last decade, there has been any good work done in the state, or for the state, in which the Santa Fe has failed to do its part, and more than its part, I am much mistaken. (Signed)) E. P. RIPLEY.

Chicago, Aug. 21, 1906. President A., T. & S. F. Ry. Co.

## The First Railroad Owned and Operated by a Government.

BY C. H. CARUTHERS.

Few of the passengers who are carried each day in the luxurious and smooth-running trains of the Pennsylvania Railroad between Philadelphia and Lancaster, Pa., realize that they are traveling upon a line which was put into operation at a date very close to the triumphal success of Stephenson's Rocket at Rainhill on March 24, 1829, and was the first railroad of any country in which ownership and control were vested in the state; yet this is the case, and such ownership and control prevailed upon the portion of the road referred to for a period of at least 25 years.

In the early half of the nineteenth century, business men and others realized that some more rapid and efficient means of transportation than the Conestoga wagon, the pack-horse, and the stage-coach was needed to meet the demands of the traffic between Pittsburg and Philadelphia. Hence the plan of building a railroad from Philadelphia to Columbia, a canal from Columbia to Hollidaysburg, a railroad from Hollidaysburg to Johnstown, and a canal from Johnstown to Pittsburg was decided upon, and the work was undertaken by the state of Pennsylvania.

The Philadelphia & Columbia Railroad formed the first part of this chain of improvements and was completed very early in the thirties. It was designed as a double-track road from the beginning, and was unique in owning no cars except a few for use in the maintenance of way, as it appears to have been the idea of the officials that a railroad was to be classed as a turnpike, and each person using it must provide his own vehicles.

Both freight and passenger trains were drawn at first by horses and mules, and even after the first locomotives had been brought from England and placed on the road, many of the animals were retained in service, especially on passenger trains, as the lack of experience of most of the enginemen and firemen, together with the possible incompetence of a number, rendered the service of these engines somewhat uncertain and unsatisfactory. No record which has ever come under the writer's notice shows state ownership of equine motive power, hence it is reasonable to suppose that until the advent of the locomotive each carrier furnished his own horses or mules, as on the turnpike and canal.

The first track used was of longitudinal stringers laid in two parallel lines, and resting on crossties. The top of each stringer was surmounted with flat bars of iron fastened in place by spikes with heads fitted in countersunk holes. These bars formed the rails upon which the cars ran, and soon developed a very disagreeable trait of becoming loose at their ends and catching against the wheels, which in turn sent them skimming up through the floors of the cars. Numerous injuries to passengers resulted from this cause, and some unfortunately proved fatal. These loose ends were known to the trainmen as "snake-heads." Just when this type of track was superseded by iron rails is not quite certain, but it was evidently very close to the change of power from animals to steam, as in the eleventh annual report of the Pennsylvania Railroad, dated Feb. 5, 1858 (the first report after the acquirement by the company of the properties of the Commonwealth), the statement appears in the report of the Resident Engineer of the Philadelphia division (as the Philadelphia & Columbia Railroad was renamed by its new owner) that 6,000 ft. of iron west of Dillerville had been renewed and that the old iron which was taken up was of "edge rail" type and had been laid in 1834 and used regularly from that date until the time of its removal! Some of the sidings owned by private parties along the line retained old patterns of rails and attachments for a still longer period. Such a siding remained at Gordonville station as late as 1862, and had a light form of T rail set in chairs on stone blocks; and at its connection with a secondary siding, no frog was used, but a section of rail, about 6 ft. in length, was pivoted at its center, and could be swung to either line of rails as desired. It was held in working position by a pin passing through the plate underneath it at one end. All bridges crossing streams of any size were of wood, and in some instances built with the track passing through their girders instead of on the top. An inclined plane was used for a time at Columbia, and another at Philadelphia opposite Peters Island, about where the Columbia bridge now stands. It is stated that after the locomotives came on the road they occasionally ran up this latter incline unattached to the pulling rope, but were not able to take any cars with them until the "Washington," built by William Norris in 1836 with 10 in. x 18 in. cylinders, 48 in. drivers and weighing seven tons, surprised railroad men everywhere by drawing, unaided in any way, a maximum load of 19,200 lbs., at a speed of 15 miles per hour up this incline, which was 2,800 ft. long and had a gradient of 7.1 per cent.

With the exception of that portion from the west end of the Conestoga bridge to Columbia, comparatively little of the present line follows the exact course of the state road and is often at a considerable distance from it, and many abandoned sections of the old line can still be seen with the ballast grass-grown, and yawning gaps where bridges formerly crossed streams or highways. Even the track between Conestoga bridge and a point about two miles west of Lancaster, although on the same ground which the state road occupied, is not on the route of the original survey. This followed what is now known as the Lancaster cut-off, but was abandoned before any track was laid, in favor of the present route with its objectionable curves, grades and grade crossings, and was only utilized by the Pennsylvania within recent years.

From Philadelphia to Lancaster the original course was decidedly serpentine in character, and the reason assigned for this by those who knew the road was that many farmers of that day realized the benefit of having the road pass through or near to their properties and threatened a withdrawal of their support from the politicians in charge of the work if the line was not built as close as possible to their farms. Probably another reason was that it was thought desirable to keep near to the old Lancaster pike and thus not merely be located in a more densely populated region, but also be better able to secure much freight and passenger traffic which otherwise would probably have continued to follow the ancient road. As one result of the route selected, a number of well-known "wagon taverns" became equally well-known as railroad eating houses, for the dining car was yet a long way off, and the slow speed of the trains, combined with some irregularity of schedule, gave frequent occasion to stop for meals (and it is whispered that the bars were also well patronized, not by the traveling public alone, but also by the employees and even the officers of the railroad company)! An old employee has informed the writer that at first a train required two days to make the run between Columbia and Philadelphia, stopping at Parkesburg over night, yet the entire distance is but 81 miles; and this man further informed me that during an effort to shovel out a stalled train from drifting snow, a high official soon ordered a discontinuance of the work, saying it was "useless for a railroad to fight against the elements." Another of his reminiscences referred to a summer of the long ago when grasshoppers were unusually numerous and alighted on the

rails in such numbers that the "sandboxless" engines of the time were quickly stalled by the oily matter left upon the rails as the wheels crushed them on the line. One part of the road near Lancaster was so especially affected by the cicada hosts that it bore the name of Grasshopper Level for many years.

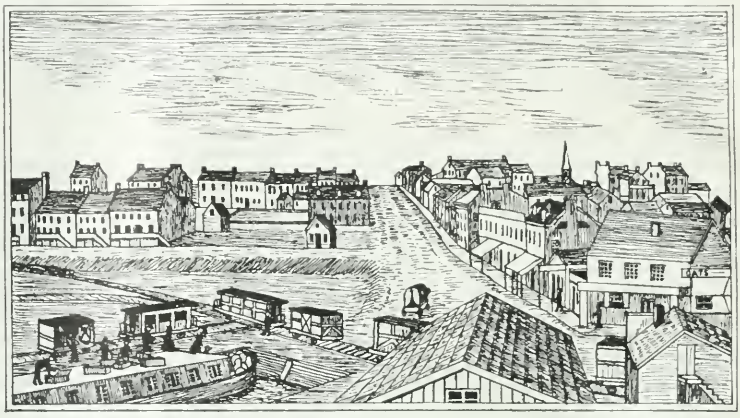
I have no authentic data to indicate whether the original starting point for passenger trains was at the foot of the Peters Island incline or not, but if so it was no doubt extended to a more convenient part of the city at a very early date. It will be noticed that the old advertisement accompanying this article places it at Eighth and Market streets in 1850, and in the eighth annual report of the Pennsylvania Railroad Company, which covers the year 1854, allusion is made to the opening of its new passenger station at Eleventh and Market streets on May 20th, of that year, and of the completion of the roof of its new freight station at Thirteenth and Market streets on December 15th, of the same year. Hence it would appear that the hauling of passengers had at that time, to a large extent, if not entirely, passed into the hands of the Pennsylvania, and this is further confirmed by a statement in the same report that the company "owns 34 passenger cars for use on the Philadelphia & Columbia Railroad."

Although trains began running on each section of the road as rapidly as it was completed between 1831 and 1834, the formal opening did not take place until the latter year, when one track was finished between Philadelphia and Columbia. This event was then celebrated by running two trains of passengers from terminal to terminal. Each train consisted of 10 four-wheel cars, and each car carried 16 passengers.

According to the "Guide to the Pennsylvania Railroad," published in 1855, which also includes a description of the Philadelphia & Columbia road, there were 29 stations between Philadelphia and Columbia, and a comparison of this list with a schedule of to-day will reveal some remarkable changes, especially between Coatesville and Philadelphia. Many of the old stations have been abandoned and many new ones opened. Some of the original stations are retained, but the names have been changed. From Philadelphia westward, Hestonville is replaced by Fifty-second street; Libertyville by Overbrook; Bryn Mawr replaces White Hall, whose old turnpike tavern, which was also used as the station house, still stands about one-half mile to the southwest on the abandoned part of the old line, and only Haverford, Villa Nova, Paoli, Green Tree, Downingtown, Gallagherville and Caln remain of the original names. has been abandoned. Several new ones have likewise been added to the list.

The "Guide" also contains a statement that at the time of beginning the construction of the state railroad, the strip of land 40 miles wide which it bisects in its course between Philadelphia and Columbia, containing 1,740,800 acres, was worth about $50,000,000; but by 1855 had increased in value to $85,000,000, and attributes this to the increased opportunities brought to its owners by the railroad.

It has already been said that the state furnished the locomotive equipment used on the road, and although the engines of English manufacture were the earliest placed in service, the first authentic



Hollidaysburg, Pennsylvania, in 1843.

matter at my command is contained in the records of the Baldwin Locomotive Works. It is there stated that M. W. Baldwin's third locomotive was built in 1834, was named "Lancaster," was placed upon the Philadelphia & Columbia road on June 25, 1834, and was followed by nine more built of approximately the same design for the same company, and late in 1835 these were followed by another engine for the road on somewhat different lines. It was Mr. Baldwin's 18th engine, was named "Brandywine," and was of the outside connected type. Its chief dimensions were: Cylinders, 10 in. x 18 in.; driving wheels, 54 in. diameter; weight, 20,000 lbs., of which probably 12,000 lbs. were on the drivers. In later years the "Brandywine" was partially remodeled by the addition of another pair of driving wheels, and was retired from service in 1858.

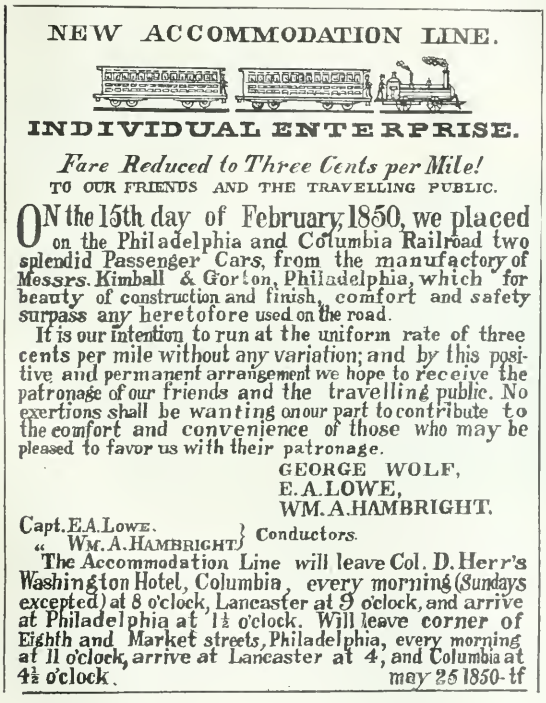
Allegheny Portage and New State Railroads from Hollidaysburg and Johnstown.

The "Guide" mentions Midway, and alludes to Coatesville as a "small village to the left," but this small village has now crept close to the line and substituted its own name for that of Midway. From Coatesville to Columbia there has been much less change. Pomeroy probably takes the place of Chandler, and two miles further on, Parkesburg remains as of yore, but without the shops which the state had erected there for repairing its equipment; and beyond this the old village of Penningtonville has long been known as Atglen. Of the rest of the 13 stations which in 1855 existed on this part of the road, eight yet preserve their names, and one

At least six engines built by William Norris of the type shown in the drawing of the "William Penn," an enlarged form of the "Washington," were placed on the road between 1836 and 1845. Several of these were yet in existence at the time of its purchase by the Pennsylvania Railroad, but with the exception of the "William Penn," all were cut up immediately after passing into the hands of their new owner. The "William Penn" was sold to the Strasburg Railroad, a private line connecting the town of Strasburg, Pa., with the Pennsylvania at Leaman Place station. It remained in service there until about 1864, when it again came into

the hands of its builders, the Norrisses, and was later partly rebuilt by them at their new shops in the old plant of the Lancaster Locomotive Works at Lancaster, Pa., receiving a square firebox and a cylindrical dome instead of the original horse-shoe box and hay-stack dome. The hook-motion valve-gear was retained, also the original tender. The engine was then taken east, loaded on a vessel, and taken via Cape Horn to San Francisco, Cal., and placed in the service of the Southern Pacific Railway, or at least of a road which afterward became a part of that system. The illustration shows it as it appeared in a photograph taken in 1897 by Mr. H. Frazer, of the Westinghouse Air-Brake Company. At that time it stood among debris in the sheds connected with an abandoned ironworks in San Francisco, and was yet in running order, although it had not been used for a year or two. The writer has no data at hand as to whether it is still in existence.

From at least half a dozen of old employees, and others who had been connected with the road, it is ascertained definitely that among the first engines were at least three of English manufacture, on lines similar to the "John Bull" now preserved in the National Museum in Washington City, D. C. These three were named "John Bull," "Red Rover" and "Hawkeye." Two Winan's engines, the one a "Crab" and the other a "Grasshopper," also rendered efficient service for a time; and an Eastwick & Harri-



NEW ACCOMMODATION LINE.

INDIVIDUAL ENTERPRISE.

*Fare Reduced to Three Cents per Mile!*

TO OUR FRIENDS AND THE TRAVELLING PUBLIC.

ON the 15th day of February, 1850, we placed on the Philadelphia and Columbia Railroad two splendid Passenger Cars, from the manufactory of Messrs. Kimball & Gorton, Philadelphia, which for beauty of construction and finish, comfort and safety surpass any heretofore used on the road.

It is our intention to run at the uniform rate of three cents per mile without any variation; and by this positive and permanent arrangement we hope to receive the patronage of our friends and the travelling public. No exertions shall be wanting on our part to contribute to the comfort and convenience of those who may be pleased to favor us with their patronage.

GEORGE WOLF,
E. A. LOWE,
WM. A. HAMBRIGHT.

Capt. E. A. Lowe, } Conductors.
" Wm. A. Hambright }

The Accommodation Line will leave Col. D. Herr's Washington Hotel, Columbia, every morning (Sundays excepted) at 8 o'clock, Lancaster at 9 o'clock, and arrive at Philadelphia at 1½ o'clock. Will leave corner of Eighth and Market streets, Philadelphia, every morning at 11 o'clock, arrive at Lancaster at 4, and Columbia at 4½ o'clock. may 25 1850-tf

Philadelphia & Columbia Announcement, 1850.

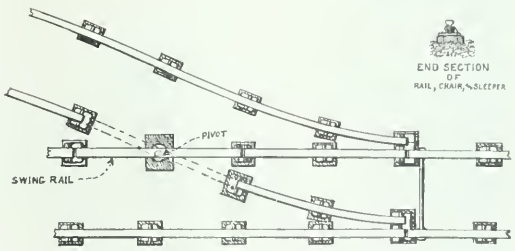
son contributed to the kaleidoscopic character of the equipment. None of the engines referred to thus far were provided with sand-boxes, headlights, cabs or cowcatchers; and the cylinder cocks as well as the try-cocks of the pumps, could only be reached when running, by the engineman creeping to them along the frame. All used wood except the "Crab" and the "Grasshopper." This soon led to placing spark-arresters on the original straight stacks, and this gave them somewhat the appearance of the Diamond stack in use to some extent to-day, but some of the bridges being found too low to permit the engines with this increased height of stack to pass through, a new form was devised in which the diamond containing the cone and netting was placed directly on the top of the smoke-box and carried the straight portion upon its top, to which it was attached by a hinge and coiled spring, which enabled it to be easily raised to an upright position. A rod from its top to the foot-plate enabled the engineman to control it.

The engine crews early learned that sand increased the adhesion of their machines to a wet or dirty rail, and began to carry it in pails or wooden boxes on their engines, and from these it was sprinkled on the track by hand when needed.

But few of the engines had more than one safety valve. The lever was attached to a spring-balance, and the adjustment was entirely under control of the engineman. Although the maximum pressure carried was not intended to exceed 100 lbs., the men often tried to obtain better results by screwing the valve down to a higher pressure, and of course explosions "occasionally" took place.

During 1845 two six-wheel conneted Baldwin engines without trucks came into service, and were followed between that period and 1850 by 15 eight-wheel (four driving wheels connected) engines from the works of Norris Brothers, the successors to William Norris. These engines ranged in weight from 38,000 lbs. to 40,800 lbs., of which from 12,400 lbs. to 20,000 lbs. were on the driving wheels. The cylinders ranged from 11 in. x 26 in. to 13 in. x 24 in., and the driving wheels of all but two were 54 in. in diameter. The two exceptions had 48-in. wheels. The valve-gear was of the "V" hook type, with independent half-stroke cut-off. On two of the engines this cut-off was driven from the crosshead. The fireboxes were of horse-shoe pattern, and were surmounted by a large wrought-iron haystack dome, which was in turn surmounted by a small dome of polished brass. Most of these engines remained in service from eight to ten years after coming into possession of the Pennsylvania Railroad.

In 1853 the first engine bought by the state from the Lancaster Locomotive Works of J. Brandt, at Lancaster, Pa., came on the road, and during the ensuing three years 26 more of substantially the same design were furnished by Mr. Brandt. Those designed for passenger service had driving wheels 66 in. in diameter, and those for freight service were built with but 60 in. wheels. In other respects all were very much alike, having wagon-top boilers with two domes, one on the waist and the other on the roof-sheet, steam chests sloping both laterally and crosswise, Stephenson link motion, French & Baird wood-burning stacks, slide throttle valves placed on the smoke-box end of the dry-pipe with a tallow cup for their lubrication on the top of the smoke arch, profuse ornamentation in brass and vermilion, tender trucks with journals and frames inside of the wheels, and altogether in a number of respects bore




Old Swing Rail Frog and Edge Rail Switch, at Gordonville, Pa., in 1862.

an exceedingly close resemblance to many modern passenger locomotives. Their dimensions varied considerably, the cylinders ranging from 16 in. x 20 in. to 18 in. x 22 in.; the total weight from 53,000 lbs. to 60,000 lbs., and the weight on drivers from 31,800 lbs. to 35,500 lbs. All were altered to coal burners by the Pennsylvania. A considerable number of these Lancaster engines remained in active service as late as 1876 and 1877, and one ran an accommodation train between Columbia and Lancaster regularly until late in 1883.

The only other locomotives owned by the state at the time its improvements passed into the possession of the Pennsylvania were two built at the works of the New Jersey Manufacturing Co., also under control of Mr. Brandt, which were quite similar to the Lancaster engines; six eight-wheelers (four driving wheels connected) from R. Norris & Son; two eight-wheel (four drivers connected) Baldwin engines bought in 1854 from the Pennsylvania Railroad, and two of similar design but somewhat lighter built by M. W. Baldwin, all of which were used on the Philadelphia & Columbia Railroad; and six Norris Brothers engines of same type as the 15 already mentioned; two Smith & Perkins eight-wheelers (six drivers connected); three Baldwin ten wheelers (six drivers connected), and four R. Norris & Son ten-wheelers (six drivers connected), all of which were in use on the Allegheny Portage Railroad. Many of these were considered large engines at that time and for several years after, and were later rebuilt at Altoona and used in some of the most exacting service of the period, covering from 10 to 12 years after their coming into possession of the Pennsylvania.

Nearly all of the engines referred to, both on the Philadelphia & Columbia Railroad, and on the Allegheny Portage Railroad, had copper fireboxes and brass flues. Of the engines used on the Allegheny Portage Railroad, the Baldwin, Smith & Perkins, and the four built by R. Norris & Son, were coal burners.

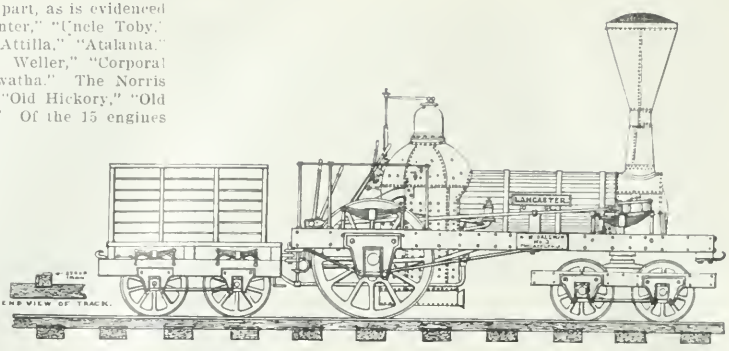
The nomenclature of the earlier engines was derived chiefly from towns, counties, streams, and an occasional man of note, but after the Brandt engines came it was evidently secured from a

wider field in which literature played no small part, as is evidenced by such names as "John Gilpin," "Tam O'Shanter," "Uncle Toby," "Bardolph," "Old Fogy," "Young America," "Attilla," "Atalanta," "Alaric," "My Son Samivel," "Yorick," "Tony Weller," "Corporal Trim," "Fingall's Baby," "Falstaff" and "Hiawatha." The Norris engines boasted of a "President," "Governor," "Old Hickory," "Old Dominion" "Hoosier State" and "Washington." Of the 15 engines on the Allegheny Portage Railroad nine were called for counties, towns, men and streams; two for heathen deities, and one for an Indian tribe.

At the date of their sale to the Pennsylvania that company had just begun the substitution of numbers for names, and all of the state engines had their names removed and were numbered consecutively with those already running. The state, as has already been mentioned, owned no cars except, perhaps, a few used in maintenance of way. Each shipper provided his own equipment in this line, or depended upon the opportunities afforded him through the cars of his more fortunate competitors. Some shippers owned but a single car. These small owners were principally dealers in produce, market gardening, etc. One such owner was an Irishman whose name I do not recall, but who was well known to the officials and employees for his frequent reference to his "big caahr," as he called it, and is reputed to have chased an engineman with a club because he suspected him of having intentionally run his engine into the end of this famous "caahr!"

The success of these individual owners, especially of those owning cars in larger numbers, led to the formation of transportation companies, chief among which were two lines, well known in those days, the one that of Leech & Company, and the other the Wallower Line. Both owned large numbers of box and flat cars, some four-wheel, others eight wheel.

These two companies also owned boats on the canals which with the Allegheny Portage Railroad formed the connecting links between Columbia and Pittsburg, and although much freight was still carried in these cars and boats over the railroads and canals of the state after the Pennsylvania was opened to Pittsburg, the Leech and the Wallower cars were occasionally seen passing over the entire length of the Pennsylvania Railroad, when the stately Susquehanna, the Blue Juniata, or the foamy Conemaugh had burst their barriers and swept away portions of the canals.

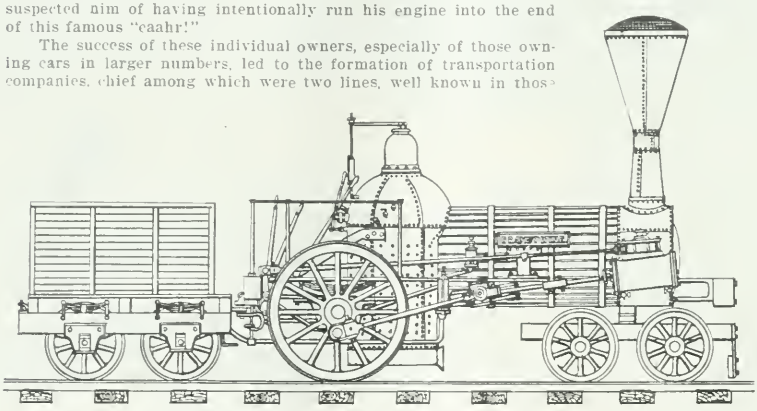



**The Lancaster (No. 3), Built by M. W. Baldwin in 1834 for Philadelphia & Columbia Railroad.**

Weight on drivers, about 10,000 lbs. Total weight, about 15,000 lbs. Boiler, 35 in. inside. Horseshoe firebox, 30 in. long inside. Cylinders, 10x 16 in.

The box cars had the roofs extended at each end, forming a hood over the platforms as on passenger cars. Most of the brakes were operated by a lever at one side of the car. The passenger cars were furnished by those engaging in this branch of transportation, and the advertisement reproduced from a Columbia paper of 1850 is interesting in that connection.

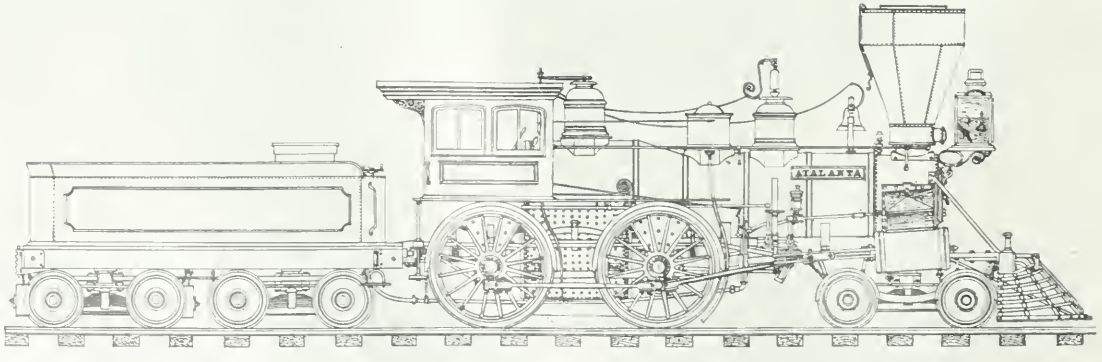
The names used in the foregoing description of the railroad equipment would have sounded strange to the railroad men of those days, as what we call a box car was known to them as a "house car," and a flat or gondola was simply a "truck." A freight train was called a "burden" train. Many other expressions were used at that time which would scarcely be understood in connection with railroad work to-day. The engine cab was the "house" at its first adoption, and "tolls" were used instead of freight rates. This word no doubt was handed down to the railroad from its predecessor, and erstwhile competitor, the turnpike, and as the first cars had but four wheels, and a certain toll per car was charged, for its passage over the lines, the word "wheel toll" added to the railroad vocabulary, and when eight-wheel cars were introduced they were always charged for at the rate of two cars.



**The Brandywine. Built by M. W. Baldwin in 1835.**

Weight on drivers, 12,000 lbs. (approximately). Total weight, 20,000 lbs. Boiler, 35 in. diameter. Horseshoe firebox, 30 in. long inside. Cylinders, 10x18 in.

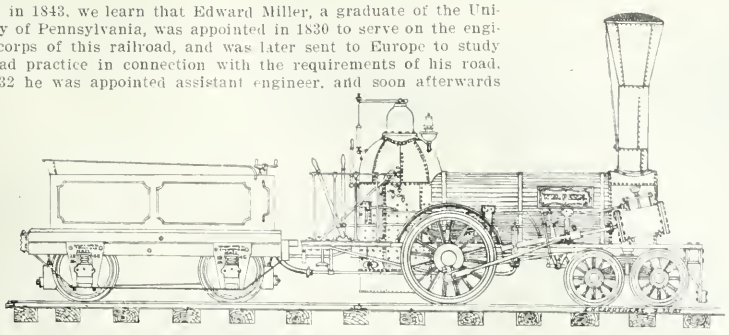
The other section of the state railroad was that extending from Hollidaysburg to Johnstown across the Allegheny mountains, and was known as the Allegheny Portage Railroad, already referred to in the description of equipment. The first section of the canal terminated at Hollidaysburg, and all freight and passengers were there transferred to the railroad or such other conveyances as might offer. From Sherman Day's "Historical Collections," pub-




**The Atalanta, Built by Lancaster Locomotive Works in 1853 for Philadelphia & Columbia Railroad.**

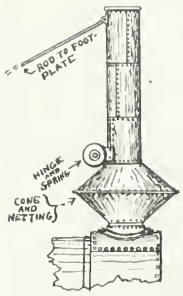
Sold with all state railroad equipment, to the Pennsylvania Railroad in 1857. Worn out in 1883. Cylinders, 16x20 in. Drivers, 66 in. Weight, 55,200 lbs. Weight on drivers, 33,200 lbs. Inside journals and frames on tender trucks.

lished in 1843, we learn that Edward Miller, a graduate of the University of Pennsylvania, was appointed in 1830 to serve on the engineer corps of this railroad, and was later sent to Europe to study railroad practice in connection with the requirements of his road. In 1832 he was appointed assistant engineer, and soon afterwards



The William Penn (P. R. R. No. 1) in 1846.

Weight on drivers, 14,600 lbs. Total weight, 23,350 lbs. Cylinders, 10x20 in.

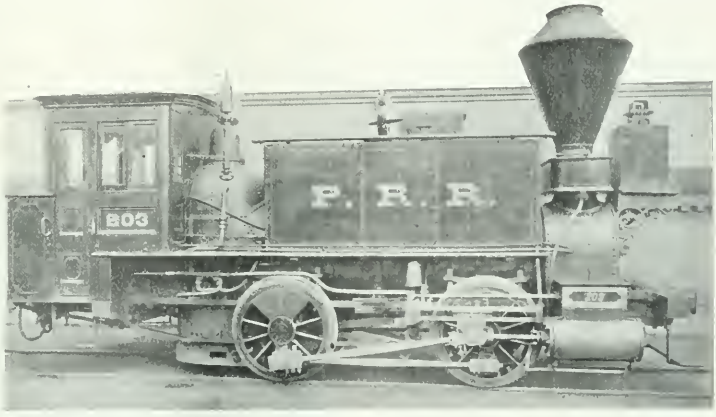



Inverted Diamond Stack, About 1849-1853.

was made superintendent of machinery. At the opening of the road on March 10, 1834, he had 10 stationary engines in operation at the planes, and 10 more building as reserves, and all were completed by the close of 1835, finishing what was then considered one of the greatest undertakings of the age.

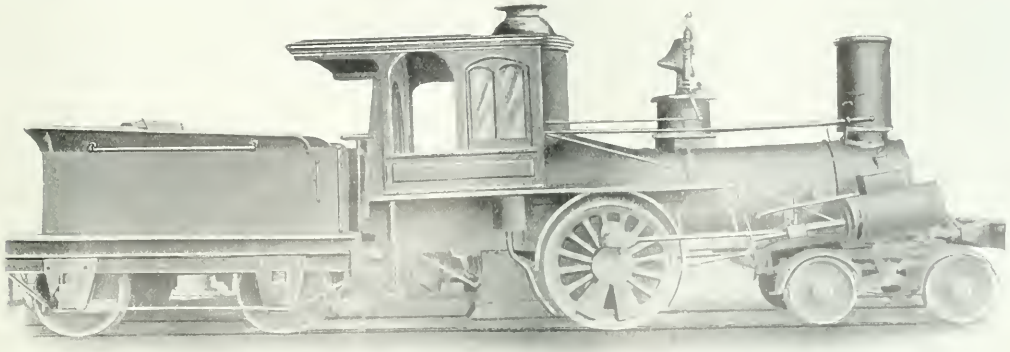
A wood cut in the work referred to conveys a fair idea of the conditions prevailing at Hollidaysburg at that time. Part of a passenger packet boat is seen lying at the wharf in the slip in the foreground, and on the railroad nearby are both freight and passenger cars, while a "Conestoga" wagon is seen just starting up the main street of the town. It is to be regretted that the artist did not portray these cars with the same accuracy that he has given to the boat. Some of the warehouses and a portion of the railroad shops appear in the foreground, and the background is devoted to the central part of the borough. A marine railroad upon which the "section boats" were run on or off the trucks used in carrying them across the mountains, and a "screw-dock," whatever that may have been, are not shown in the illustration, although both are stated to have been at Hollidaysburg. There were also 10 or 11 forwarding houses and immense warehouses and several hotels.

From Hollidaysburg west a portion of the road at least was laid on stone blocks instead of wooden ties, and within a very few years a number of these blocks still remained in place and were occasionally sketched by artists in their summer rambles through the picturesque scenery of the neighborhood. Like its later neighbor, the Pennsylvania, it also had a horse-shoe curve, and 10 inclined planes carried it over the steeper portions of its route. The remains of the embankment of one of these planes still exists at Lilly's station, on the western slope of the mountain, and is plainly visible from the trains of the Pennsylvania. These planes were afterward avoided by a new road built by the state at a cost of $2,000,000, which approached the Pennsylvania opposite the upper end of that company's famous horse-shoe bend at Kittanning Point, and continued westwardly along the opposite side of the glen until it reached the summit a short distance south of the Gallitzin tunnel. Here it passed through the mountain by a shorter tunnel of its own and then followed the line of the Pennsylvania closely as far as South Fork. All of these lines across the mountains were operated for a few months by the Pennsylvania after it purchased them, but their expenses, although much less than under the management of the commonwealth, were found to so largely exceed the income derived from them that it was deemed wise to abandon




State Locomotive Montgomery (Allegheny Portage Railroad), as Rebuilt by the Pennsylvania in 1866.

The original boiler, firebox, dome and smokestack remain. Also cylinders, but these have been set lower down than when first built. The "Montgomery" was built by Norris Brothers in 1850, with four drivers and a 4-wheel truck. Principal dimensions at that time: Cylinders, 12x24 in.; drivers, 54 in.; weight on drivers, 25,300 lbs.; total weight, 40,800 lbs. Engine was retired from service in 1873.



The William Penn as It Appeared in 1898.

them and remove the rolling stock and all other available material to the main line. It was also found here, as on the Philadelphia & Columbia Railroad, that the state had done no more repairing or made no purchases of new materials during the months in which negotiations for the transfer of the roads were pending than could not possibly be done without, and hence most of the locomotives required immediate and heavy repairs.

The Allegheny Portage Railroad was not a double-track road, but had several passing sidings; and the right to remain on the main line belonged in the earlier use of the road to the train which first arrived at certain posts placed near the siding. Hence great efforts were made by trains due to pass each other to be the first at these posts, and as a consequence collisions are said to have occurred frequently.

The "Historical Collection" referred to also states that a missionary of the Seamen's Friendly Society was stationed permanently at Hollidaysburg to look after the general welfare of the boatmen on the canal, and it is but reasonable to suppose that a portion of his efforts was also accorded the railroad employees.

It may be of interest to note in closing this article that the new freight route or "cut-off" of the Pennsylvania between Hollidaysburg and the point of its union with the main line below Gallitzin on the western slope of the mountain follows the roadbed of the Old Portage to its junction with the New Portage referred to already, and thence over the roadbed of the latter to the summit, and through the old tunnel to the main line.

## Steam Shovels in Anthracite Coal Mining.

One of the interesting uses to which steam shovels recently have been put is the stripping of anthracite coal lands in Central and Eastern Pennsylvania. Some years ago a builder of this class of machinery went into this district for the purpose of designing some kind of machine for handling anthracite culm, which at that time was considered of very little value, other than for use as low grade fuel. The price of the culm at that time was therefore so low it could not be handled by hand profitably. The machine which he designed, although quite crude, was used for handling this culm and worked very successfully, but was confined to that particular use. One objectionable feature of the machine was the unhandiness in moving it from one pile of culm to another. Soon after the introduction of this first machine a new type was introduced, which was mounted on traction wheels, was self-propelling, and in many other ways was a great improvement. It was an adapted "Little Giant" steam shovel, built by the Vulcan Iron Works Co., Toledo, Ohio. The accompanying view shows one of these machines in this service. The type has been used for years by the large miners of anthracite coal, and is still in use. It has enabled these miners to turn to a profit what was previously a dead loss, this class of fuel being now exclusively used by numerous large industrial plants.

Vulcan Steam Shovel Handling Anthracite Culm.

While millions of tons of anthracite coal have been taken from this district, and no doubt millions of tons remain, the deep mining is growing less every year. When mine owners first became aware of this fact, they began to look about for some means for keeping up the supply of this class of coal. It was known at that time that there were thousands of acres of coal land still left, but the problem of mining it was so great there was little hope of its ever being produced at a profit. The reason for this was that many acres of this land had large veins of coal underlying the surface from 10 to 50 ft.—an insufficient depth to undermine safely. The increasing scarcity of timber, so much of which is needed in such shallow mines, made that method of mining impossible, and to strip it by hand was out of the question. Thus the matter stood until some three or four years ago, when a successful miner and producer of coal conceived the idea of using a steam shovel for stripping the material off of the underlying coal. It was at that time thought to be feasible to strip the coal where the depth of stripping was not over 10 to 15 ft. A steam shovel maker was called into consultation in the matter, and after careful consideration it was decided by the operator to try it. A steam shovel of suitable size and capacity was installed, with results far in advance of the expectations of any of the parties concerned. The problem of surface mining of anthracite was thus solved, and today steam shovels are considered an indispensable factor throughout the anthracite coal region of Pennsylvania.

The use of steam shovels in stripping coal lands is not confined to the anthracite regions, but is being adopted as well throughout the bituminous districts in Missouri, Kansas, Oklahoma and Indian Territory, with comparative success. A detailed account of the use of the steam shovel in connection with the mining of bituminous coal will be given in a future article.

We are indebted to the Vulcan Iron Works Co., Toledo, Ohio, for the foregoing.

## A Railroad Journey in Honduras.

An 18-hour trip of 37 miles over the length of the Interoceanic Railway of Honduras from Puerto Cortez to San Pedro is thus described by a correspondent of the New Orleans *Times-Democrat*:

The leaving time was 6 o'clock, but we didn't pull out of Puerto Cortez until 10 in the morning. The train consisted of a wood burning engine, four flat cars and a passenger coach. Our crew was composed of an engineer, a half dozen firemen, one brakeman and the conductor. There was an extra man, but in the whole vocabulary of railroads I find no name for him. His position, however, was a commanding one, and, as subsequent events proved, a most important one. He perched himself on the front of the engine, above where the cowcatcher should be, and upon occasion industriously ladled sand from a box beside him to the rails in front. Our numerous firemen passed the wood from the cars to the engine, and at various points along the road turned into a bucket brigade and supplied water from nearby streams to the engine. The engineer was a Jamaican who invariably announced our approach to a village by putting the hard pedal on the whistle, at which the entire population turned out to greet us.

The engineer's musical efforts came near causing a catastrophe at one point where we encountered a very heavy grade. Just before we reached the top of the hill he thoughtlessly pulled the whistle cord, and in the screaming blast that followed, the steam gave out and the train began to slip back. Although the cars were without brakes of any kind, the company had prepared for such emergencies by providing a mahogany log on the rear platform to be dropped under the rear wheels. Unfortunately the rear brakeman was asleep on a flat car in front, and before he awakened the momentum of the train was so great as to render the remedy unavailing. We ran so fast and so far in the next fifteen minutes that it took us four hours to get back.

At Laguna, 10 miles out, there was a stop of forty minutes to replenish sand and water. Leaving Laguna, the train plunged into a tropical swamp and forest. The foliage was indescribably luxuriant and beautiful. Mile after mile we passed through archways of bending palms, gigantic in size, and through groves of corozo trees. To my mind the latter is the most perfect representation of the picturesque in tropical vegetation. Its trunk is clad in the richest attire of parasitic life; its wonderful feathery leaves, often 30 or 40 feet long, bend in elegant and graceful curves under the weight of their own luxuriance or the burden of the ornamental vines, while beneath all this mass of tropical richness may be seen clusters of delicious cahorn nuts hanging like immense cornucopias containing two or more bushels. For a distance we passed a deep, swift stream, which flows for miles through a wild jungle, in the eternal shadow of the gigantic ceiba, cedar and rubber trees, between whose moss and vineclad trunks grow palm trees of every description. Precious woods are here so common that rosewood is often used for telegraph poles, and the ties are of mahogany.

Emerging from the jungle, we came to the banana plantations, and here I learned that this remarkable railroad transports to the steamers 60 per cent. of the bananas received at the port of New Orleans.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS. We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 9. FRIDAY, AUGUST 31, 1906.


The last Government Quarterly Accident Bulletin, reprinted in this paper, shows continued heavy totals in all the items, testifying to the enormous business now being done by the railroads of the country, to the fact that some men are inexperienced and some are overworked, and that no appreciable progress is being made in safeguarding passengers' and employees' lives and limbs. Some interesting details appear. The Adobe (Colorado) collision, in March (No. 29) killed 34 and injured 24, not 22 and 22, as reported at the time—which shows the need of official reports. The bulletin says that the operator whose sleeping led to this disaster, slept at his post *not over one minute*. The statistician speaks of the rules (which were not in force in this case) to keep train-order signals normally at danger, so as to require operators to be awake when trains pass, and to require conductors of superior trains to acknowledge meeting orders before the orders are issued to the inferior train; but rightly says that the only true measure for the prevention of such collisions as this is the adoption of the block system. In another accident in this bulletin the conductor gave to the engineman the special warning signal on approaching a meeting point, and the engineman acknowledged it; and yet he did not stop. The explanation of this breakdown of the rule is interesting. Another interesting case is collision No. 25. But the most suggestive record of the whole lot is that of collision No. 8. This was a runaway, which was due to both engineman and fireman falling asleep in their seats. These men had been on duty during the preceding 74 hours as follows:

| | | |
|---|---|---|
| On duty | 14½ hrs. | |
| Off duty | | 4½ hrs. |
| On duty | 14 hrs. | |
| Off duty | | 4½ hrs. |
| On duty | 22 hrs. | |
| Off duty | | 4 hrs. |
| On duty | 10½ hrs. | |

when the collision occurred. How do the records of trainmen's hours on your road compare with this?

This bulletin makes no mention of the weakness of the smoking car, which was reported to have been a main factor in the death and injury of passengers at Boston, February 1. nor did the last preceding bulletin have anything to say about the similar circumstance connected with the derailment at Sheffield, Mo., in October, when ten passengers were killed. The habitual running of old passenger cars in the front part of heavy trains, with heavy cars in the rear, is common in all parts of the country, and is unjustifiable—except on the theory that disastrous collisions are never again to occur. Besides the positive evidence of the danger of the practice which we have in such cases as Boston and Sheffield—and at many other places during the past dozen years—we have the frequent evidence—not so positive, but equally convincing—afforded by serious wrecks of trains that are composed wholly of strong cars, in which nearly or quite all of the occupants escape alive. If it is worth while to build these strong cars it is important that the utmost advantage be secured from their use. Government investigation of accidents should not be conducted at arm's length, by correspondence, from Washington, but through competent inspectors empowered to visit and inquire at short range. The difference between strong cars and weak ones is well known in a general way, but it ought to be explained specifically, with the actual wrecks cited to illustrate the truth. The railroad companies do not boast much, even about a good thing—strong cars—when the boasting is likely to call attention to another thing which is not good—the fault which led to the wreck. Hence the need of an outside inspection.

The interesting application of reinforced concrete to strengthening an old cylinder bridge pier, described on another page, is suggestive of what the future may be expected to develop in innumerable applications of this material in ways at present unthought of, which will completely revolutionize many engineering methods now considered good practice. For example, after the successful completion of the application referred to, its originator conceived the idea of extending the scheme to the construction of new pier foundations in alluvial deposits, or of the pier entire, as the case may be, and carried the idea into execution on a bridge now being built over the Red river at Shreveport, La. A description of this bridge from the plans, which have since been modified in many respects, was given in these columns a year ago (June 16, 1905). One of the piers was sunk to a depth of 80 ft., and others go down 50 or 60 ft. Briefly, Mr. Schaub's plan for new pier work consists of the construction of the concrete shell in practically the same way as that described in the present article, except that the temporary dam or outer form is assembled on ways and floated to the site, and then sunk by excavation in open wells either by sand pumps or dredges. When the desired penetration has been attained the shell may be filled with sand or concrete as desired, and finished in the usual way. In the Shreveport bridge concrete filling is used. In general, however, because of the relatively great depths necessary in these deposits, the plan contemplates the use of the sand filling only, up to low water at least as the more economical, and therefore in many ways more satisfactory, method. Mr. Schaub estimates that a saving of from 30 to 50 per cent. in cost of foundations could be effected by the use of the sand. His plan differs from the older one

using a crib with pockets filled with concrete in two important essentials one being the absence of timber within the shell, and the other the sand filling.

As indicative of the behavior of such a structure of reinforced concrete in withstanding unexpected stresses, two incidents which occurred in connection with the work on the Clarenden bridge are of interest. As explained in the article, the temporary dam was supported from the tops of the cylinder piers, the tackle, of course, also sustaining a considerable part of the weight of the constantly growing concrete shell. When the total weight had reached something like 600,000 lbs. the tackle unexpectedly gave way and the uncompleted dam was precipitated to the bottom with such force as to attain approximately the penetration originally desired. Despite the unusual stresses to which it was thus unintentionally subjected, careful examination failed to reveal a single crack in the concrete. The second incident occurred after the completion of the shell. Contrary to the intention of the engineer, and without his knowledge, the foreman on the work sealed the dam at the bottom with concrete. As he did not pump out the contained water, the result was that as the filling progressed the upper portion of the shell was subjected to a hydrostatic pressure, which subsequent calculation showed to have used up completely the factor of safety allowed in designing it. However, the structure suffered no injury whatever.

The paper of Mr. Henry W. Thornton, read before the Traffic Club, of Pittsburg, which we reprint this week, deserves careful reading not only by operating and traffic men, to whom primarily it is addressed, but by railroad men of all departments, be they high or low in the service. Shippers and managers of industries also come in for some good advice and would profit by a perusal of the paper. None of the points which Mr. Thornton makes may be new, his subject—co-operation—certainly is not, but there is an engaging frankness, a spiciness and a convincing quality about his discussion that gives it interest even to the non-technical reader. Those whom it most particularly concerns should keep it convenient for periodical re-reading, such discussions of this subject being all too rare, and good sermons are too soon forgotten. The arguments that superintendents, if for no other reason than through selfish motives, would find it to their interest to aid the traffic department to secure business, and that every employee, no matter how humble his station, is likewise helping himself in inducing his neighbors and friends to patronize his road, are sound logic; just as it is natural for men working under the stimulus of self-interest not only to accomplish more work but a better quality of work, than where duties are perfunctorily performed. The suggestions regarding the traffic officer's direct interest in retrenchment are of equal value in pointing out the effect which his attitude toward the public has in making it easy or difficult to retain existing competitive business and obtain new business; and of the importance of knowledge on his part of costs of movement of the business he obtains. As to the "absolute frankness and honesty" between managers of industries and railroad officers which Mr. Thornton recommends, and sets forth in some detail to show what he means, such co-operation is, of course, possible, and would be most delightful; but if it should ever become the general rule instead of the very rare exception, the millennium will doubtless be following close on its heels. But it is worth while that the ideal kind of management should be held up in plain sight, even if it cannot always be realized; and Mr. Thornton shows—like our esteemed contributor, Mr. R. C. Richards—that it always pays to remember that the final purpose of the work of every officer and employee, whether he be general manager or telegraph operator, is to make the railroad prosper.

## STATE RAILROADS—THE LESSON OF ITALY

We print this week the third paper of a series on the government railroad monopoly in Italy by Mr. Giuseppe Spera, who has had a long and useful service as engineer of the government council. Mr. Spera has pointed out that the Italian government and parliament took it upon themselves to solve the railroad problem in Italy when they were totally unprepared from a technical, economic and administrative standpoint. The results have been a long-drawn-out failure, with about every variety of bad railroad service. The first railroad in Italy was opened in 1839, but until 1859 the system of separate and independent Italian states naturally greatly hindered development, and Hadley, in his "Railroad Transportation," points out that as far as there were any railroads at all each state had its own separate system. The systems were not merely independent, but were isolated. The railroads of Tuscany did not reach those of Rome; those of Rome did not reach those of Naples. After the series of wars from 1859 to 1870, and the formation of the present government, the railroad system was in the main connected, although the conflict between the natural economic development along the line of the through routes from northwest to southeast, and the old crosswise political divisions occasioned the Italian system to be broken up into four groups. These roads were originally operated, part by the state and part by private companies, helped by government subsidies. In the '70s the railroads were in extremely bad shape physically and financially, and the government undertook the operation of them. In 1876, however, the Italian parliament voted to reverse this course, and the Minister, Depretis, was instructed to draw up a plan under which private companies might manage the state railroads. The history of this management was marked principally by two contradictory features: by a studious parliamentary research into the situation and by great recklessness in expenditures. It was estimated that it would cost $125,000,000 to put the systems in shape for proper private operation. As a matter of fact, this was doubled before the work was really under way, and was constantly increased thereafter for political reasons much like those which influence our own congressmen in the conduct of river and harbor appropriations. In a word, government ownership supplemented by government operation having promptly proved a failure, the policy was reversed in 1885, after the work of the parliamentary committee, and then government ownership with private operation failed, although it was arranged, as Mr. Spera points out, that the companies should pay the government $53,000,000 to represent the value of the railroad material, and then should operate the roads, the government agreeing to pay their annual interest charge of $369,730.

This experiment was just as unfortunate as the other. The properties were insufficiently maintained, they were not profitable, rates were up and service was down, and all the time they were a drain on the government.

In the face of popular clamor the policy has for the third time been reversed, and now the government has taken the operation of the railroads back again. It seems impossible that it should succeed now any better than it succeeded thirty years ago, and the outlook is not a hopeful one. The wretched tangle of bad policy, bad finance and bad service which has occupied so unnecessarily much of the time of the Italian state for the last generation, stands as a perpetual warning to those who see only economy, efficiency and good service in state railroad ownership and management.

## TRADE COMBINATION AND RAILROAD COMBINATION.

In view of the confusion of popular distinctions it is not surprising to present-day observers to see how commonly the trade combination and the railroad combination in this country are bracketed as one. The party platforms, especially in the west, have often joined the two almost in the same sentence, the campaign orator has caught the same keynote, and even writers and economists of higher intellectual cast than the politician have sometimes followed the same bent. In the impulsive reasonings of such thinkers both railroad consolidation and the trust represent "combination," both have to do with prices—under different technical terms—and both are aimed at competition; *ergo* both fall into one economic order. Certain rough and general analogies of the two may be conceded. At the same time, during a period when both the railroad and the trade combination are under fire, it is well to point out certain distinctions, practical as well as academic. Those differences may not serve for some time to come to change the face of legislation or, still less, shift public feeling. But they are fundamental enough, in the slow grinding of the economic mill, to work out ultimate results.

Railroad consolidation and the trade combination both happen to be present facts with the result of obscuring past history. The immediate synchronism fills the vision and clouds the larger fact that the consolidation of American railroads far antedated the great rise of the trusts. The one reaches back for several decades as a steady and progressive movement following a fixed law; the trade combination and the rise of the so-called "industrials" moved very slowly until they came with a veritable rush some five or six years ago. Railroad consolidation in its incipiency and progress was, relatively at least, non-speculative and based much more on economies of operation than on paper values; the "boom" of the industrials exactly reversed the process with speculation and "fiat" values at the front and administrative economies either so far in the rear as to be unseen, or, if made prominent, only for a speculative prognostic. It is true that the industrial trade combination

climax of half a dozen years ago was timed with considerable increase of the pace of railroad combination, and in some cases the application of the "holding company" device to large railroad properties, as well as with inflation of street railroad securities. But the latter was an incident of new invention rather than a logically evolved tendency; and the truism remains that, in contrast with the sudden mushroom growth of the great majority of the large trade combinations, steam roads have united under a force far-reaching, persistent, comparatively steady in its compulsion, and, in the most unqualified sense, historic. That fact alone should have some meaning for those in authority, who are called upon to deal in these days with the problems of the great railroad system.

Another distinction to be accented is one of limitation. The great railroad systems of the country have fallen naturally into a series of groups, few of them having complete local monopoly and none of them a monopoly of very long distance traffic between great terminal cities. In the evolution of these systems there seems to have been reached now a kind of territorial limit, and, as a general truth with some exceptions, indisposition on the part of one group to encroach quickly on the local domain of another. This situation may or may not continue. But it is certain that the prophecies heard three or four years ago of new combinations of a size that would dwarf the old are now stilled or heard only on the lips of the professional bull speculator. At a period of revived governmental interference there is also the spectre of federal control standing athwart the path of further consolidation on a huge scale. But on the trade combination there is in this country no territorial limit. The trust may fear government intervention, but, unlike the railroad, suffers from no natural territorial check. Whether an incorporated body of trustees or acting under voluntary agreement, its reach is for complete control of the specific commodity or set of commodities in which it deals. Indeed, substantial control of the prices of such commodities is a prime law of the trust's successful life. The railroad may thrive fairly well in the face of moderately sharp competition. The trade combination almost never.

When we come to the consumer, using that term in its most ample sense as including not only purchaser but also freighter and passenger, another divergence comes to view. In the great majority of cases the trade combination has been aimed directly at competition and has been followed pretty promptly by a rise of prices—if for no other reason, because of the quest for dividends on inflated capital. The trusts, and especially those trusts formed a few years since, were marked by a proclaimed policy of "regulation" rather than advancement of prices, but, in practice, both those ends have been sought with the advanced price more clearly than "regulation" descried by the public eye. With railroad consolidation a different economic tale is told. As a general truth, reduction of freights and fares, even in territory quite monopolized, have been steady and permanent, yet with dividends increased rather than lowered. Within three months have come the official announcements of reduced passenger fares on both the Pennsylvania and the New Haven systems. Partly, no doubt, this downward curve in freights and fares is an exponent of the high national prosperity, but may it not be even more the sequel of a condition in which genuine "regulation," system and efficiency have followed railroad consolidation? Whatever the cause or causes, the vivid contrast presents itself between recent industrial consolidation which has lifted prices for the consumer and railroad consolidation which has lowered them. And, if the further test of the relative stability of values and of credit of the two classes of prosperity is sought, one may find it by a very cursory glance at the quotations of the stock market reduced to the rate of return on the investment.

We come, finally, to the most vital distinction of all, not the less important because it is familiar and obvious—the difference between the trade combination as a *quasi* private concern, and the railroad as a "public service" corporation. In the final analysis that distinction, indeed, seems to fade away. When we search the depths of the question it is hard to see why the trade combination that controls, seeks to control or hopes to control any article of first necessity sold to every household in the land, does not stand in a relation of public service, while a corporation that sells transportation does so. The difference is technical rather than real, but, in practice, has widened into a vast gap. The trade combination is exempt from public supervision; it renders no reports, not even to its stockholders, save, in some cases, those of a most condensed character; and the most ingenious and studied legislative effort has thus far failed to exact publicity and—at any rate in the case of "voluntary" combinations—is likely to continue to fail. Such non-publicity can be and is used alike to mask prosperity, adversity and speculative manipulation of both. Contrast with this the fierce light that beats on the affairs of the railroad corporation—its reports sometimes monthly, often quarterly, always annual, one for stockholders, another, and in different form, for the state; and the complex methods of regulation shaped by hundreds of pages of state laws, and thirty-five or more state railroad commissions, besides the federal body lately charged with new power over interstate traffic! Such a disparity based upon the "public" relation or absence of it is alone enough to suggest consistency, if not wisdom, to the legislators, to the party conventions and to the campaign talkers who have been wont to blend railroad and trust in the same economic category.

Divergencies in history, in territorial limitation, in the private relation, in the public relation—all these, some of them in radical forms, come forth in the campaign of the great railroad groups and the great trade groups. How the two, with their deep, and, in some directions waxing, problems, will emerge in the far future no man can tell, and the interrogation mark set against the query is deep, dark and long. But, if the question is answered, say, a hundred years hence, we venture to say that the political economist writing then will set it down as one of the marvels of our present era that interests so divergent in form, substance, functions and public and private status were so often linked.

## July Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of July, printed in another column, contains accounts of 24 collisions and 32 derailments. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | August | Killed. | Injured. |
|---|---|---|---|---|
| 1. | Maple Hill, Kan. | 5th | 2 | 2 |
| 2. | Gulpha, Ark. | 7th | 0 | 25 |
| 3. | Chattanooga, Tenn. | 8th | 4 | 0 |
| 4. | Plantersville, Texas. | 16th | 3 | 2 |
| 5. | Hamlet, N. C. | 22d | 16 | 31 |
| 6. | Wanetа, Wash. | 22d | 4 | 7 |
| 7. | Camden, Wash. | 23d | 4 | 3 |
| 8. | Springfield, Mo. | 26th | 0 | 25 |
| 9. | New Hamburg, N. Y. | 29th | 2 | 12 |

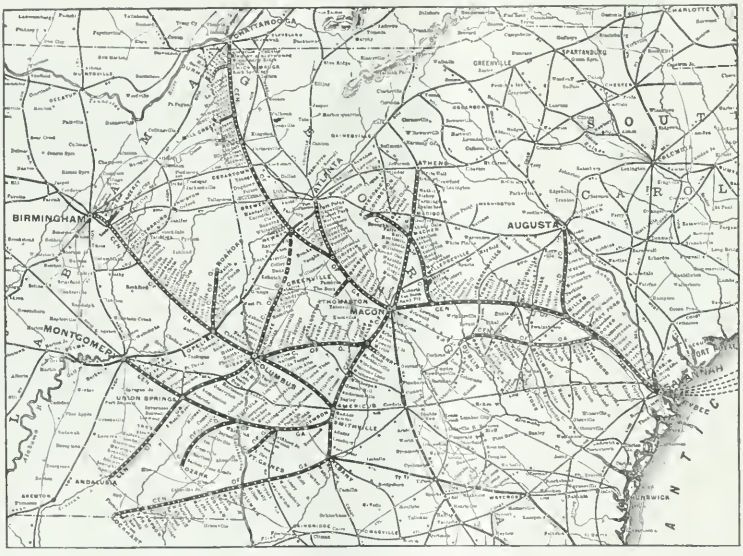
The Hamlet collision, the worst in the list, might be taken as a shining illustration of a typical weakness of the American system of managing the rights of trains on a single-track railroad. The failure of the operator to deliver the order, when explained in the government report next January or February, may or not be found to differ in detail from a large number of other failures with which the reader is acquainted. Our discipline in this respect fails often enough to make failures a familiar thing, to officers who watch this department of the work, and the question need not be called important just here. The difficulty of insuring the delivery of orders unerringly is so well recognized that provision is made against it by a rule requiring meeting orders to be sent to two places—one the meeting place and the other a place which the train will reach before approaching the meeting place. That provision appears to have been in the rules of the road in this case, but it failed. If no such precautionary provision had been prescribed, a greater dependence would necessarily have been placed on the engineman. Safety would have depended on his surely seeing and heeding *one* stop signal. Whether or not this engineman, in the absence of a rule requiring the use of the "middle" order, would have exercised extreme caution and have been able to scent the cause for not receiving an order against the opposing train at a certain place, cannot be told; but the suspicion that his knowledge of the order-at-two-places rule lessened his vigilance will occur to many minds. Whatever may be the facts in this particular, the main fact—that the numerous props provided to support our train-rule structure often fail to dovetail together as they should—is patent to all.

This collision marks progress, in one respect. It has led a state railroad commission to say that "the commission is satisfied the collision would not have occurred had the block system been in operation at that point."

The number of electric car accidents reported in the newspapers of the United States in July was 28, in which eight persons were killed and 186 injured. The most serious accident was a butting collision, due to a misplaced switch, at Martinsville, N. Y., in which the number reported killed was five and of injured 20. At Los Angeles, Cal., on the 28th, a street car was struck by a locomotive, killing three of its occupants and injuring a large number.

The Nashville Chattanooga & St. Louis has just issued a new book of rules governing the operating department. With this book the N., C. & St. L. uses the code of the American Railway Association for the first time. Up to this year the use of red signals on the front of trains to indicate a following section, and other practices which everywhere else are almost unknown to the younger railroad men, were still in vogue on the N., C. & St. L. (Our recent

allusion to the Michigan Central as the last of the large roads to adopt the standard code was not made on the assumption that the N., C. & St. L. was not a large road, but was due to the fact that its peculiarities of practice had for the moment slipped the editor's attention). Most of the essential features of the code now issued may be found in the article by Mr. Forman which is printed in this and two preceding issues of the *Railroad Gazette*. Mr. Forman has been with the Nashville, Chattanooga & St. Louis for a number of months now, and the marks of his work are to be seen throughout the book. The most notable feature of the book in which the views of the management of the road differ from those of Mr. Forman is that embraced in Rule 88. This rule requires a superior train to wait five minutes at schedule meeting points for an opposing train of the same class, although in all other cases that is to say, at stations other than the schedule meeting point, when running under the time table, and also in cases where the train is running under a "wait" order," or a "run-late" order from the despatcher—the superior train is in fact absolutely superior, being never required to wait for the opposing train a single second. It is also to be noted that the N., C. & St. L. does not require the headlights of locomotives to be concealed when a train is waiting at a meeting point. This is uncommon, but it has long been the practice there and it is also the practice on the Louisville & Nashville. The N., C. & St. L. book contains much interesting reading besides that in the standard code; i.e., in the rules of what is called the non-standard portion; the rules not discussed by Mr. Forman (although he reprints a few of them at the end of his article). These rules contain many phrases which could be adopted with profit in other codes; and the way in which the reasons for doing certain things are given in the rules in numerous cases is highly commendable. Giving the reason frequently serves to soften the attitude of a critical or unwilling employee. For example, rule 463 says that engines must not stand near stations, telegraph offices, or passenger trains "where the noise and smoke will disturb the occupants." Rule 481, forbidding the giving of a red hand signal with a white light in the same hand, which we have seen in one other code, here has the reason attached—"As a white light near a colored one prevents the colored light from being as readily seen." Passenger brakemen, when standing near a car to assist passengers, must "maintain an erect attitude; never lean against the cars," etc.




Central Railroad of Georgia.

Three different sorts of road motor vehicles are in use by the North-Eastern Railway (England) in the area which it serves. It now has at work seven motor omnibuses, 16 motor wagons and nine motor charabancs, which are helping to develop the districts in which they work. From some of these districts the company had petitions for the construction of light railroads, but, after careful consideration, came to the conclusion that they would not pay, and the motor buses were tried as a substitute. The different classes of motor vehicles have been a convenience to the people for whom they were intended. The motor wagons have assisted the farmers in carrying small parcels of agricultural produce, which they would have had a difficulty in conveying with their horses and carts, and the charabancs have been very useful for pleasure parties. Earnings from this source of traffic have not been a very important feature as yet, but they increased during the past half-year and are still growing. The possibilities of breakdowns have also been reduced by remedying certain weaknesses in the machinery of the motor buses.

## Central of Georgia.

In 1895 this company succeeded to the foreclosed properties of the Central Railroad & Banking Company of Georgia, and in 1901 there was merged with it the Chattanooga, Rome & Southern, now the Chattanooga division. The Central of Georgia has only $5,000,000 capital stock (or at the exceptionally small rate of $2,662 a mile), all of which is controlled by interests who manage the road in harmony with the Southern Railway. The capitalization is an unusual one in other ways than in the small amount of stock. In addition to various first mortgages amounting to some $35,000,000, there are preference income bonds to the amount of $15,000,000 outstanding, $4,000,000 each of first and third preference incomes, and $7,000,000 of second preference incomes. These income bonds are entitled to not more than 5 per cent. non-cumulative, when earned and full payments on all of them were for the first time made in October of last year. Payments ranging from 1½ to 5 per cent. have been made on the first incomes ever since the company was organized. The first payment on the second incomes was in 1904, when 2 per cent. was paid, and the payment of 5 per cent. on the third incomes in 1905 was the first payment on that issue.

The past fical year, in which there were large increases in earnings over the fiscal year 1905, on the basis of whose earnings payments of the full amount on all the income bonds was made, was by far the most prosperous year in the history of the road. Favorable returns for the Central of Georgia represent distinctly prosperity in the South, for the road, as will be seen by the map, is mainly a collection of branch and connecting lines, filling up a large portion of the state of Georgia, with various arms reaching west into Alabama and a northern connection for through traffic to Chattanooga, Tenn. Traffic statistics also go to make this clear, for they represent no one or two traffic specialties, but, on the whole, a general traffic. Lumber, to be sure, furnished 1,101,648 tons of the 4,675,596 tons carried in 1906, but with this exception and that of butuminous coal (684,053 tons) and fertilizers (551,932 tons), the traffic is fairly well distributed. The largest of the other items are grain, 222,000 tons; cotton and cotton products—the typical southern commodity—387,880 tons; cement, brick and lime, 247,246 tons; merchandise, 318,941 tons, and miscellaneous, 189,426 tons. The manufactures and miscellaneous group, which may usually be considered the highest grade traffic, furnished 1,561,948 tons, or one-third of the total.

The 1906 earnings were $11,396,000 gross, an increase of $1,261,000, or over 12 per cent.; and $3,160,900 net, an increase of $443,821, or over 16 per cent. After all fixed charges, including equipment trusts, rentals and a year's interest on the three classes of income bonds, there was a surplus for the year of over $503,000. Gross earnings per mile, which as lately as 1902 were only $1,292, were $6,069, an increase of $672 a mile over 1905. Net earnings per mile ($1,057 in 1902) were $1,683 against $1,447 in 1905. Passenger earnings, which as a whole increased 11.81 per cent. in 1905, were $393,252 larger in 1906, an increase of 13.77 per cent. Freight earnings showed about the same proportionate increase = $929,022. There was a slight increase in earnings per passenger mile against a decrease almost as large in the ton mile receipts. The number of revenue passenger miles was 112,175,678 against 101,319,130 in 1905, an increase of 10.72 per cent., while the number of ton miles of revenue freight increased from 595,231,752 in 1905 to 701,066,873 in 1906, a gain of 17.78 per cent. The ton miles of both revenue and company freight were 874,148,597, an increase of 18.23 per cent. over 1905.

Owing to the large amount of local and branch line traffic the train load naturally cannot compare favorably with that of an important through line or a coal and ore road, but steady increases are being made. In 1904 the average loading was 187 tons. This rose to 208 tons in 1905 and to 218 tons last year, the latter an increase of 4.65 per cent. This is for revenue freight. For all freight the train load increased from 259 tons in 1905 to 271 tons last year. The freight traffic density has been steadily on the increase since 1902, when the number of revenue tons one mile per mile of road was 255,594. Last year it was 373,339, following 316,979

in 1905. The same figure for passenger traffic was 59,737 revenue passengers one mile per mile of road against 53,955 in the year previous. The 18 per cent. larger freight traffic was carried with an increase of only 12.80 per cent. in the freight train mileage, including in this mileage the freight proportion on a car mileage basis of the mixed train mileage. The increase in freight engine mileage at the same time was less than 14 per cent. The larger traffic, therefore, seems to have been handled with reasonable economy, although the General Manager states that notwithstanding liberal expenditures for general improvements there was at times considerable difficulty in properly handling all business offered.

Under operating expenses, maintenance of way and structures increased $238,000, maintenance of equipment decreased $32,000, and conducting transportation increased $498,461; the largest increases in the latter group being in fuel for locomotives, $140,000; freight train service, $43,000; station laborers, $57,000; per diem balance, $36,000; freight loss and damage, $26,000; injuries to persons, $52,000; rent of tracks, yards and terminals, $16,000; switchmen, flagmen and watchmen, $42,000, and freight engineers and firemen, $61,000.

One important piece of new construction is under way, a new connecting line from Greenville, the terminus of a 50-mile branch running north from Columbus, Ga., to a point near Newnan on the Chattanooga division. This is to connect the Chattanooga division with the Alabama territory so as not to have to carry traffic by a roundabout route as at present. The new connection is to be 24 miles long and should be completed by November 1st. During the year, in anticipation of this construction, the Columbus-Greenville branch was widened from 3-ft. gage to standard, and about two miles of trestle on it eliminated by providing suitable waterways and by filling. Grades on the Chattanooga division were also reduced.

One hundred new side tracks and spur tracks, aggregating 13.55 miles, were built, and 58 such tracks were extended, making a total of 18.78 miles of new side track built during the year. Extensive terminal improvements are nearing completion at Albany and Savannah, Ga., which include enlargement of the yards and erection of a 2,500-ton coal bin at Albany and a new receiving yard at Savannah. There were 56 miles of new 70-lb. rails and 25 miles of new 80-lb. rails placed in the track during the year. Of the total operated mileage of 1,878 miles, 504 miles are laid with 80-lb. and 140 miles with 70-lb. rails.

Under an equipment trust there were bought during the year 450 ventilated box cars, 500 coal cars, 400 flat cars and 50 ballast cars. The outstanding obligation of the road in equipment trusts on June 30, 1906, was $2,429,765. On July 2, 1906, under an additional trust there were contracted for five switching locomotives, 10 passenger locomotives, 25 freight locomotives, 1,000 plain box cars of 60,000 lbs. capacity, and 1,000 all-steel coal cars of 100,000 lbs. capacity; these to be delivered in time for next winter's business. Fifty stock cars of 60,000 lbs. capacity were built at the Savannah shops during the year.

A new coal development on the company's lines has been put in operation through the completion of the Henry Ellen spur, 10½ miles long, operation of which was begun last month. This reaches coal lands in St. Clair County, Ala., belonging to the company and leased on a royalty basis. A minimum production of 600 tons a day is now guaranteed, and this amount under the terms of the contract is to be increased every six months until output is at the rate of 2,000 tons a day. This coal property, including lands, railroads and franchises, was bought last year for $600,000, which was paid in a new issue of purchase money first mortgage Upper Cahaba Branch bonds.

New Electric Drawbridge at Velsen, Holland.

The following are the principal statistics of the year's operation:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,878 | 1,878 |
| Passenger earnings | $2,248,396 | $2,855,145 |
| Freight earnings | 7,737,661 | 6,808,629 |
| Gross earnings | 11,396,123 | 10,135,055 |
| Maint. way and structures | 1,845,793 | 1,607,530 |
| Maint. of equipment | 1,712,132 | 1,744,226 |
| Conducting transportation | 2,892,830 | 3,394,369 |
| Operating expenses | 7,882,217 | 7,091,527 |
| Net earnings | 3,160,910 | 2,717,089 |

## NEW PUBLICATIONS.

*Water Softening and Treatment.* By William H. Booth. New York: D. Van Nostrand Co. 308 pages; 6x9 inch; 92 illustrations. Price, $2.50.

On the title page of this book there is added Condensing Plants, Feed Pumps and Heaters for Steam Users and Manufacturers. It is suggested that a descriptive title of the book might be the Preparation, Use and Manipulation of Water for Boiler Purposes. It is such a work as can be profitably read by lay manufacturers who know that they are using large quantities of water in their power plants; that there is more or less trouble connected with the same, but who do not know the reason therefor nor have any very definite idea of the proper way out.

Water softening, to which the book owes its name, occupies the longest of the five sections, into which the whole is divided. Naturally, in treating a subject of this kind, that is so purely a chemical one, the usual formulæ expressing the composition of the impurities of the water, that of the reagents used and the action that follows are employed. The language of the text, however, is such that any well-informed layman can read it intelligently, and yet it does not at all savor of the popular style that says and teaches nothing. It is such that the boiler owner who is having trouble with scale forming waters should, after reading and studying it, be able to proceed intelligently to remove his difficulties without making mistakes that will be injurious to the plant.

In its general scheme, the first section treats of the sources of water impurities and their composition, and the reactions of the agents used in its purification, taking up both the common and the less usual ones that are used; a brief chapter on scale and its effects, and one but little longer on water analysis, in which an outline of the methods to be employed in this work are given. But for a full treatment of water analysis, readers are referred to works on chemistry.

To the possible user of a water-softening plant the chapter on Apparatus in Commercial Use is especially valuable in that it gives concisely and clearly the principles upon which the successful apparatus must be made and work. Then follows another chapter giving an outline description of a number of typical apparatus that are upon the market.

The other sections deal with the subjects with which all steam users should be familiar, a familiarity that will mean much saving of expense if it is properly utilized. These subjects are air pumps, condensers, feed water heaters, water cooling, feed pumps and injectors, each of which is handled in a way that is readily understood, and in a style that tends to fix the meaning of the author in the mind without requiring an especial effort on the part of the reader. As stated at the outset, the book is one that commends itself to the attention of the boiler user who is having trouble with scale-forming waters and wishes to free himself from these annoyances.

## New Electric Drawbridge at Velsen, Holland.

The Velsen bridge, the largest of its kind in Europe, is 940 ft. long, and crosses the North Sea Canal. The bridge is partly fixed and partly rotary, the length of the draw being 427 ft. and that of the fixed spans 513 ft. It is built with a revolving pier on one side of the navigable channel, and with a supporting pier on the other side. The arms of the revolving part of the bridge are thus of equal length. One of these arms reaches over the fairway of the canal and a portion of the shore, while the other stretches over the passage way. A strong rigid bridge spans the other portion of the fairway and a part of the shore on the other side. The bridge is approximately 20 ft. 8 in. above water level, and the width of the passageway between the two piers of the canal is about 180 ft.

The rotary pier is a cylinder 45 ft. in diameter and is built of concrete faced with granite. Within this granite facing is fitted the supporting ring of granite, the divided surface of which is raised 1 cm. and bevelled off. This latter, by the intercalation of copper plates, carries the cast-iron base of the metal superstructure, and is fastened to the supporting ring by means of 216 bolts and nuts. The hollow cast-steel pivot or spindle is located upon the center of the top surface of this pier, to which it is fastened by means of six cramp irons let well into the masonry work.

The foundation of the rotary pier was placed pneumatically upon the Mortier & Thouvard system. The supporting pier, the fonndation of which was placed in the same way, is oblong at the bottom, constituting a rectangle between the semi circles. It is also of concrete, reinforced at the upper surface with granite. The protecting pillar was built by sinking a bottomless cylinder or jacket to a depth of about 49 ft.; as no weight is ever thrown upon the

pillar, which merely serves to lock or bolt the bridge open, the pneumatic system of construction was not necessary in this case. The total substructure of the bridge, including piers and abutments, cost $160,000.

The bridge is built for a double railroad track and has three main bearings. Following the method adopted for large American revolving bridges, the rotary part rests upon the rotary pier by means of a ring of rollers.

The weight of the revolving portion of the bridge is about 1,100 tons, unloaded, the weight being calculated at 2,100 tons when the bridge is closed and under load.

## The New Standard Code.

BY H. W. FORMAN.

*(Concluded from page 156.)*

### FORMS OF TRAIN ORDERS.

FORM A. FIXING MEETING POINTS.

EXAMPLES.

(1.) *No 1 Eng 20 will meet No 2 Eng 30 at B*

(2.) *No 3 will meet Second No 4 at B*

(3.) *No 5 will meet 1st No 40 North at B.*

(4.) *Ex 50 South will meet Ex 60 North at B*

(5.) *No 1 and Second No 3 will meet Nos 2 and 4 at B and Two Exs 70 and 80 North at C*

Trains receiving these orders will run with respect to each other to the designated points and there meet in the manner provided by the rules.

FORM B. DIRECTING A TRAIN TO PASS OR RUN AHEAD OF ANOTHER TRAIN.

EXAMPLES.

(1.) *No 1 will pass No 3 at B.*

(2.) *No 6 will pass No 1 when overtaken.*

(3.) *Ex 20 South will run ahead of No 3 B to E*

(4.) *No 15 will run ahead of No 1 from B until overtaken.*

(5.) *No 15 will run ahead of No 1 C to Z unless overtaken.*

When, under Example 1, a train is to pass another, both trains will run according to rule to the designated point, and there arrange for the rear train to pass promptly.

Under Examples 2, 4 and 5, both trains will run according to rule until the train in advance is overtaken at some siding, and there arrange for the following train to pass promptly.

Under orders similar to example 3, the second named train must consider the character of the train first named and look out for it, especially on heavy ascending grades or where the view is obstructed, but this in no way relieves the first named train from properly protecting.

When an inferior train receives an order to pass a superior train, right is thereby conferred to run ahead of it.

FORM C. GIVING RIGHT TO A TRAIN OVER ANOTHER TRAIN.

EXAMPLES.

(1.) *No 2 has right over No 1 B to D.*

(2.) *Ex 20 North has right over No 3 B to D.*

(3.) *Ex 30 South has right over all trains 1 to Z.*

This form of order makes the train over which right is given inferior to the train which is given right over it, between the points named, and it must not enter the designated limits without further orders over the train thus made superior, unless its time can be cleared at least five minutes.

If two trains moving in the first or last named point, the train which is inferior by rule must take siding. Between the designated points, the train over which right is given must take siding, unless otherwise instructed by order.

If the trains meet within the limits named, the train over which right is given must identify itself to the other train.

FORM E. TIME ORDERS.

EXAMPLES.

(1.) *No 1 will run twenty 20 mins late A to E*

(2.) *No 1 will run one 1 hour and twenty 20 mins late D to E one 1, hour and fifteen 15 mins late E to B etc.*

Examples 1 and 2 make the schedule time of the train named, between the stations mentioned, as much later as stated in the order, and any other train receiving the order is required to run with respect to this later time, as before required to run with respect to the regular schedule time

(3.) *No 1 will wait at E until ten five 10.05 a m for No 2.*

Under Example 3, the train first named must not pass the designated point before the time given, unless the other train has arrived. The train last named is required to clear the time specified, at the designated point, or any intermediate station where schedule time is earlier than that named in the order, at least five minutes.

(4.) *No 1 will wait at E until ten fifteen 10 15 a m.*

Under Example 4, the train named must not pass the designated point before the time given. Any opposing train receiving the order is required to clear the time specified, at the designated point, or any intermediate station where schedule time is earlier than that named in the order, at least five minutes.

(5.) *No 1 will run on the following late schedule*

*Leave A eleven thirty 11 30 p m*

*" B twelve twenty five 12 25 a m*

*" C one forty seven 1 47 a m*

*Leave D two twenty two 2 22 a m*

Example 5 makes the schedule time of the train named, between the stations mentioned, as shown in the order, and any other train receiving the order is required to run with respect to this later time as before required to run with respect to the regular schedule time. The train named loses its schedule when twelve hours behind time table schedule time, as prescribed by Rule 82

FORM F. CREATING AND CHANGING SECTIONS.

EXAMPLES

(1.) *C to E Engs 20 and 30 1*

*Engs 20 and 30 will display signals and run as First and Second No 1 1 to Z*

(2.) *Eng 40 will run as Third No 1 1 to Z*

(3.) *Engs 50 60 and 70 will run as First Second and Third No 1 1 to Z*

(4.) *C to E No 1 and Engs 80 1*

*No 1 will display signals 1 to E for Eng 80*

(5.) *Second No 1 will display signals 1 to E for Eng 90*

Under Example 3, engines 50 and 60 must display signals. See Rule 20

(6.) *C to E 1st and 2d No 1 E*

*Eng 30 is withdrawn as Second No 1 at E. First No 1 take down signals at C to E 1st 2d and 3d No 1 E*

Under Example 6, engine 30 surrenders its authority to run as second No 1, and its train orders become void at E.

When it is necessary to take down signals before reaching the point to which they were directed to be displayed instructions will be given as shown in this example or the order creating the section will be annulled. An order may be given to again display signals.

(7.) *C to E 1st 2d and 3d No 1 E*

*Eng 20 is withdrawn as First No 1 at E. Following sections change numbers accordingly.*

Under Example 7, engine 20 surrenders its authority to run as first No 1, and its train orders become void at E, and the following sections must take the next lower number.

(8.) *C to E Eng 40 and 1st 2d and 3d No 1 E*

*Eng 40 will display signals and run as First No 1 E to Z. Following sections change numbers accordingly*

Under Example 8, engine 40 is made first No 1 at E, and the following sections must take the next higher number.

(9.) *Order No — is annulled Engs 60 and 50 will run as First and Second No 1 1 to Z Eng 60 puts Eng 50 at L.*

Example 9 may be used to pass a section by another, the order or instructions annulled being those which created the section. The section to be passed must not take down signals until the section which is to pass it has arrived.

The character of sections may be stated. Those affected must receive the orders, and must arrange signals and numbers accordingly

FORM G. EXTRA TRAINS

EXAMPLES

(1.) *C to L Eng 20 1*

*Eng 20 will run extra 1 to L*

(2.) *Eng 30 will run extra 1 to E and return.*

(3.) *Eng 40 will run extra 1 to E and return to B*

Under Examples 2 and 3, the extra should go to E before returning, but, when necessary, the return portion of the order may be used without doing so. Whether the extra runs to E or not, all of its orders become void upon its return to the point to which it is directed to return.

(4.) *Eng 50 has until nine fifty 9 50 a m to run extra D to E*

Under Example 4, the extra named must understand that its authority to run extra between the stations named becomes void five minutes before the time mentioned in the order

(5.) *Eng 60 will run extra leaving 1 Thursday Feb 17th as follows with right over all trains.*

*Leave A eleven thirty 11 30 p m*

*" B twelve twenty five 12 25 a m*

*" C one forty seven 1 47 a m*

*Leave D two twenty two 2 22 a m*

Example 5 may be varied by specifying the kind of extra and the particular trains over which it shall or shall not have right. Trains over which the extra is thus given right must clear the time of the extra at least five minutes.

When practicable, extra trains should be given running orders to their destination at the starting point

FORM H. WORK EXTRAS.

EXAMPLES.

(1.) *C to L Eng 20 1*

*Eng 20 will work ext a s x thirty 6 30 a m until six thirty 6 30 p m between 1 and B*

Under Example 1, the work extra is not required to protect against extra trains. The time of regular trains must be cleared as prescribed by the rules.

A work extra may be directed to clear the track for, or protect itself after a certain hour against a designated extra by adding to Example 1 the following words:

(2.) *and will keep clear of* (or, *protected against*) *Ex 30 South between 1 and B after two ten 2 10 p m*

Under Example 2, extra 30 south must not enter the working limits until 2 10 p. m., and then run expecting to find the work extra clear of the main track, or protecting itself as the order may require.*

When the movement of an extra over working limits cannot be anticipated by these or other orders to the work extra, an order must be given such extra to protect itself against the work extra in the following form.

(3.) *Ex 30 South will protect against Work Ex 20 between 1 and B.*

Under Example 3, extra 30 south must protect against the work extra as prescribed by Rule 99. This may be added to the order to run extra.

When it is desirable that a work extra shall at all times protect itself against extra trains while on working limits, it may be done by adding to Example 1 the following words

(4.) *protecting against extras* (or, *protecting against Southbound extras.*)

A work extra receiving this order must, whether standing or moving, protect itself within the working limits, as prescribed by Rule 99, in one or both directions, as the order requires.

Extra trains must not be run over working limits without notice of and provision being made for passing the work extra. When the other forms are not necessary, notice may be given as follows

(5.) *Work Ex 20 is between 1 and B.*

Extra trains receiving this order will run expecting to find the work extra protecting itself.

To enable a work extra to work upon the time of a regular train, the following form may be used:

(6.) *Work Ex 20 will protect against No 15* (or *all Third Class trains*) *between 1 and B*

Under Example 6, the work extra may work upon the time of the train, or trains, mentioned in the order, and must protect against such train, or trains, as prescribed by Rule 99. The regular train, or trains, receiving the order will run expecting to find the work extra protecting.

When a work extra is given an order to protect against all regular trains except, say first or second class trains, it must clear the time of the regular trains excepted.

(7.) *Work Ex 20 has right over all trains between 1 and B seven thirty 7 30 p m until eleven thirty 11 30 p m*

Under Example 7, the work extra has the exclusive right between the points designated, between the times named.

Work extras must give way to all trains as promptly as practicable.

Work extras must clear the time named in their train orders at least five minutes, except as prescribed by Rule 91

FORM J. HOLDING ORDER.

EXAMPLES

(1.) *Hold No 1 at C*

(2.) *Hold all Southbound trains at C*

These orders will be addressed to the operator and acknowledged in the usual manner. He will deliver copies to trains which he is directed to hold without requiring signatures.

When a train has been so held, it must not proceed until the order to hold is annulled, or an order is given to the operator in the form:

"——— *may go*."

Copies of this order will also be delivered to trains which the operator was directed to hold without requiring signatures.

Form J will only be used when necessary to hold trains until orders can be given, or in case of emergency

FORM K. ANNULLING A SCHEDULE OR A SECTION

EXAMPLES

(1.) *No 1 of Saturday Feb 25th is annulled 1 to Z.*

(2.) *No 3 due to leave 1 Sunday Feb 26th has arrived at E and is annulled E to Z*

(3.) *Second No 5 of Monday Feb 27th is annulled 1 to Z*

(4.) *Third No 7 of Tuesday Feb 28th has arrived at E with no signals and is annulled E to Z*

The schedule or section annulled becomes void between the points named and cannot be restored.

---

*NOTE.—Should the work extra be found at A before 2 10 p. m., there would be no objection to extra 30 south entering its limits before the time named, provided the precaution was taken to insure that the work extra was at the station mentioned with its entire train.

FORM L. ANNULLING AN ORDER.

EXAMPLES.

*Order No 10 is annulled.*

If an order which is to be annulled has not been delivered to a train, the annulling order will be addressed to the operator, who will destroy all copies of the order annuled but his own, and write on that:

*Annulled by Order No* ——.

An order which has been annulled must not be reissued under its original number.

FORM M. ANNULLING PART OF AN ORDER.

EXAMPLES.

*That part of Order No 10 reading No 1 will meet No 2 at B is annulled.*

FORM P. SUPERSEDING AN ORDER OR A PART OF AN ORDER.

This is done by adding to prescribed forms the words "instead of — ."

EXAMPLES.

(1.) *No 1 will meet No 2 at B instead of E.*

(2.) *No 2 has right over No 1 Z to Y instead of to E.* (or, *instead of meeting at E.*)

(3.) *No 1 will display signals for Eng 50 A to Z instead of to E.*

(4.) *Eng 40 instead of Eng 50 will display signals and run as First No 1 E to Z.*

An order which has been superseded must not be reissued under its original number.

## LONDON & PARIS RAILROAD.

### CLEARANCE CARD. FORM A.

*Station* Paris *Date* June 15 *190 6*, *Time* 8 35 P *M.*

*To Conductor and Engineman Train* 108

*I have* ..(No)... (3)... *orders for your train.*

*On account of a preceding train do not leave this station until* 8 40 P *M.*

Jones *Operator.*

Clearance Cards, properly filled out, must be delivered with all train orders, and also as prescribed by Rules 83 and 221.

Conductors and enginemen must each have a copy and see that their train is correctly designated, also see that the total number of orders received corresponds with the number inserted above.

When necessary to deliver Clearance Cards to a train for which there are no orders, operator will write "No" in the blank space provided.

To be printed on pink manifold paper (4x6 inches).

Form 19 | **LONDON & PARIS RAILROAD** | Form 19

*Train Order No.* 30 June 15 *190 6*

*To* **C. & E.**

Opr

*At* Johnstown *Station.* *X* *Opr.:* *M.*

Ex 20 South will meet Ex 30 North at Johnstown

X Y Z *Superintendent*

Conductor and Engineman must each have a copy of this order.

*Made* Com *Time* 2 30 a *M.* Smith *Operator.*

To be printed on pale green paper. Space for the order 5½ in. x 7 in.

Form 31 | **LONDON & PARIS RAILROAD** | Form 31

*Train Order No.* 20 June 15 *190 6*

*To* **C. & E.** No 1 and Ex 20 South

*At* Brownville *Station.* *X* A B C *Opr;* 1 10 a *M*

No 1 Eng 70 and Ex 20 South will meet No 2 Eng 80 at Smithville.

No 1 will run one 1 hour and ten 10 mins late Brownville to Williamsburg.

X Y Z *Superintendent.*

Conductor and Engineman must each have a copy of this order.

*Repeated at* 1 15 a *M.*

| CONDUCTOR | TRAIN | MADE | AT | OPERATOR |
|---|---|---|---|---|
| White | No 1 | Com | 120 a | Black |
| Green | Ex 20 | Com | 130 a | Black |

To be printed on pale yellow paper. Space for the order 5½ in. x 7 in.

FORM

## LONDON & PARIS RAILROAD.

..... Station ..190.

To C. & E. ...

5 inch

3½ inch.

Chief Train Despatcher.

This form will be used as prescribed by Rule 95. Conductors must know by consulting train register that signals have been displayed for their trains.

| Conductor | Train. | Conductor. | Train. |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

To be printed on white manifold paper

SAMPLES OF GENERAL RULES.

337. Trains must be opened to clear public crossings while standing at stations, and in no case may a crossing be blocked longer than five minutes. While passenger trains are at stations, other trains must avoid blocking the passageway to them.

341. At railroad crossings at grade, unprotected by interlocking, trains must stop, and, if view is obstructed, one of the crew must go to the crossing and give signal when safe to proceed.

Cars or engines must not be allowed to stand on railroad crossings.

353. To avoid damage to track and bridges, care must be exercised in the movement of engines not having main or side rods in place. They must not be moved in fast freights, and under no circumstances may a speed of twenty miles an hour be exceeded. They shall be in charge of a competent man, who must frequently advise the conductor as to their condition. When practicable, side rods must be up.

354. Steam shovels, derricks, pile drivers, gun truck cars, twin loads and cars upon which are loaded heavy or long girders, or other similar freight, must be moved at a speed that is safe.

355. As far as practicable, running switches must not be made. When it is done, switch and hand brakes should be tested to see that they are working properly. Cuts should be given sufficient start to run them in to clear, care being taken that speed is not such as will prevent them from being stopped before striking other cars. Do not attempt to throw switch unless there is a good space between the two cuts to admit of its being done safely. Be on the alert so that if switch is not thrown the two cuts will not collide.

365. When conductors or enginemen change off before completing their

trip, they must exchange any train orders or instructions they may have, and each must know that his train orders or instructions are perfectly understood by the other. The conductor or engineman changing must compare the train orders or instructions he receives with those in the hands of the conductor or engineman of the train to which he exchanges, before proceeding.

376. In transmitting slow orders, name a speed that is safe, and instructions will be issued accordingly. Speed indicated must not be exceeded.

377. When signals are displayed to warn enginemen of unsafe track or bridges, a white signal should be placed on the engineman's side of the track at the point where usual speed may be resumed.

378. When a train order is placed at a station where the order signal is located at or outside of the switch which is used by inferior trains in going on the siding, restricting a superior train for an inferior train in the opposite direction, train despatcher will use the form "No. —— gets this order and will meet No. —— at ——." The inferior train shall then take into consideration the place where the superior train is likely to stop, and will govern its movements accordingly. When possible, the order must be sent to the superior train before reaching such station.

379. As the lights in train order signals are not required to be kept displayed at day offices after operators are excused for the night, care is enjoined upon all to prevent accident when an order is sent to a superior train at such stations between the hours of seven p. m. and seven a. m. Train and engine crews must observe order signals at all times and respect the stop indication, even though the light may have failed. As far as practicable, train despatchers should avoid restricting trains at such points during the night, and must advise with and know that newly appointed operators understand the danger of depending entirely upon the order signal. Operators must carefully watch the light, and, in addition, when necessary, use other stop signals. When torpedoes are used, they should be placed far enough from the order signal to insure stopping the train in time, but not where persons about the station might be injured by them.

393. At meeting points, if the superior train arrives first and holds the main track, it shall, if practicable, and if near it, open the switch for the inferior train to pull into siding; but this in no way relieves the inferior train from approaching under such control that it can stop at the initial switch.

SAMPLES OF INSTRUCTIONS FOR TRAIN DESPATCHERS.

433. In fixing meetings at stations on heavy descending grades, or where the order-signal is in an obscure location, or is near the switch at which trains enter the siding, special precautions must be taken. The train that is to be restricted must be stopped, unless the order has been delivered to it at some other station. If the order has not been thus sent to another station, the train must be stopped before the other train is allowed to act on the meeting order.

434. Familiarize yourselves with the conditions at stations, and, in issuing restricting orders, consider the conditions of the weather and the rail. Remember the danger of brakes failing.

During heavy fog, require operators to space trains a safe distance apart.

As far as possible, prevent trains from bunching at stations in such manner as to cause delay in passing.

Instructions must be issued that will insure full protection when a train is rapidly gaining upon another, or when a train starts from a point where the crew do not have opportunity to inform themselves of trains closely following.

When it is known that a train has work to do on a heavy descending grade, an obscured curve, or any unusual place, following trains should be advised.

Operators must be required to report trains promptly, and at registering points to report the signals registered by sections.

Each figure and word of a train order must be written or underscored while it is being repeated.

Under circumstances admitting of a doubt, do not attempt to hold a train upon the operator's statement that it has not passed.

Avoid a combination of orders which might cause misunderstanding. When a train order is misunderstood it must be annulled or satisfactorily explained, and the person in error corrected. When a condition exists that might result in an accident, warn all concerned.

All trains to meet at a station by train order must be included in the order, and such additional information given as may be necessary to avoid collision between trains in the same direction, or prevent a train from moving against another through misunderstanding or lack of information. Inferior trains which are closely following to properly govern their movements, must be given copies of all time orders restricting sections in advance.

When a crew is unacquainted with the division, or when necessary to move an engine without a conductor, take extra precautions, surrounding such trains with every safeguard.

## Wreck of the Interstate Bridge Draw-Span.

A view is shown herewith of the wrecked draw-span of the Interstate bridge connecting Duluth, Minn., and West Superior, Wis., the result of a collision with a large package freighter on August 10. As is plainly seen in the view, the boat struck the bottom chord of the first panel on the near side of the pivot pier, smashing same and causing the entire span to collapse. The force of the shock also displaced the span from the turntable. The draw-span is one of the largest ever built, being 493 ft. long and 58 ft. wide over all. The structure carried four tracks and the steel work in the whole bridge weighed about 2,500,000 lbs. The bridge also has two fixed spans 300 ft. long. The draw opening allowed two waterways 200 ft. wide in the clear. The bridge was designed by Mr. A. P. Boller, M. Am. Soc. C. E., New York, and was opened in the summer of 1897. It belongs to the Great Northern R. R. and was used for both steam and street railroad and highway traffic.

The wrecking of the bridge closed the channel, of course, causing a suspension of commerce, a number of vessels, both freight and passenger, being shut up in the harbor. To attempt to open the channel by removal of the disabled draw-span would have meant an indefinite delay, so it was decided to remove instead one of the fixed spans—the one directly south of the draw, which is the Wisconsin side. This was done by means of four scows which were sunk beneath the span, a timber cribbing built up on them and the water then pumped out. The span was floated to a temporary pile support, navigation being resumed on the afternoon of August 13. It is estimated that the bridge cannot be restored in less than a year. The traffic carried by the bridge is being conducted by ferries.

The Wrecked Draw-Span of the Interstate Bridge.

## Foreign Railroad Notes.

An Austrian car works exhibits at Milan a street car intended to be rented by the day to private parties, just as special private street cars are rented in this country.

After extensive experiments, the government of Bavaria has decided to equip railroad trains with wireless telegraphy. On one of the tests a message was transmitted to the Minister of Railroads, who was on a train, from Berlin, 200 miles away.

It is reported from St. Petersburg that an official inquiry at Tomsk into the conduct of the Siberian Railway during the war has brought to light the fact that the government was at one station alone defrauded of $350,000, and that on the whole line some 1,500 cars disappeared.

Score one for France! On the Orleans Railroad, in each car of an express train which leaves Paris at 9:49 a. m. the despatches of the Associated Press, or what answers to it in France, are posted, and again at Poitiers at 2 p. m., so that on arriving at Bordeaux at 5 the passengers need not buy an evening paper.

## Iron and Steel Production.

The following comparative statistics of iron and steel production in the United States in 1905 and 1904 are taken from the Annual Statistical Report of the American Iron and Steel Association.

The production of all kinds of pig iron by states in 1904 and 1905, according to their rank in each year, was as follows:

| States. | 1905. Rank. | Gross tons. | Per cent. | States. | 1904. Rank. | Gross tons. | Per cent. |
|---|---|---|---|---|---|---|---|
| Pennsylvania | 1 | 10,579,127 | 46.01 | Pennsylvania | 1 | 7,644,321 | 46.34 |
| Ohio | 2 | 4,586,110 | 19.95 | Ohio | 2 | 2,977,929 | 18.05 |
| Illinois | 3 | 2,034,483 | 8.85 | Illinois | 3 | 1,655,991 | 10.04 |
| Alabama | 4 | 1,604,062 | 6.98 | Alabama | 4 | 1,453,513 | 8.81 |
| New York | 5 | 1,198,068 | 5.21 | New York | 5 | 605,709 | 3.67 |
| Virginia | 6 | 510,210 | 2.22 | Virginia | 6 | 310,526 | 1.88 |
| Missouri, Colorado | 7 | 407,774 | 1.77 | Tennessee | 7 | 302,096 | 1.83 |
| Tennessee | 8 | 372,692 | 1.62 | Maryland | 8 | 293,441 | 1.78 |
| Wisconsin, Minnesota | 9 | 351,415 | 1.53 | West Virginia | 9 | 270,945 | 1.64 |
| Maryland | 10 | 332,096 | 1.44 | New Jersey | 10 | 262,294 | 1.59 |
| New Jersey | 11 | 311,039 | 1.35 | Michigan | 11 | 233,225 | 1.41 |
| West Virginia | 12 | 298,179 | 1.30 | Wisconsin, Minnesota | 12 | 210,404 | 1.28 |
| Michigan | 13 | 288,705 | 1.26 | Missouri, Colorado | 13 | 151,776 | .92 |
| Kentucky | 14 | 63,735 | .28 | Georgia, Texas | 14 | 75,686 | .46 |
| Georgia, Texas | 15 | 38,699 | .17 | Kentucky | 15 | 37,106 | .23 |
| Connecticut | 16 | 12,521 | .05 | Connecticut | 16 | 8,922 | .05 |
| Massachusetts | 17 | 3,466 | .01 | Massachusetts | 17 | 3,149 | .02 |
| Total | | 22,992,380 | 100.00 | Total | | 16,497,033 | 100.00 |

The following table gives separately the production of Bessemer ingots and castings since 1898, all made by the acid process. Prior to 1898 Bessemer castings were included with ingots. Basic Bessemer steel has not been made in this country since 1897.

| Year. | Gross tons— Ingots. | Castings. | Total. |
|---|---|---|---|
| 1898 | 6,605,478 | 3,539 | 6,609,017 |
| 1899 | 7,582,415 | 2,939 | 7,586,354 |
| 1900 | 6,678,303 | 6,467 | 6,684,770 |
| 1901 | 8,706,538 | 6,764 | 8,713,302 |
| 1902 | 9,125,815 | 12,548 | 9,138,363 |
| 1903 | 8,574,730 | 18,099 | 8,592,829 |
| 1904 | 7,843,089 | 16,051 | 7,859,140 |
| 1905 | 10,919,272 | 22,103 | 10,941,375 |

The production of all kinds of rails in 1905 amounted to 3,375,929 tons, against 2,284,711 tons in 1904, an increase of 1,091,218 tons, or 47.7 per cent. The maximum production was reached in 1905. The year of next largest production was 1903, when 2,992,477 tons were rolled. The increase in 1905 over 1903 amounted to 383,452 tons, or over 12.8 per cent. Rails rolled from purchased blooms, crop ends and "seconds," and rerolled, or renewed, rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. In the following table the production of all kinds of rails in 1905 is given by states, in gross tons, followed by the total annual production since 1897.

| | Gross tons— Bessemer. | Open-hearth. | Iron. | Total. |
|---|---|---|---|---|
| Pennsylvania | 1,097,154 | 18,687 | ..... | 1,115,841 |
| Other states | 2,095,193 | 164,577 | 318 | 2,260,088 |
| Total for 1905 | 3,192,347 | 183,264 | 318 | 3,375,929 |
| Total for 1904 | 2,137,957 | 145,883 | 871 | 2,284,711 |
| " " 1903 | 2,946,756 | 45,054 | 667 | 2,992,477 |
| " " 1902 | 2,935,392 | 6,029 | 6,512 | 2,947,933 |
| " " 1901 | 2,870,816 | 2,093 | 1,730 | 2,874,639 |
| " " 1900 | 2,383,654 | 1,333 | 695 | 2,385,682 |
| " " 1899 | 2,270,585 | 523 | 1,592 | 2,272,700 |
| " " 1898 | 1,976,702 | 1,220 | 3,319 | 1,981,241 |
| " " 1897 | 1,644,520 | 500 | 2,872 | 1,647,892 |

## The Government Railroad Monopoly in Italy.

### III.

BY ING. COMM. GIUSEPPE SPERA.

When the Italian government took over the management of the two great Mediterranean and Sicilian railroad systems, it left unsettled the yet more serious problem of the repurchase of the Adriatic railroad system, owned largely by the Southern Railroad Company.

But if, as we have said, the government was unlucky in taking its first step in this direction, owing to its lack of preparation and to the character of its agent, the man who rose from the position of a mediocre civil servant to that of Minister of Public Works, bringing to the discharge of his new duties all the defects of a bureaucrat and none of the qualities of a statesman, it has had better luck in the solution of the much more difficult and complex problem of the repurchase of the Southern Railroads.

This is due not only to greater forethought on its part, and to the longer study given to the question, but more especially to the competent and enlightened men who have dealt with it. The negotiations with the company were long, and were renewed on three occasions, owing to the political vicissitudes which in a short period called three different men to the supreme direction of the Ministry of Public Works, Ferraris, Carmine and Gianturco. The real solution of the problem was, however, bound by the two last; by Engineer Carmine, a talented man equipppd with a thorough understanding of railroad questions, and by Prof. Gianturco, the famous jurist, a man of keen and versatile intellect, one of the most illustrious men of Italy.

Useful and enlightened assistance has also been given in this great undertaking by two talented engineers, the Manager General of the State Railroads, Engineer Bianchi, who showed consummate skill in overcoming the enormous difficulties involved in taking over the management of the railroads at a most critical moment and under most unsatisfactory conditions; and Engineer Rava, one of our finest civil engineers, who combines technical knowledge with an exceptionally wide and modern culture, and a clear insight into the problems connected with the economic revival of Italy.

The repurchase of the Adriatic railroad system presented a complex problem. The Italian Southern Railroads Company ran the Adriatic system, which was composed as follows:

| | Miles. |
|---|---|
| Lines granted to the Italian Southern Railroad Co. by laws and concessions prior to 1888 | 1,070 |
| Lines granted to the company by the law of July 20, 1888, No. 5550 (3d series) and of July 2, No. 269 | 280 |
| Lines granted to several companies but managed by Adriatic Company | 101 |
| Total | 1,451 |

Besides these, the Southern Railroad Company had obtained a further grant of 65 miles by laws prior to 1888, but this mileage had been leased to the Mediterranean Company.

In the case of the railroad concessions granted by laws made before 1888, the government undertook to pay $6,838,070 annually to the companies, to whom the concessions had been granted for the whole durations of the lease, that is to say, until December 31, 1951, for a small portion of these lines, and until December 31, 1966, for the balance.

In the case of railroad concessions granted by the law of July 20, 1888, the subvention amounted to $1,725,901, until December 31, 1966, besides $30,940 for works carried out along the Po by the company.

By the terms of the concession the government could reacquire possession by the payment to the company of an annual grant till the expiration of the lease, to be calculated on the net annual income for the last seven years, from which were to be deducted the receipts for the least profitable years.

The concession, sanctioned by the law of April 27, 1885, No. 3048, which divided the Italian Railroads into three great systems, the Mediterranean, the Adriatic and the Sicilian, contained a clause by which, on the expiration of this concession, its fundamental conditions could only be applied after a lapse of seven years, that is to say, on the 1st of July, 1912.

Moreover, the terms of the concession made in 1885 settled that the government was to pay to the Adriatic Company, first, the subvention for the lines granted before 1888, $6,162,095, instead of $6,838,070, as the sum of $675,975 due by the company to the government was deducted therefrom, leaving intact the other subventions of $1,720,201 and $30,940.

Notice of withdrawal of the concession having been given, the contract with the companies ceased on June 31, 1905, but while the government took over the railroads belonging to the Mediterranean and Sicilian lines, it added thereto, for the needs of the service, a very small portion of the Adriatic line, and asked for a year's delay in which to settle the question of the repurchase of the Southern lines.

Meantime progressive measures were taken for ensuring the regularity of the service, and the companies were paid for the winding up of the lease the stipulated sums, to which no demur was raised. The annual subvention paid by the government to the company was taken as the basis of the future agreement.

By a preliminary agreement, dated May 15, 1905, the Adriatic Company, along with other measures of secondary importance, agreed to a reduction of $177,080 on the subvention for the lines which had received concessions before 1888, thus fixing that sum at $5,985,000. To this was added the subvention of $1,720,201 for subsequent concessions, besides the annual payment of $30,940 for other works, the other subventions above mentioned remaining unaltered. This agreement aroused in the Italian Parliament and throughout the country the most animated discussions of a political, social and financial character.

On one hand, the principal towns along the Southern Railroad lines petitioned Parliament for the speedy repurchase of those lines, since private railroad service was injurious to their interests now that the government controlled the lines in other parts of Italy.

Similar claims were urged by the railroad employees of the Southern lines, who were extremely anxious to enter the service of the government. The political parties in the country, each from its own special point of view, discussed the question, supporting or combatting the idea of a government monopoly, and finally the Parliamentary Commission itself, appointed to study the scheme of repurchase, divided up into a majority and a minority, the former favoring the repurchase on the terms fixed by the agreement between the government and the companies, the latter opposing it as imposing excessive burdens on the state. The majority in the Commission, looking upon the agreement from a purely financial point of view, simplified the matter by asking itself whether the annual payments which the government would

...ment, should it not recommend the Southern lines, would be harder or rather than these it would have to meet if the purchase were made on the proposed terms. The calculations of the Commission showed that by making the purchase the government would reduce its obligations by nearly $1,000,000 a year.

On the other hand, the majority in the Commission, taking into consideration a number of circumstances, came to a diametrically opposite conclusion, according to the minority the government by consummating this purchase would have to meet an annual loss of $2,185,200.

Meantime the government after several ministerial crises managed in the course of subsequent negotiations to reduce the subvention to another $1,000,000, and later on a further reduction of $600,000 was agreed to so that the annual subvention for the railroad lines leased before 1885 was reduced to $5,700,000 for the remainder of the lease, that is to say, in most cases, till December 31, 1905. The other articles of the previous agreements were then essentially confirmed. Among these the agreement by which the employees of the Southern lines, with the exception of those who remained in its service—for the company did not wind up—are taken over by the government from July 1, 1906, confirming the positions and wages in force on March 1, 1906, is of special interest.

This agreement finally obtained the sanction of both Houses of Parliament, certainly not because they were convinced of its intrinsic excellence, but because it was looked upon as an inevitable financial necessity, for in view of the conditions of the Italian railroads it would have been an unpardonable error to stop half way. The principal of a government railroad monopoly having been accepted and being already in force on a great many lines, it would have been an abnormal and absurd state of affairs to continue private operation on the others, and as the repurchase of the important southern lines became a necessity to which all other considerations were quite secondary. The winding-up of the Southern Railroads Company, that is to say, the final settlement of many points is certainly not yet concluded and will offer many difficulties, but for these also a solution will undoubtedly be found, because of the clear headed way in which the problem is being met.

And it is on the well-balanced national mind that reliance must ultimately be placed for though the government now owns a railroad monopoly, the present railroad administration has all the characteristics of a temporary makeshift. A law is needed to fix the limits and conditions of the new and important service, which we wish to see quite autonomous, but which now has to face difficulties on all sides arising from defects in the administrative laws of the country; a law is needed to establish a real and rational working plan, and while all those measures which should guide the administrative working of the railroads are lacking, these latter are not only in need of renovation in view of their present insufficiency, but also require a deep and radical modification of their technical and financial basis, which to-day is far from corresponding to that which the country has a right to expect, after so many financial sacrifices and such long and harmful delays.

## Accident Bulletin No. 19.

The Interstate Commerce Commission has issued Accident Bulletin No. 19 giving the record of railroad accidents in the United States during the three months ending March 31, 1906. The number of persons killed in train accidents was 274 and of injured 3,806. The total number of casualties from train accidents and other causes was 10,208 (1,126 killed and 17,179 injured). These accidents are classified in the following table. These reports deal only with the passengers and the employees on duty.[1]

Table No. 1.—[illegible] to Persons.

| | Passengers | | | Employees | | | Trespassers | | |
|---|---|---|---|---|---|---|---|---|---|
| | Killed | Injured | Total | Killed | Injured | Total | Killed | Injured | Total |
| [illegible] | 4 | 15 | 19 | 147 | 1,747 | 1,894 | 196 | 1,246 | 1,442 |
| [illegible] | — | 25 | 25 | 14 | 70 | 84 | 70 | 1,105 | 1,175 |
| Misc. [illegible] | 1 | 1 | 2 | 17 | 46 | 63 | 10 | 47 | 57 |
| [illegible] | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2

| No. | Class | Kind of train. | Killed. | Injured. | Damage to engines, cars & company property. | Reference to record. | Cause. |
|---|---|---|---|---|---|---|---|
| | | | | | | | Derailment: No. 15. (See below.) |
| 15 | P. | F & F. | 1 | 3 | [illegible] | 72 | [illegible] and engineman eastbound [illegible] to meet westbound No. [illegible] proceeded to execute it with such [illegible] attention that they forgot [illegible] previously received to meet No. 71. |
| 16 | M | F & F | 1 | 0 | [illegible] | [illegible] | Runaway on descending grade; train [illegible] of 25 cars; 9 braked and 9 [illegible] cars; 4 empties. |
| 17 | B. | P. & P. | 3 | 20 | [illegible] | 25 | No. [illegible] running 15 minutes [illegible] by despatcher's orders failed to [illegible] meeting station, as [illegible] |
| 18 | B. | P. & P. | 1 | 18 | [illegible] | [illegible] | [illegible] and [illegible] eastbound, [illegible] [illegible] that [illegible] [illegible] train had [illegible] |
| 19 | B. | P. & F. | 3 | 20 | [illegible] | 9 | Enginemen of empty engine forgot [illegible] of passenger train. |
| 20 | B. | P. & F. | 3 | 12 | [illegible] | 87 | Conductor and engineman of freight [illegible] side of passenger train at meeting point. |
| 21 | B. | F & P | 5 | 5 | [illegible] | 20 | Runaway freight cars [illegible] left standing on grade with only air [illegible] [illegible] in charge of train on only 15 cars. |
| 22 | M | P. & F. | 1 | 7 | [illegible] | 43 | Cars of freight train left standing on [illegible] [illegible] where engine was switching ran out on main track and met passenger train. |
| 23 | B. | F & F. | [illegible] | [illegible] | [illegible] | [illegible] | Air brakes ineffective, angle cock had not been opened behind third car. |
| 24 | B. | P. & P. | 2 | 30 | [illegible] | 30 | Engineer of empty engine misunderstood [illegible] and [illegible] to meet opposing passenger train. |
| 25 | B. | P. & F. | 4 | 18 | [illegible] | 6 | Station man gave false [illegible] clock signal. (See note in text below.) |
| 26 | B. | P. & P. | 1 | 28 | [illegible] | 42 | Agent and operator failed to deliver order to eastbound train; operator, 27 years old, 2 months' experience, went off duty without informing agent that there were orders to deliver to 2 trains; agent delivered to 1 train. |
| 27 | B. | P. & P. | [illegible] | 8 | [illegible] | 5 | Eastbound train ran past meeting point; engineman forgot order; conductor, taking up tickets, discovered engineman's error, but not soon enough. |
| 28 | B. | P. & F. | [illegible] | | [illegible] | 74 | Enginemen went to sleep [illegible] but one of two eastbound trains was to meet; conductor and two brakemen [illegible] while waiting at meeting point and assumed engineman had waited for two trains. |
| 29 | B. | P. & P. | 24 | 23 | [illegible] | 63 | Operator 2 a.m. on duty [illegible] hours; received order after train had passed. (See note in text below.) |
| [illegible] | | | 70 | [illegible] | [illegible] | [illegible] | |
| | | | | | DERAILMENTS. | | |
| 1 | D. | I. | 1 | 1 | 82 | 19 | Maryland point frog and [illegible] plate rail having been broken; signalman held [illegible] worthy for not having discovered fault by tightening of lead switch lever. |
| 2 | D. | P. | 0 | 0 | [illegible] | 25 | Switch maliciously misplaced; speed of train, 65 miles an hour, yet no injuries reported. |
| 3 | B. | F. | 0 | 0 | 2,800 | 24 | Broken wheel, due to sticking of brake, caused by defect in triple valve. |
| 4 | D. | P. | 0 | 4 | 2,500 | 95 | Unexplained; speed 35 miles an hour, 2 cars overturned. |
| 5 | D. | F. | 10 | 17 | 25,000 | 92 | Work train carrying laborers derailed at culvert washed out by flood. Water in creek was raised suddenly by melting snow. Ice gorge filled opening beneath track, and water then found its way to culvert 1,000 ft. east of bridge. |
| 6 | D. | F. | 1 | 1 | [illegible] | 82 | Worn tires on driving wheels of engine, combined with slight [illegible] and [illegible] of stock rail of switch. |
| 7 | D. | P. | 1 | 28 | 6,512 | 96 | Switch loosened by mail bag thrown from car, breaking switch stand. |
| 8 | D. | P. | 0 | 25 | 9,917 | 74 | Rails spread, track in [illegible] fair condition; curve, 6°; superelevation, 6 ins.; weight of engine, 57½ tons; speed, 45 miles an hour. |
| 9 | D. | P. | 0 | 10 | 10,725 | 91 | Washout caused by river changing its course after a rain storm; engineman was not properly observing slow order. |
| 10 | D. | P. | 0 | 48 | 11,735 | 76 | Broken rail; internal defect. |
| 11 | D. | P. | 0 | 5 | 13,500 | 47 | Unexplained. |
| 12 | D. | P. | 3 | 3 | 16,000 | 50 | Washout. |
| 13 | D. | F. | 0 | 5 | 17,500 | 49 | Runaway on 3½ per cent descending grade; train of 72 cars was started from [illegible] by engineman's [illegible] 4 [illegible] [illegible] and 2 [illegible] [illegible] |
| 14 | D. | P. | 2 | 2 | [illegible] | 88 | [illegible] |
| 15 | D. | P. | 2 | 20 | 42,700 | 87 | Accident [illegible] [illegible] track [illegible] by [illegible] [illegible] [illegible] [illegible] eastbound train [illegible] No. 14. |
| Total..... | | | 29 | 268 | $[illegible] | 121 | |
| Grand total. | | | 99 | 604 | $521,750 | | |

Collision No. 29, causing the death of 24 passengers and a money loss (besides the damages paid on account of deaths and personal injuries) of over $50,000, was due to the non-delivery of a meeting order sent by the train despatcher. The collision occurred about 2 a.m., and a blinding snowstorm prevailed at the time. Immediately after the collision the wreck took fire and eight cars—passenger, mail and baggage—were burned up. A portion of the deaths were caused by the fire. The westbound train ran past the meeting point which had been fixed by the despatcher, for the reason, as before stated, that the meeting order was not delivered. The westbound train, running from A to G, had been ordered to meet the eastbound at E, but it was found that the eastbound train was gaining time over the westbound, and it was decided to change the meeting point to D and an order to this effect was sent to the eastbound train at F and to the westbound at C. The non-delivery of the order was due to the fact that the telegraph operator at C accepted it from the despatcher after the train had passed. The despatcher, depending on the station operators for knowledge as to the whereabouts of all trains, inquired of the operator at C if the westbound train No. 3 had passed. The operator replied that it had not and the despatcher at once instructed him to display his stop signal. But it turned out that the train had passed while the operator had been asleep and the information given by him to the despatcher after he awoke was therefore, false. This operator had been on duty all day the day before and then served at night in place of the regular night operator—19 hours in all, except for the time occupied at meals. It is estimated that he had been asleep only about one minute. He had worked an excessive length of time to accommodate his fellow-operator and without the permission or knowledge of his superintendent. He had been in service at C one week, for this company two months, and for other companies nearly two years. He is reported as being proficient and habitually attentive to duty.

Collision No. 6 was due to practically the same cause as No. 29.

Collision No. 5, occurring at 4 a.m. in a severe blizzard, was due to a mistake in conveying orders over a telephone line. Communication with the despatcher's office had been cut off, and the trainmaster, a despatcher of 25 years' experience, telephoned to the engineman of the superior train (passenger) to stop at H for orders but the engineman did not so understand the message and proceeded beyond the point where the orders were to be delivered and where he was to have met the opposing train. The trainmaster asserts that he got a response "all right," spoken twice, but he did not cause his order to be written down by the engineman, nor did he have it repeated or delivered to the conductor of the train. Having got his worthless "all right" from the engineman, he sent the order in regular form to the inferior train.

Collision No. 7a appears to have been due to a confusion of despatcher's orders on the part of an engineman, and is notable as illustrating the failure of a safeguard which has come into use within recent years, the safeguard of requiring the conductor of a train to notify the engineman on approaching a meeting point. In the present case this notification was given, but did not produce the intended result. Eastbound trains ordinarily have the right of track over westbound; but in this case the westbound passenger train had been made superior to eastbound trains for about 58 miles. At D, within this district, the westbound train received orders to wait at C until 9.15 p.m. The eastbound train therefore had right of track to C until that hour, or until such time as it should be able to reach the side track C and get out of the way of the westbound train; but there was also a westbound freight train waiting at C, and the eastbound train had orders to wait at C until 9.05 p.m. for this freight.

The eastbound train came on at 9.10 p.m., and having fulfilled the order as regards the freight train had no other train to look out for except the westbound passenger. The westbound passenger was at a standstill about 600 ft. east of the west switch, and with this standing train the eastbound train collided. It would appear that the engineman of the eastbound forgot entirely about the westbound passenger train or mistakenly calculated that he was to meet it at another station farther east. He asserted that the air-brake pipe had been closed back of the second car of his train, and that this was the cause of his approaching the station at high speed, but the officers of the road reject this explanation. The station next east of C was the usual meeting point for the two passenger trains. The conductor of No. 2, on approaching C, gave the proper signal by air whistle to remind the engineman that C was a meeting point, but it is believed that the engineman took this as applying to his order to wait for the freight. He acknowledged the conductor's signal, but did not make the reduction of speed which it required. The signal given by the conductor conveyed no information as to what or how many trains were to be met at that station and therefore did not provide for the contingency of an engineman's forgetfulness as to how many trains he was to look out for at a given point. This engineman had been in the service 2½ years.

In collision No. 7, 40 passengers were injured, most of them not very seriously, by a combination of neglects, failures and unfavorable circumstances. The train was a special, occupied by a company of firemen being taken home after extinguishing a fire. The train (two cars) was being pushed from a side track to the main track, when it was struck by a through freight train. The conductor of the special had instructed a flag signalman to pro-

tect this switching movement, but the signalman went off duty without informing the man who relieved him, and this man allowed the through freight train to proceed. The conductor of the passenger train threw a lever to put in the stop position a semaphore signal connected with the switch at which he was at work; but this signal did not move to the stop position, for the reason, it is said, that a wire controlling it had been lengthened by the heat from the fire, which had been raging near by. The conductor and the engineman of the special passenger train, as well as the signalman, were dismissed, as it was their duty under the rules to send back a flagman, notwithstanding the arrangement with the block signalman.

Collision No. 8 was due to a freight train running uncontrolled on a steep grade in consequence of both the engineman and the fireman falling asleep. This fireman had been in the service only one month, but the engineman had had long experience. Both of these men had worked very unreasonably long hours. Taking the engineman's record from the third day before the collision, his periods on and off duty were as follows: Off 13 hours, on 14½ hours; off 4½ hours, on 14 hours; off 4½ hours, on 22 hours; off 4 hours and on 10½ hours at the time of the collision. It is to be observed that this is the record as shown on the call books. The short periods off duty could not be availed of entirely for sleep. The report says that after the 22-hour tour of work the engineman requested that he be called for a certain train, this for the purpose of reaching his home sooner (and he was thus called), and that he could have been relieved by another engineman if he had made a request to that effect.

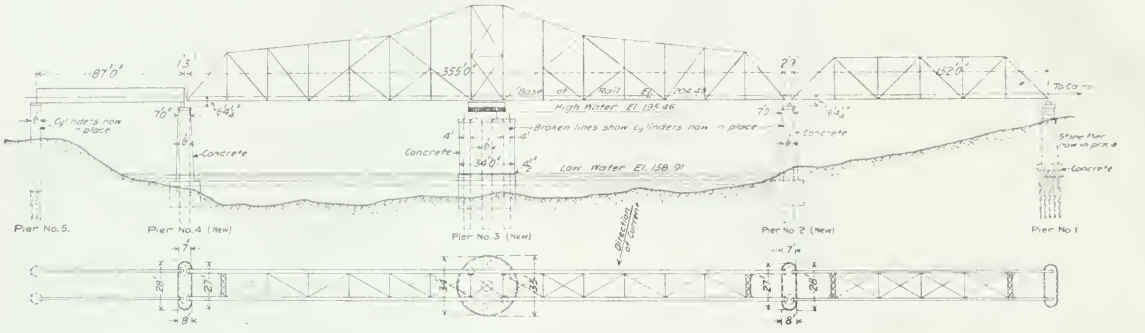
Collision No. 17 was due to a misunderstanding or neglect concerning the time at which a southbound train should clear the track for a northbound. The northbound train, due at B at 3.54 p.m., was authorized to run 15 minutes late, or to leave B at 4.09. The southbound train, due at B at 4.04, was behind time, but the conductor and engineman were aiming to reach the station at 4.09. These men assert that the collision, which occurred at a point about 1,000 ft. north of the station, happened at about 4.08, and though the evidence is conflicting the preponderance is in favor of this statement. The northbound train, however, should have waited at the station, if necessary, until 4.12, as, according to a regular rule, a stop of three minutes should have been made, if necessary, to allow for a possible error on the part of the men in charge of the southbound train. This three-minute rule applied not only at schedule meeting stations, but to meeting stations made by train despatchers' special orders.

Collision No. 25 was due to the gross negligence of a block signalman, an engineman, and a conductor, and the contributory negligence of several other employees. The collision was between eastbound passenger train No. 2 and westbound freight train No. 7, both running at full speed. The wreck took fire and three cars were burned up. These trains had both been ordered by the train despatcher to meet at B, but No. 2 passed B, and the collision occurred between B and A. No. 7 was allowed to proceed from A to B by reason of the negligence of the signalman at A, who set his signal in the "proceed" position and subsequently fell asleep. The eastbound train passed B because the block signal at that station was cleared for it, no information having been received from A concerning train No. 7, and because both the engineman and the conductor of train No. 2 carelessly assumed that train No. 9, standing on the side track at that station, was No. 7, the one which they were to meet. The engineman of the eastbound train was killed.

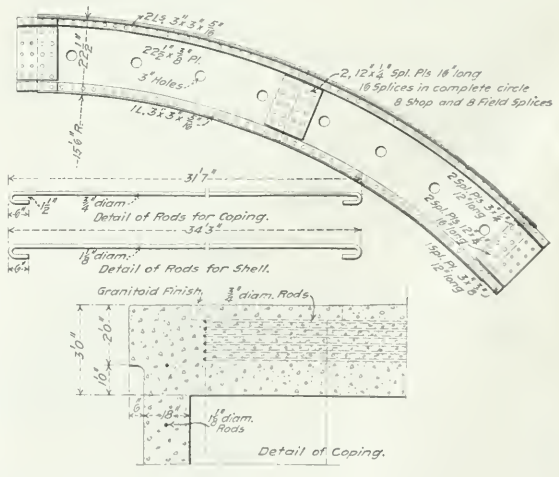
The conductor evidently took no pains to identify the train on the side track. The signal for eastbound trains at B was in the proceed position, because no communication had been received from the block-signal operator at A, and because the meeting order for the trains had not been sent to B. The signalman at A was employed as brakeman five years ago; he lost an arm three years ago and was then employed as signalman. Communication from station to station was by telephone. The report says that this signalman had been on duty 11 hours, after a suitable period of rest. Although this signalman was primarily at fault for permitting the westbound train to pass A, the engineman of that train is also blameworthy, for under the rule he should not have accepted a clear signal unless he saw the signal moved from the stop to the clear position. This rule he disregarded and accepted an all-right signal which had been set at "all right" by the signalman some time before.

## A Novel Method of Cylinder Pier Reinforcement.

There has recently come to our notice a novel method of strengthening, or increasing the stability of old cylinder piers on a bridge in Arkansas of the St. Louis Southwestern Railroad which is quite interesting, and although done last year, has never been described, so far as we know. The bridge is the White river crossing of the road at Clarendon and was built originally in 1882 for a narrow gage track. About ten years later the superstructure was replaced by one of modern design and carrying standard gage track, the substructure, however, remaining as before. A plan and elevation of the bridge, which contains a 355-ft. draw span, are shown herewith, from which it will be seen that there were five cylinder piers (No. 1 was subsequently replaced with stone), all but the pivot pier being formed of 6 ft. twin cylinders. Pier No. 3, the pivot pier, was composed of six 4 ft. cylinders surrounding a central 6-ft. cylinder.




Repairs to St. Louis Southwestern Bridge at Clarendon, Ark.




Details of Pier No. 3 and Cofferdam, St. Louis Southwestern Bridge

The bridge was originally designed for Cooper's Class A loading. But as the weights of cars and locomotives increased the piers manifested evidences of instability under the heavier loadings, finally reaching a point where the vibrations became seriously objectionable, necessitating resort to some method of strengthening or reinforcing the principal piers—Nos. 2, 3 and 4. The devising of a plan for doing this was entrusted to Mr. J. W. Schaub, Consulting Engineer, Chicago.

The plan adopted for the smaller piers—Nos. 2 and 4—is evident from reference to the plan and elevation views. The two cylinders were simply enclosed in a solid concrete pier which is

founded on an 18 ft. x 36 ft. concrete cofferdam, the size of the enlarged pier being 7 ft. x 27 ft. under the coping. The original bridge seats were not disturbed, the top of the coping coming flush with these.

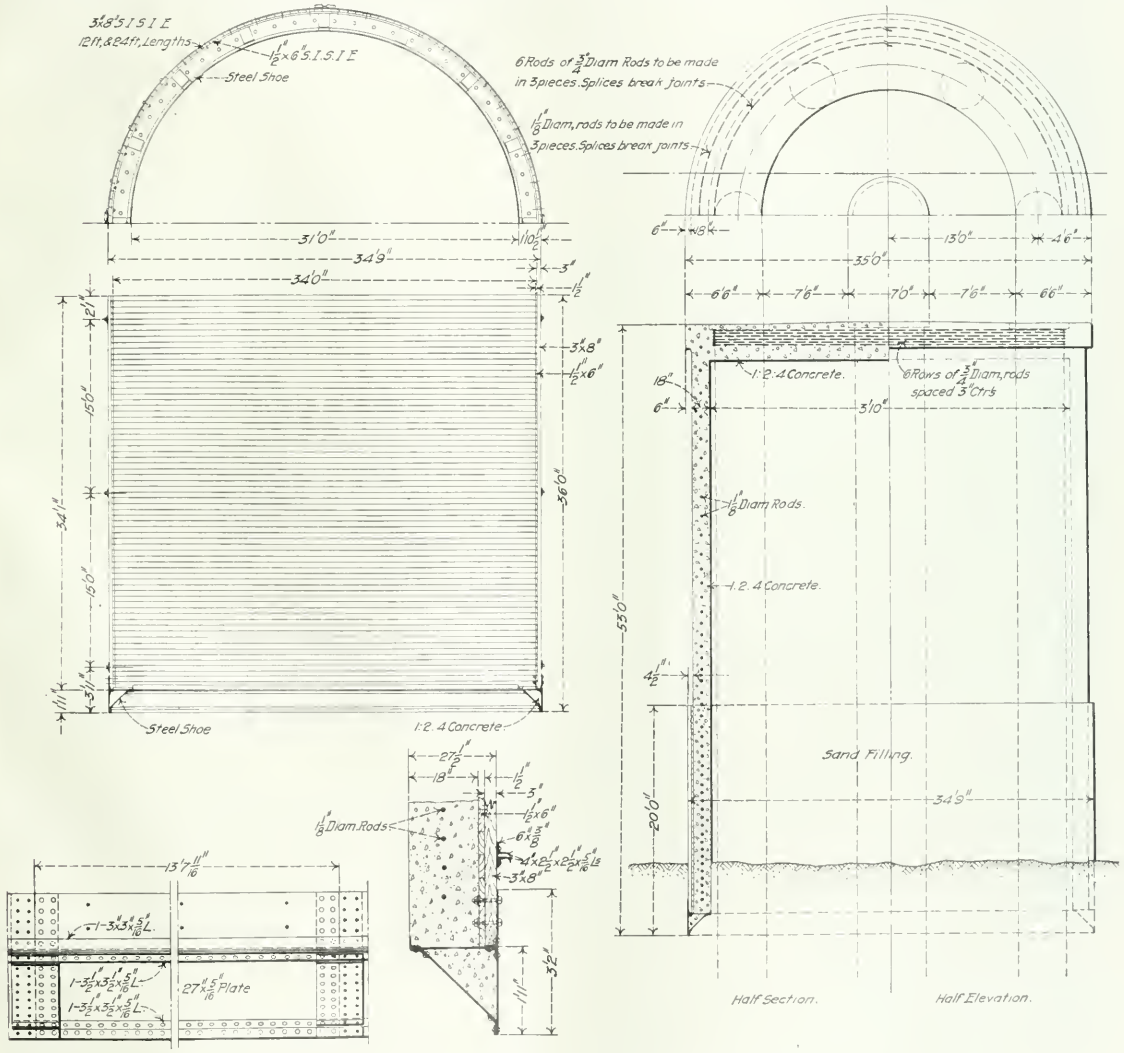
The interesting work was in connection with the pivot pier. As with the smaller piers, the bridge seats here were left undisturbed, thereby avoiding the use of falsework and also disturbance to traffic. The cylinders were to continue carrying the load, it being necessary only to provide the requisite stability. As noted on the drawings, the penetration of the cylinders was not known; neither was the exact character and condition of their filling. However, these were not factors of any great importance in the problem.

Instead of the usual sheet-piling cofferdam, Mr. Schaub concluded that the driving of this piling could be avoided and the cofferdam made a part of his pier instead. His scheme for doing this is illustrated in detail herewith. It involves the use of a circular cofferdam of reinforced concrete sunk to a depth of approximately 8 ft. below the river bed. The wooden dam or outer form for the concrete, with the steel shoe, was assembled around the cylinder pier. The shoe has 16 splices in the complete circle, eight of which were field splices. The upper or wooden portion was formed of 3 in. x 8 in. staves to which an interior lagging of 1½ x 6 in. material was nailed, the whole being held on the outside by three bands with provision for tightening. This cofferdam was 34 ft. inside diameter, 34 ft. 9 in. outside and 36 ft. high at completion. At time of assembling, the height was 9 ft., which was gradually added to as the dam sank to place. The river wall of the form was a circular wooden apron 8 ft. high, which was let down to position and remained stationary until the cofferdam, which sank as the concreting progressed, was landed in position in the river bed. The apron was then gradually raised to form the inside of the shell all the way up. The wooden dam and apron were both swung from the pier top.

A 1:2:4 concrete mixture was used throughout and time not allowed for setting before immersion. Reinforcement is by means of 1⅛ in. diameter plain rods, spaced as shown. When the shell was completed the interior was filled with sand. The pier was then finished with a reinforced concrete coping having a granitoid finish on its top. As indicated, the outer wooden form was cut off at low water after the pier was completed.

The cost of the work entire was $20,000. As indicative of the relative economy of the method, another bridge of this road of similar construction and therefore in need of similar attention, was repaired several years previously to this one. The pivot pier only was strengthened and by the method used, which involved cutting off the cylinders and building thereon as foundations a new concrete pier, the cost was $25,000.

The work on the Clarendon bridge was under the supervision of Mr. J. S. Berry, Superintendent of Bridges and Buildings. It was done by force account, George C. Callahan & Co., Chicago, being the contractors.




Details of Repairs to St. Louis Southwestern Bridge Piers.

## Co-operation.*

While there are about as many different kinds of co-operation as there are excuses for dodging the settlement of a claim, there are two particular kinds concerning which I propose to speak, namely: co-operation between the traffic and operating departments of the same railroad, and co-operation between a railroad on the one hand and an industry upon the other. We will first consider what may be made of co-operation between the traffic and operating departments of the same railroad, but before doing so, it is necessary to get a clear idea of the financial skeleton of the railroad in order to form some conception of the responsibility of the two departments and the joint object which demands their co-operation.

Gross earnings are the beginning of all things in railroading after the railroad is built and equipped for operation. Nothing can be paid out until something is taken in, and the difference between the two is net earnings, which become the measure of the success of the road. A railroad is a business proposition; not a Christmas tree. It is built for the purpose of making money by the sale of transportation, and the net earnings determine whether the road will advance, push its business, improve its property, and, by improved service to its patrons, become a factor in the upbuilding in the community through which it is located; or whether, on the other hand, it will shrink, lose business, deteriorate physically, and, through bad service, become a common nuisance. Let us clearly understand that there are, first, the gross earnings, then the expenses, and finally net earnings which tell the tale, and to which everything else is incidental, or a means to an end.

The traffic department gets the business. That is to say, it is responsible for the gross earnings. Gross earnings are estimated in dollars, not tons, for tonnage means nothing until it is converted into dollars. The operating department is responsible for the movement of the business, and, therefore, is necessarily responsible, in a large degree, for the expenses. Hence, the traffic and operating departments are seen to be directly responsible for, and factors in, making the net earnings. This is the same end for which they work together, or, in other words, co-operate. How many superintendents on the average railroad know each month the gross earnings of their divisions, or are able to estimate with any degree of certainty what those gross earnings are likely to be? They can usually tell how many cars have been moved, from purely an operating point of view, but the knowledge of what that movement means in cash to the company is too often lacking.

And yet, unless the gross earnings are favorable, there is a demand for retrenchment, the burden of which falls most heavily upon the operating department. The superintendent finds his clerical and agency force closely examined, his maintenance of way expenses (if that department be under his charge) forced to a minimum, improvement work, which, when completed, will reduce his operating cost, stopped, and from every side comes the demand for curtailment. The life of the superintendent, under the pressure of retrenchment, is not always a "bed of roses." Should he not for purely selfish motives, if for no other reason, do all in his power to aid the traffic department in securing business, thereby, through increased net earnings, making possible the improvement and development of the property under his charge and contributing not a little to the ease of operation?

How many division freight agents know what the expenses of their division are, and how many, if they do know, give the matter serious consideration with the view of determining to what extent there is an increased necessity on their part for discrimination in the selection of the most paying business? It is frequently a question of how many tons the freight department can secure; but what that tonnage means, when converted into dollars, is often overlooked. The best traffic officer is he who gets the most lucrative business for his road and lets his competitors compete for what is left, and how can he tell what traffic pays the best unless he has some conception of what the movement costs?

Perhaps the traffic officer deceives himself with the notion that a call for a reduction in expenses will pass him by unscathed and the operating department will carry the burden. However, do not overlook the fact that, through taking off fast but expensive merchandise runs, the task of retaining your share of competitive business grows no easier. The inability to complete additional main tracks, which will quicken the movement of traffic, leaves you, perhaps, still further behind your competitor, and the more the gross earnings fall off the harder the "boss" applies both "scourge and steel." Therefore, let the traffic officer remember, anything that affects the net earnings, whether it be a reduction in gross earnings or an increase in expenses, will bring to him, as well as to the operating officer, its train of troubles. It behooves both sides of the house to see how many dollars are taken in and how many are left after the expenses have been met, in order to form a clear idea of what each can contribute to swell the net earnings. From this viewpoint, the traffic and operating departments are exactly like a two-horse team. Unless they pull together and each hauls his share, the wagon will not move. And besides, the driver is likely to become busy with the whip and not make too fine a distinction as to which horse is at fault and failing to pull his share of the load.

Broadly speaking, railroad business is just like the grocery business, or any other business which has for its object the sale of a commodity to the public. The man who sells the best article at a reasonable rate and furnishes the best service gets the trade. We would like to haul our freight and passengers for nothing, but that would eliminate the necessity for the treasury department, and there are about a million and a half of us in this country that find that department quite useful about the first of the month. There are also some industries that find the railroads convenient in disposing of their surplus products, which might find their revenues decreasing if we stopped our purchases. For example, the railroads of the United States disburse about the following amounts annually for the various articles which they consume. These figures are for the year ending July 1, 1903. For the year ending July, 1905, they would probably be greater:

| | |
|---|---|
| Ballast | $10,000,000 |
| Ties | 25,000,000 |
| Rails | 40,000,000 |
| Bridges | 25,000,000 |
| Buildings | 20,000,000 |
| Materials for locomotive, freight and passenger car repairs and renewals | 120,000,000 |
| Fuel | 150,000,000 |
| Shop tools | 10,000,000 |
| In all, approximately | 400,000,000 |

In addition to which there are paid out in wages to employees, about $660,000,000, the largest proportion of which, in time, finds its way back to the treasuries of all trades and industries. Are not the railroads of the country liberal customers, and does it not strike you that those figures represent a little concentrated sermon on the subject of co-operation from a different point of view than that we are considering, but something quite as tangible and important to the prosperity of our country?

The conduct and attitude of employees in the operating department, who come into daily contact with the shipping public, are larger factors in securing business than is often supposed. The yard conductor is just like the man who drives the delivery wagon for a grocery store. He is the man who delivers the goods. There is the driver who wipes his feet before going on the back porch, puts the goods down gently, offers to carry them to the cellar, if desired, jollies the cook, pats the dog, and wants to know if there is anything else he can do for the house. He goes on his way, leaving behind a large amount of good will and friendly feeling for his employer. There is another kind of driver that prances on to the back porch with his muddy feet, drops the goods down, breaking most of the eggs, tells the cook to get a move on and empty the potatoes, kicks the dog, and rattles down the street. Is it necessary to enlarge upon the impression the mistress of that house soon gets of that particular grocery store? You have all seen exactly the two same kinds of yard conductors; perhaps few of the former, but a lot of the latter. A yard conductor who performs his work properly about an industry and conducts himself decently, can help the solicitor who calls the next day to secure for his road a large shipment; but the yard conductor who never comes into an industry without knocking down the fence, disarranging every car in the yard, as well as dispensing a liberal amount of profanity, can lose his company more business in 15 minutes than a freight solicitor can pick up in as many days.

The same thing is true of passenger trainmen. Passenger conductors are usually promoted from freight conductors, whose training has been in handling packages and who feel that the responsibility of the company begins with receiving a package or car at the original point and getting rid of it as quickly as possible in good order at destination. They are apt to consider passengers only so many packages to be safely unloaded at the end of the journey and entitled to no greater consideration. The passenger trainmen who treat their passengers as though they were guests of the company, and as though they wanted them to come again early and often, are the men who help to put dollars in the company's treasury.

I know that I am safe in saying that the large proportion of the more important railroad officers are courteous and fair in their dealings, but we cannot escape the fact that after all, the yard conductor, the passenger conductor and the agent come more into contact with the public than any other class of railroad employees, and the public judges the railroad by the kind of men it employs in those positions. What we need in those positions are men who realize that the public spends its money where it gets the best treatment and the road that makes the most money is in position to do the best by its employees. By no means is the least responsibility of the operating department that of watching their employees to meet the public and of employing men who will not hamper the efforts of the traffic and passenger departments in securing business.

If you bought a pound of butter at your grocery, asking the dealer to send it up to the house at once, and were told that the delivery wagon would not leave until late in the afternoon, and that you would have to wait until that time, what would you think?

*A paper read before the Traffic Club of Pittsburg, by Mr. Henry W. Thornton, Superintendent Pennsylvania Lines West of Pittsburg, Newcastle, Pa.

What does the manager of an industry think whose plant is about to close down because there are some cars of much needed material in an adjacent yard which a yard engine cannot deliver because a special move is necessary? It may cost money occasionally to make special movements, but why should we be afraid to spend a trifling sum to accommodate a concern which may be paying us a large sum each month in freight charges? In chasing the present penny, do not forget the future dollar. Therefore, it is well to remember that nothing is too much trouble to accommodate the man who has the money to spend with you. Usually there are two or three hot competitors to whom he can give it, and the way he ships his freight depends largely upon the treatment he receives at the hands of the operating department. It is here that the operating department can put the traffic department in a position to get business which it would otherwise lose. Exclusive of the question of rates, the accommodation and service offered by railroads is in the hands of the operating department. You may as well rob an army of its powder and expect it to win battles as to take from the traffic department the support of the operating department and expect them to get business.

Good road service means the handling of freight expeditiously and safely. Of course, we all strive to move our freight as promptly as circumstances will permit, but sometimes it happens that an industry may be in great need of some particular car of material which has, perhaps, been delayed in transit. Possibly the fault may be with the industry in not having ordered the material soon enough, but that is not the point and has no bearing upon the matter. The industry wants the car and needs it in its business, and it is up to the railroad to get it there as quickly as possible. On railroads there are certain routine ways of tracing cars; sometimes it brings the answer and sometimes it does not. The local officers in the operating department should feel a personal responsibility in endeavoring to forward cars under such circumstances as quickly as possible, even if an especial effort is necessary. At times it is not sufficient to telegraph the car record office or turn the matter over to a subordinate. If it requires the personal attention of the trainmaster or division superintendent, the same should be cheerfully given. This is one of the things those officers are paid to do, and it brings forth fruit a hundredfold.

It is of great advantage for the local operating officers to accompany the representatives of the traffic department on their periodical visits to industries. The average operating officer is, in these strenuous times, a very busy man, but he could certainly find time to take three or four days a month in visiting the industries in his territory. It is true that the division superintendent on such expeditions may hear some disagreeable things, but the "kicker" and the critic are those who will help you improve your service. While it is very pleasant to hear that your service is satisfactory, and the knowledge of it is a spur to greater effort, at the same time he who can intelligently criticise and point out wherein your service can be improved, is the man you are looking for. Frequently there is hesitation to make known minor defects in yard and road service. They are, perhaps, not thought to be of sufficient importance to justify specific complaint, and it is only by visiting shippers in person that the operating officer is able to develop such minor points.

It is desirable that there should be a frequent consultation and exchange of ideas between the local traffic and operating officers. The yard master and the agent should co-operate to improve the service at their station. When the freight solicitor is at the division headquarters, let him call upon the trainmaster and the superintendent, and vice versa. The division superintendent and division freight agent should take advantage of every opportunity to get together and talk over their mutual interests, gaining thereby some conception of each others' difficulties.

In a territory where industries are dependent upon the railroads for a regular supply of raw material, it is necessary for the operating officer to have a fair idea of their consumption, and the conditions at various plants, in order that he may appreciate the requests of the industries as they arise, and, at the same time, determine whether such requests are reasonable. It is only by visiting plants, and through an acquaintance with their managers, that this is made possible. All of these things place the operating officer in a position to help his brother in the traffic department by giving industries such service and attention as will cause them to ship the bulk of their freight over that road.

The traffic department is especially charged with soliciting business; but there is not a man in the employ of any railroad whose co-operation with the traffic department may not have the result of steering some shipment to his line, or perhaps give the local freight solicitor a "pointer" which will enable him to secure the business. If every engineman, fireman, conductor, brakeman, supervisor and so on through the whole classification of railroad employees, was constantly upon the lookout to attract business to his road, in addition to his regularly assigned duties, would not such a spirit swell the traffic and passenger receipts of so fortunate a company? In any highly organized body, such as a large corporation, the individual is too prone to perform only his own duties, leaving his neighbor to shift for himself. It would certainly add to the gross earnings of every railroad, if every man on the payroll felt it incumbent upon him to induce his neighbors and friends to patronize his company as much as possible. And why should he not? Increases in salaries and wages may not be of common occurrence, but they are certainly not likely to be made in the face of falling earnings. This is not a wild dream, but it is a perfectly practicable proposition. For example: Smith is a yard brakeman. He lives next door to Jones. Jones is going to move to California. Perhaps a word from Smith to the freight agent, or a little missionary work on his part in the evening with Jones, will decide whether Jones will travel over Smith's road or some other line. Things of this sort are happening many times a day, and every employee of the railroad often has it in his power to direct shipments over his line. I do not know that this idea has been taken up by any road and pushed consistently, but the field seems worth the attempt.

We have seen some of the ways in which the operating department can aid the traffic department; there are also some ways in which the traffic department can lighten the burdens of the operating department. It has happened that solicitors, in their zeal to secure business, have promised utterly impossible things, or a service which, under existing circumstances, cannot be given. Solicitors should post themselves in regard to existing conditions and not promise anything which is beyond the power of the operating department to perform, and which, in the long run, hurts the solicitor in the eyes of the shipper. It is folly and unfair to promise cars for shipments when the cars cannot be obtained. It is unreasonable to ask the operating department to switch cars to connections for business off the company's lines which instructions may preclude furnishing. By a complete knowledge of the situation, which can only come through free intercourse and exchange of ideas, the traffic department can often reduce the troubles of the operating department.

Give the operating department a fair chance, and, before you decide that a delayed shipment or slow switching service is the result of pure carelessness or lack of appreciation of good business methods, find out what was the real cause. The operating department does not often hold cars in yards for the improvement of the landscape. There is generally a good (but perhaps unfortunate) cause for such things. When you congratulate yourself upon the high development of your commercial training, remember that the commercial side of the freight business does not consist in a wild scamper to secure tonnage—"any old" tonnage; but that a true commercial training never fails to count the cost. Let the competitive business you secure for the operating department to move be that business which pays the best.

It is possible, in hard times when business is dull, for the traffic department to create business, and, in this connection, I want to tell you a story which very vividly represents the possibilities along this line. It is said to be a true story. Among other things at the end of a certain railroad, there was a large ice house with a pond near by, from which the owner harvested each year a goodly crop of ice at small cost, which he sold to the summer cottages and hotels which infested those parts, at no small profit to himself. The general freight agent of this particular road, observing the ice house one day in the early spring, when it was full to the roof, asked the owner why he did not ship the ice to a large city at the other end of the railroad, to which the proprietor made reply that he had neither a siding to his ice house nor a purchaser, but he expressed a willingness to sell if a siding was provided and a buyer secured, naming his price. The general freight agent, times being dull and traffic scarce, lost no time in journeying to the large city at the other terminus of his line and arranging for the sale of the ice to a large wholesale ice cream factory, upon terms mutually advantageous to the owner of the ice and the factory. Accordingly, a siding having been put in, the ice traversed the entire length of the railroad, to the enrichment of the company.

This having been done, the ingenious traffic man bethought himself of a company engaged in the manufacture of artificial ice, also located in the large city, and inquired of the manager why he never shipped ice to the other end of the railroad where so many summer residences offered a good market. The manager explained that there was an old chap down there who harvested his ice each winter from a pond at small cost, and with whom, on this account and on account of the freight charges, the artificial ice company could not compete. Moreover, even if such were not the case, there was no place to store any quantity of ice without putting up a store house, which the profits of the business would not justify. Upon being told that the owner of the ice house had disposed of his stock, with the further assurance that a store house could be obtained at reasonable cost, the artificial ice man expressed his willingness to enter the field and ship his ice to the other end of the railroad.

The next scene opens with the general freight agent arranging with the owner of the now empty ice house for the lease of his building to the artificial ice company for the summer, and, satisfactory terms having been reached all around, back went the ice to the

other end of the line. Now, that is what I call creating traffic. You may not all have ice houses so well located but the idea remains the same.

We have seen how it is possible for the departments of a railroad to co-operate with each other. Let us see whether there may not be a degree of co-operation between railroads and industries, which may be mutually advantageous. In the first place, there should be an absolute frankness and honesty between the managers of the plants and the officers of a railroad company. If the industry is depending upon the arrival of certain cars of inbound material, do not answer an inquiry by saying that the cars will be placed the next day when you do not know whether it will be the next day or the next week. If the consignee is to be disappointed in the arrival of his material, it is very much better to tell him when it will be in, if you know, giving him an opportunity to make other arrangements, if you cannot get it to him soon enough. If he asks for a dozen or so cars to be placed at his plant for a particular shipment and is depending upon the same, do not tell him that the cars will be delivered that afternoon when you know perfectly well it is impossible to furnish any cars at all, only a proportion of what he asks. Rather than embarrass the shipper, tell him frankly what the situation is and give him an opportunity to ship his freight over another road. That may be heresy, but is the best course in the long run. It will ultimately be to the credit of your road. On the other hand, as superintendent of a plant, do not ask a division superintendent to furnish 30 cars when you only need 15, figuring that he will be compelled to cut your order through circumstances beyond his control, and by placing your requirements high enough you will get about what you really want. In time, such practices are found out and future requests are not given full weight.

In the matter of car supply, an industry local to a railroad has the right to expect that its requirements will be filled in preference to the requirements of the competitive industries which may draw their supply from more than one road. The purely local industry is absolutely dependent upon the railroad company for its facilities, and the railroad company practically decides, through the car supply furnished, what business that industry may do. Frequently it is thought that competitive business should take preference, and cars are often sent off of a company's line to other roads for switched business of this character while, perhaps, at the same time, local or non-competitive plants where you can get all the business, are suffering for cars. A railroad should consider that an industry located on its line, to which it has sole access, should receive every consideration and assistance that it can be given for the transaction and development of its business to the exclusion, if necessary, of all others. The strength of a railroad is the prosperity of its local shippers and it is suicide to sacrifice those shippers in a killing competition for other business. The railroad which pursues such a policy drives existing plants from its line and makes doubtful the location of new ones.

A railroad company endeavors to supply sufficient cars to transact its business. The number of cars it builds is based upon the amount of tonnage anticipated and the average daily movement that may be expected. It is just as much a duty on the part of an industry to unload its cars promptly as it is for a railroad company to give the cars prompt movement in road service. It is not fair to the railroad company to use those cars as store houses and, in the long run, it reacts upon the industry so doing, as it tends to reduce the general car supply. The argument that a slow road movement justifies the consignee in dilatory unloading is illogical, for two wrongs never yet made a right. A railroad company does not want the money accruing through demurrage charges. What it wants is the cars; and it is the duty of every industry to put forth every effort to release cars promptly. If such a spirit prevailed at every plant, there would be little need of car service regulations.

In laying out a new industry it is highly important that the railroad company's engineer should be consulted. Unfortunately, it often happens that an industry is built, after which the railroads are told to get to it. This is bad for the railroads and bad for the industry, for frequently the forced arrangements of tracts is such as to prevent a logical development of the plant and, moreover, switching is made slow and expensive by a bad track layout. I have in mind one plant which was laid out in opposition to the railroad company's suggestions. The result is that, in order to make a contemplated addition, it will be necessary for the plant to buy additional ground at a very high figure, while, had the original suggestions of the railroad entirely been carried out, such necessity would have been avoided.

As I have said, a railroad company should not be afraid to spend a little money to give a patron the necessary service in emergencies; so industries should not hesitate to spend a little money to help cut a railroad, especially when by so doing they are helping themselves. At a certain plant the bar between the tender and the engine broke, which would have necessitated sending the engine some distance to the shop. The manager of the plant had his own force at the blacksmith shop to repair the engine, which enabled it to switch the rest of the day; while, otherwise, the plant and the railroad would have both suffered had the engine been forced to return to the house. The occasional tank of water or bucket of sand which saves time for the shifter, will, in the long run, help the industry by avoiding the necessity of sending the engine back to the shop.

There are many little ways in which an industry can help a railroad. If a car is placed so that it is not exactly on the spot the manager of the industry wants, but so he can very well get along, and he insists upon that car being put to the inch he desires, for no apparently good reason, he has not only delayed his own switching, but he has probably made the shifter late in getting to some other indstry, with the result that, if every manager acted that way, the engines in the employ of the railroad company in yard service would never get any work done.

Our methods and practices in railroading have changed greatly in recent years. The introduction of locomotives of greater capacity, forced by the conditions of the times, has brought longer trains, more difficult to handle, which, with the equipment of cars with air-brakes and the consequent liability of sudden stoppage and rough handling, has rendered lading more liable to damage. It is reasonable for the railroads to expect that proper consideration should be given these conditions in the preparation of lading for shipment, and no shipper should forward packages which he knows are improperly protected, feeling that if they reach destination in good order, well and good, but if not the carrier will be compelled to pay his claim. The railroad is right in expecting some co-operation from the shipper in correcting such matters.

Claims should not be presented for adjustment that are not really legitimate upon the supposition that, because of the volume of traffic controlled by the claimant, an unreasonable settlement can be forced. Cars destroyed or damaged at plants by industries, through the carelessness of their employees, should be settled for upon a fair basis. Can the railroad be expected to give heed to the claims of others if a deaf ear is turned to its own legitimate claims?

The cars of a railroad are its own and do not belong to any other railroad. They are one of the chief means whereby it is able to care for its patrons. Industries should respect the ownership of equipment, and are not in any way justified in loading the cars of a railroad out over another line, no matter how badly the cars of the second road may be needed for shipments to points via that line or local to it.

The interests of railroads and industries are identical and they are both absolutely dependent upon each other. No policy, which is harmful to the one and favorable to the other, can be pursued through a term of years without becoming unfavorable to both. It is ultimately an advantage to an industry for railroad companies to carry on their business profitably in order that they may keep abreast of the times and afford such service as the rapidly increasing industrial development in this country demands. We have already seen the vast amount which the railroad companies of this country distribute each year in the form of purchases of material, wages and salaries. Are not the interests of so valuable a customer worthy of the consideration and protection of those who share so largely in its disbursements? On the other hand, if the railroad desires to see its business increase, and consequently its profits, it must for its part afford every opportunity for industries to market their products and expand their business. It requires no gigantic intellect to see that the interests of the railroad and industries are so interwoven that a blow at one is a blow at the other. We need, in this country, a keener realization of this principle and the promulgation of the doctrine: "Co-operation between transportation and industrial interests."

## Galveston Causeway Plans.

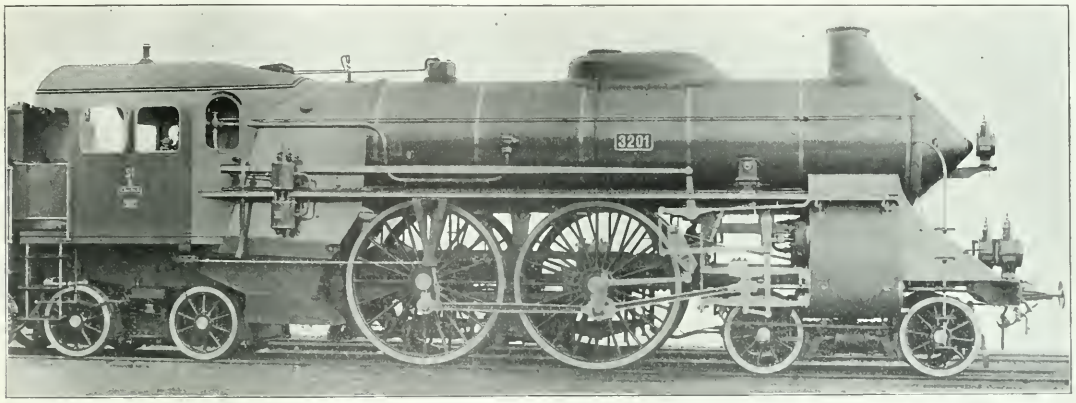
Plans and estimates for the proposed causeway across Galveston Bay, Texas, have been submitted to the Mayor of the city by James Stewart & Co., New York. Two plans are submitted, one for a structure to carry three steam railroad and two electric railway tracks, one roadway and one sidewalk, the estimated cost being $1,450,000. The other plan is the same, except that it provides for only two steam railroad tracks and one electric railway, at an estimated cost of $1,390,000. The larger causeway would be 140 ft. wide on top, 10 ft. above mean low water, and 10,850 ft. long, connecting the island of Galveston with the mainland at Virginia Point. The highway is to be 30 ft. wide, the footwalk 10 ft. wide, and a space of 10 ft. is allowed for water mains which are to supply the city of Galveston. On each side single rows of piles are driven 12 ft. apart on centers, with stringer sheet piling inside. Sand, gravel or clay, or a mixture of them, is to be used for the fill, and there will be rip-rap protection on each side laid with a slope of one and one-half to one. There will be three openings in the causeway. One, 100 ft. wide, will be spanned by three steel bascule bridges, one of which will carry two steam railroad

tracks, one an electric railway track, and the third for the roadway and footwalk. The other two openings will be 30 ft. wide, and across them will be built reinforced concrete arches. To provide for the tidal flow, 256 6-ft. reinforced concrete conduits will pierce the causeway 35 ft. apart on centers.

## Four-Cylinder Compound Express Locomotive for the Bavarian State Railroads.

The Bavarian State Railways have in operation a 4-4-4 express passenger locomotive built by J. A. Maffei, of Munich, which embodies a number of interesting features. A first glance would indicate that the wind breaking plows at the front have been found to be a good thing in European practice, for we find them persistently recurring in new designs—somewhat simpler in general arrangement, to be sure, than the early elaborate forms that were used, showing that, in the opinion of the mechanical officers the device is worth using in the lower resistances offered to the engine by the air.

The frames are of the American bar type at the front, with a slab at the back over the rear truck, in which there is but little variation from the practice of this country. The wide firebox extending well out over the frames with the trucks set well to the rear lends itself to the use of the outside ashpan that is seen in the illustration. A noticeable feature is the apparent lightness of the driving wheels, the very small counterbalance that is used, and the location of the same in the main wheels, where it is placed about 120 deg. back of the crank. The high and low-pressure cranks on the same side of the engine are opposite each other. The following are some of the principal dimensions:




Four-Cylinder Compound Express Locomotive, with Schmidt Superheater, for the Bavarian State Railroads.

| | |
|---|---|
| Steam pressure | 210 lbs. |
| High-pressure cylinder, diameter | 16.14 in. |
| Low-pressure cylinder, diameter | 24.0 " |
| Piston stroke | 25.20 " |
| Driving wheels, diameter | 86.61 " |
| Truck wheels, diameter | 39.61 " |
| Heating surface, firebox | 177.34 sq. ft. |
| " " tubes | 2,141.24 " |
| " " superheater | 403.50 " |
| " " total | 2,722.28 " |
| Grate area | 50.57 " |
| Weight in working order | 184,800 lbs. |
| Tender capacity, water | 6,864 gals. |
| Tender capacity, coal | 15,400 lbs. |
| Total weight of tender, empty | 41,800 " |
| Tractive effort | 11,000 " |

| | |
|---|---|
| Total weight / Tractive effort | 16.8 |
| Tractive effort x diam. of drivers / Heating surface | 250.0 |
| Heating surface / Grate area | 53.8 |
| Firebox heating surface / Total heating surface | 0.065 |
| Weight / Total heating surface | 67.88 |
| Vol. of two H. P. cylinders, cu.ft. / Total heating surface | .5% |
| Total heating surface / Vol. 2 H. P. cylinders | 156.7 |
| Grate area / Vol. 2 H. P. cylinders | .8.48 |

## Electrolysis of Underground Pipes.

BY PUTNAM A. BATES.

Although during the past 10 or 15 years a number of damage suits have resulted in the payment of large sums of money to certain water companies of this country and England to liquidate damages to their systems due to the mechanical weakening and consequent failure of hydrants, water mains, service pipes, etc., from electrolysis, it is noticeably true that only occasionally does one find that any precaution is taken by water companies to avoid a repetition of the experience of others in this direction. It might be argued that the water companies being in no way responsible for the damage done to their own property by electrolysis ought not to worry about any bad effects which might result at some future time, but a small amount of time spent in consideration of this problem before the piping system is laid out and installed might be all that would be necessary to prevent this needless damage and result in the saving of considerable money and much bitter feeling.

An examination of the conditions existing in water systems which have been installed for a considerable length of time, and which were put in without regard to the possibility of damage from this cause is likely to show most astonishing results, and if water companies located in the vicinity of electric lines could be brought to see the wisdom of making periodic tests for the presence of stray electric currents and act accordingly much damage to the water pipes could undoubtedly be prevented by taking the necessary steps to prevent the flow of these stray currents before a sufficient time for the destruction of the pipes had elapsed.

The chance of danger varies so with local and climatic conditions that it is almost impossible to lay down rules which would be proper for all installations. It is likewise true that conditions indicated from tests made at one season of the year do not necessarily hold good for others. Therefore to get a comprehensive idea of the situation in any one case it is necessary to study the problem from the standpoint of the particular installation in question, and to conduct tests under the extreme as well as the average conditions.

Electrolytic action will take place wherever a current of electricity leaves a conductor which is capable of being oxidized (such as cast-iron, wrought-iron or lead water pipes) and passes into some other conducting medium in the presence of more or less dampness, except in cases where the current passes directly from one metal conductor to another by direct metallic contact.

Thus it will be found that wherever a current of electricity leaves a line of water pipe and passes into the surrounding earth or water, either to follow some other path or to return to the pipe after passing some obstacle offering electrical resistance, such as an imperfect joint, more or less electrolytic action will be taking place, depending upon the volume of current leaving the pipe. This electrolytic action will result in corrosion and more or less rapid eating away of the pipe at the joint where the current is leaving, which will in time cause the pipe to fail.

A point which the railroad companies seem to loose sight of is the fact that their own property is being damaged as well as that of the water companies having pipes in the ground. Wherever the current leaves the rails, to pass through the earth into a piping system, due to a defective rail bond in the return circuit, electrolytic action will take place, and slowly but surely the rails at such places will be eaten away and will have to be replaced at considerable expense. A thorough bonding of the rails in the first place and a careful test of the return circuit from time to time would reduce this difficulty to a minimum.

The writer had occasion recently to make some exhaustive tests on a water system of one of the larger suburban towns lying just beyond the outskirts of New York city, the object of the investigation being to determine the conditions prevailing in that town with regard to the presence of leakage currents from the grounded circuit of the local traction company, operating an overhead trolley system with grounded return, and whether such currents, if they were found to exist, followed such a path and were of such volume as to cause damage to the pipes of the water company by electrolytic action.

The results of these tests made by the writer to determine the presence and direction of flow of leakage currents between the tracks of the trolley company and the gas mains, water mains, hydrants and service pipes showed the following conditions:

| | | Volts. |
|---|---|---|
| 1. | Between gas main and trolley track | 0.0 to 0.6 |
| 2. | Between water pipe for hydrant No. 36 and trolley track | 1.5 to 6.0 |
| 3. | Between hydrant No. 21 and trolley track | 1.6 |
| 4. | Between hydrant No. 31 and gas lamp post (lamp post positive) | 0.9 to 1.0 |
| 5. | Between hydrant No. 31 and sewer manhole (hydrant negative) | 1.1 |
| 6. | Between hydrant No. 24 and trolley rail | 3.0 to 4.0 |
| 7. | Between hydrant No. 24 and gas lamp post (lamp post positive) | 0.6 |
| 8. | Between hydrant No. 19 and trolley rail | 3.5 |
| 9. | Between hydrant No. 10 and trolley rail | 4.0 to 11 |
| 10. | Between hydrant No. 6 and end of trolley rail | 4.5 |
| 11. | Between hydrant No. 3 and sewer pipe, where latter enters salt water bay inlet nearby | 1.0 |
| 12. | Between hydrant No. 28 and trolley rails | 2.5 |
| 13. | Between trolley rails and river running into above mentioned bay inlet | 2.5 |
| 14 | Between hydrant No. 30 and trolley rails | 2.5 to 4.0 |

Voltmeter used for test was a Weston 0-15 volt instrument, having a resistance of 1.357 ohms.

Tests were made between the hours of 10 a.m. and 6 p.m. under ordinary conditions as found daily.

The actual difference of potentials at the time these tests were made were between the minimum of 0.3 volt (which was the smallest amount which could be read with certainty on the instrument) and a maximum of 11 volts depending upon the location of the point where readings were taken, amount of current taken by, and the position of the various trolley cars at the time when the tests were made.

These results indicate that a current of electricity of varying amount (depending upon the physical condition of the ground and the amount of current being used by the trolley cars at the moment) was leaving the trolley rails and finding its way into and along the pipes of the water company, traversing that path until it could find a point of low resistance at which to leave the water system, and go to earth to return again to the source from which it emanated.

Having determined these points, it still remained to ascertain as nearly as possible the volume of these leakage currents, as it is this alone which fixes the amount of damage which such stray currents are capable of causing. This was a much more difficult point to settle owing to the various electrical and physical conditions beyond our control.

In reading articles on electrolysis one very often sees statements made that if there is a difference of potential between any point on a pipe line and the surrounding earth, that point will be subject to electrolytic action, and the amount of the electrolytic action will be indicated by the difference of potential between that point and the surrounding earth. This is a fallacy and very often leads to erroneous results; for example, a test was made on a piece of "L" shape water pipe which supplied several houses located near the water front. The difference of potential between the corner of the "L" and the body of water was found to be 12 volts; the difference of potential between the body of water and a point on the extreme right of the "L" was found to be three volts. This would seem to indicate that a large amount of current was flowing from the corner of the "L" to the body of water and thence back to the generator. As a matter of fact, this particular point was free from electrolytic action, and the other point mentioned above having a difference of potential of three volts had considerable action taking place. The explanation of the above condition is found in the fact that nine volts were dropped in the horizontal portion of the "L." The corner of the "L" was on a hill composed of dry sandy loam, and the extreme right of the "L" was on lower ground, which was constantly damp. Thus it is seen that a high difference of potential between any point on a pipe line and the surrounding earth or water does not necessarily mean that much electrolytic action is taking place at that point. Reports and statements on electrolysis, as a general rule, refer only to difference of potential and make no mention of the current flowing, in spite of the fact that the work of electro-chemists all over the world has long ago established the fact that it is the volume of current flowing, and not the difference of potential between the electrodes which determines the amount of metal which will be eaten away from the anode or conductor, from which the current passes into the surrounding electrolyte. While the difference of potential is a fair indication of electrolytic action it must not be blindly relied upon in determining the extent of electrolytic action at any point.

In this particular test it was found possible to determine the amount of current flowing in a loop of pipe running from hydrant No. 41 to hydrant No. 2, and also on a loop feeding hydrants Nos. 40 and 9. In each of these loops a current was found of such volume as would be capable of causing rapid deterioration of the pipe if physical conditions were such as to cause that current to leave the pipe in a restricted area. If, however, as may be the case, this current should leave the pipe throughout a considerable area, it is probable that the damage done by electrolytic action would not be sufficient materially to affect the life of the pipe over that area.

On one occasion, between 11.30 and noon, when the load on the trolley system was at its minimum, a test was made to determine as nearly as possible the total amount of current entering the water system due to the leakage from the rails of the trolley road. With the exception of the time when the road was entirely shut down it was found that a current of very considerable magnitude was leaking from the trolley rails into the water mains. The current was of such volume, even at that time of the day, as to be capable of doing very considerable damage, and during the busy hours of morning and evening the current would naturally be even greater. Of course the mere presence of the current in a piece of pipe does not always mean that that particular piece of pipe must necessarily be subject to electrolytic deterioration. A great many joints in a pipe line might be so good electrically as to prevent the escape of enough current to cause the action. The current might manifest itself at one point, and no electrolysis might be taking place within several hundred feet of this point. If pipe lines could be laid so that the stray current would not leave them, except by a metallic connection with the negative side of the dynamo at the power house, electrolytic action could not occur. Unfortunately this is impracticable owing to the nature of the soil and the method of pipe line construction.

The flow of current in the above test was found to be continuous all during the time of test, although it showed the characteristic fluctuations of the trolley current caused by the variation in the power consumed by the trolley cars in operation at the moment. This current though very small in volume caused very much trouble, as it was compelled to leave the pipe in a restricted area. This condition might arise at any time, due to some portions of the pipe surface offering an easier exit for the current than others, or due to a leak in the pipe forming a small stream which might work its way through the soil, making a low resistance path for the electric current through the earth and causing the current to be concentrated at this point. This same condition might arise from subsurface streams crossing the pipe line, or at points where the pipe passes in a short distance from comparatively dry earth into damp or wet earth such as marsh lands. Again this condition might be brought about by a very bad joint in the pipe line, over which the current was flowing, offering more resistance to the passage of the current than the surrounding soil, which is a very common occurrence, in which case the current would leave the pipe at the joint to re-enter it further on.

One of the most interesting points brought out by the test referred to and the careful investigation which followed it was that wrought-iron and lead pipes forming the service connection to buildings taking water from city mains are more susceptible to electrolytic action than the cast-iron water mains themselves, and having so little body are rendered useless in a much shorter time than the large mains would be by the same current.

There is a physical reason for the lesser susceptibility of the cast-iron pipe to this electrolytic action, and it is to be found in the method of its manufacture and finish.

In casting these pipes the molten metal fuses the sand immediately surrounding them, and upon cooling this fused sand forms a silicious or glassy surface over the pipe. While this coat is extremely thin and is not uniform in its nature, it offers an appreciable resistance to the passage of electric current either into or out of the pipe, and this partial insulation of the pipe surface is often added to by a coating of asphaltic paint applied to the outer surface of the pipe. Wrought-iron and lead service pipes on the other hand have no such protecting coating, and as they are usually secured to the street mains by a screw joint or wiped joint, the electrical connection between the two pipes is excellent, and if one or more of these service pipes is located near some point where the current tends to leave the mains, it will be found that the current will use them as an exit and they will therefore be rendered unserviceable by electrolytic corrosion due to this current.

As a result of the tests and investigations herein referred to, it may be stated that the following facts were disclosed with respect to this particular system:

1. That a leakage of electric current from the rails of the trolley company does exist.

2. That the leakage current enters the pipes of the water company, and after passing along these as conductors leaves the pipes and passes into the surrounding earth, where low resistance is offered.

3. That this current is of sufficient volume to cause very appreciable damage to the pipes.

4. That this damage will be more apparent in the small service pipes than in the mains, partly because the amount of metal in them is so much less and partly because they form an easier exit for the current on account of their physical structure.

A conclusion which the writer has found to be frequently demonstrated and which is apt to be overlooked is that a water pipe system may seem to be practically everywhere positive to the trolley rails and yet be in a dangerous condition. The reason for this is simple enough if one gives it a little thought, yet tests have been reported as showing a safe condition when the current was actually leaving the pipe at a point which could not well be tested from the surface, and would re-enter further on, making the next hydrant or exposed joint indicate a positive relation to the trolley system. Much time and money have also been spent for tests which have resulted in reports being rendered that a safe condition existed, when serious damage was actually taking place, owing to the fact that the tests showed a leakage current of an extremely low potential, no effort being made to determine its volume.

In outlining the above tests I have dwelled considerably on the cause and effect of stray current from trolley systems, and before concluding wish to say a few words regarding the various methods of preventing and guarding against this destructive foe.

After a grounded return trolley system has once been installed in the neighborhood of a piping system there is nothing that a water company can do to absolutely protect their pipes from electrolytic action. There are many ways, however, in which they can reduce the trouble to a minimum. As an example, it was found in the above test that a large number of lead service pipes were so badly corroded that they became absolutely useless. This was brought about by the fact that the current in leaving the piping system at certain points left by way of these lead pipes and passed through the earth for a distance of about 50 ft., and then entered another main. If a jumper of sufficient cross section had been connected between these two mains, which were about 50 ft. apart, the current would not have left by way of the lead pipes and the latter could have been saved.

Several remedies can be applied to parts of an affected piping system which will in most cases result in saving such affected districts. It rests entirely with the trolley companies to decide whether their systems shall or shall not cause electrolysis of underground pipes. If they so choose, they can entirely prevent the nuisance. They have but two questions to consider, viz., shall we put in an expensive return system and be sure no pipes are being damaged, or shall we save considerably on our first cost by using a track return and run the chances of paying damages to the water company for destroying their pipes? Unfortunately they usually choose the latter.

When the return circuit is grounded it is impossible to entirely prevent the escape of current from the return system, but the amount of leakage current can be greatly reduced by thoroughly bonding or welding the joints in the track. In time, however, due to wear and atmospheric conditions, some of these joints might become defective and leakage result. A very good way to detect defective bonds, after a system is in operation, is to make a trip over the road after a slight snowfall and take a look at the various rail joints. Defective bonds will manifest themselves by melting the snow about them due to the heat caused by the high resistance of the joint. This, however, will only point out bonds which are in very bad condition.

If it were possible to maintain a balanced condition, a three-wire system might be used in which the ground could act as a neutral and the two trolley wires as the outside conductors. This, however, is rarely done, as it is next to impossible to keep the two sides of the system balanced, and any unbalancing would cause current to flow through the earth and the surrounding pipe lines. A good feature of the three-wire system, however, is the fact that the stray current which would flow through the ground would not always flow in the same direction. When one side of the system became unbalanced the ground acting as the neutral would carry the current in one direction, and when the other side of the system became unbalanced the current in the ground would flow in the opposite direction so that while any water pipes which might pick up the current would be eaten away at one time, they would have metal deposited on them when the current flowed in the opposite direction.

Another method which might be used is to apply an extra generator at the power house, the negative side of which is connected with the piping system and the positive side to the feeder system. If this generator is kept at a slightly higher potential than the rest of the system all underground pipes to which it is connected will become electro-negative and electrolysis will be prevented to some extent. This system, however, has many disadvantages and is rarely if ever employed to mitigate the nuisance.

If the danger zone has been definitely located on any piping system, a large conductor can be run from the negative side of the generator and be connected to all the pipes of the underground system in the affected territory. This might happen to be a good many miles from the power station, and for that reason becomes impracticable in many instances.

There are a few other methods which slightly improve conditions, but there is only one satisfactory way out of the difficulty, and that is to install a complete metallic circuit for the traction system. This is usually accomplished by employing what is known as the double trolley system in which arrangement the current passes from one trolley to the motor, through the motor, and out through the other trolley to the second trolley wire and thence back to the negative side of the generator, both wires being insulated from the ground. This system has been employed in several of the western cities.

When the open conduit system is used, as is the case in our larger cities, the circuit is completed through two conductors lying side by side in the conduit and both being insulated from the conduit. With these two arrangements there is little inducement for a current to be diverted from the conductors and to stray off on iron pipes or underground metallic structures, taking some other course back to the negative side of the dynamo.

While these two methods of overcoming electrolytic action add somewhat to the first cost of the electrical equipment of a railroad system, the results obtained are well worth the additional outlay.

## Train Accidents in the United States in July.[1]

bc, 2d, Mobile, Jackson & Kansas City, Newton, Miss., butting collision of freight trains, wrecking both engines and several cars. Both firemen were killed and three other trainmen were injured.

dn, 3d, Delaware & Hudson, Ballston, N. Y., a passenger train was derailed at a misplaced switch and the engine and four parlor cars were overturned and ditched. The occupants of the train all escaped uninjured.

bc, 4th, 11 p. m., Northern Pacific, South Tacoma, Wash., collision between a passenger train and an empty engine; both enginemen injured.

unx, 4th, Salt Lake & Ogden, Farmington, Utah, the tender of the locomotive of a passenger train was derailed and, with the first two cars, was wrecked. The engineman and fireman were injured, the engineman fatally.

unx, 4th, Central of New Jersey, Bethlehem, Pa., a passenger train was derailed at a switch and the engine and one car were overturned. Two passengers were injured.

†rc, 5th, 2 a.m., Chicago, Rock Island & Pacific, Maple Hill, Kan., a fast freight train, carrying fruit, ran into the rear of a preceding stock train, wrecking the caboose and several cars. Two drovers riding in the caboose were killed, and two others were injured.

unx, 5th, Lake Shore & Michigan Southern, Glenville, Ohio, a fast mail train consisting of two mail and seven passenger cars was derailed. A man stealing a ride was fatally injured.

unx, 6th, Kansas City Southern, Ravanna, Ark., a work train was derailed and the engine and seven cars were ditched. Three trainmen were injured, one of them fatally.

unf, 7th, Little Rock & Hot Springs Western, Gulpha, Ark., the engine of a passenger train was derailed at a burning trestle and, with the baggage car, fell to the creek below. One passenger car fell part way through but remained suspended a few minutes, and the passengers escaped without serious injury. About 25 passengers were injured, but only two of them seriously.

bc, 8th, 2 a. m., Western & Atlantic, Chattanooga, Tenn., butting collision of freight trains, making a bad wreck, which took fire and was partly burned up. Both enginemen and both firemen were killed. It is said that the southbound train ran past a meeting point.

bc, 9th, Chicago, St. Paul, Minneapolis & Omaha, Stillwater, Minn., butting collision between a passenger train and a switching freight train, damaging both engines and several freight cars. Four trainmen and one passenger were injured.

xc, 9th, Southern Railway, Memphis, Tenn., collision between a passenger train and a switching freight train, doing slight damage. Immediately after the collision the switching train ran unattended some distance to Calhoun street and collided with two mail cars. Nine persons were injured, one of them seriously.

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

| | |
|---|---|
| rc | Rear collisions. |
| bc | Butting collisions. |
| xc | Miscellaneous collisions. |
| dr | Derailments; defects of roadway. |
| eq | Derailments; defects of equipment. |
| dn | Derailments; negligence in operating. |
| unf | Derailments; unforeseen obstruction. |
| unx | Derailments; unexplained. |
| o | Miscellaneous accidents. |

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

unx, 9th, Atchison, Topeka & Santa Fe, Flagstaff, Ariz., passenger train No. 4 was derailed and the engine was ditched. The engineman and fireman were badly scalded, the fireman fatally.

unf, 9th, Surry, Sussex & Southampton, Wakefield, Va., a freight train was derailed at a washout and the fireman was killed.

*rc, 10th, Seaboard Air Line, Lake City, Fla., a freight train standing in the yard was run into at the rear by a following freight, and the engine, caboose and several cars were wrecked. The wreck took fire, but by the aid of the city fire engines the flames were soon extinguished. A brakeman was killed and the engineman and fireman were injured.

*c, 10th, Little Rock & Hot Springs Western, Hot Springs, Ark., butting collision between passenger train No. 6 and an empty engine. Three trainmen and several passengers were injured.

xc, 10th, 3 a. m., Anderson, Ind., a passenger train of the Cleveland, Cincinnati, Chicago & St. Louis collided with a freight train of the Central Indiana, at the crossing of the two roads, and the passenger engineman was badly injured.

rc, 11th, Seaboard Air Line, Columbia, S. C., a freight train consisting of several freight cars, two empty passenger cars and a caboose, standing at the station, was run into at the rear by a following freight and the caboose and the passenger cars were derailed and knocked off a bridge. Two trainmen in the passenger cars were injured, one of them fatally.

xc, 12th, 4 a. m., Pennsylvania Railroad, Atglen, Pa., an eastbound passenger train collided with a freight, badly damaging both engines and wrecking one baggage car. Five trainmen were injured, one of them fatally.

dr, 12th, St. Louis, Iron Mountain & Southern, Chidester, Ark., a passenger train was derailed by spread rails and 24 passengers were injured, only two of them seriously.

unf, 4 a. m., Southern Railway, Petersburgh, Ind., a freight train was derailed at a switch which had been maliciously misplaced or blocked, and the engine and several cars were wrecked. Two trainmen were killed and two injured.

unx, 12th, Minneapolis, St. Paul & Sault Ste. Marie, Kenmare, N. Dak., a work train was derailed and the engine and seven cars were ditched. Seven employees were injured, two probably fatally.

unx, 13th, Chicago, Indianapolis & Louisville, Rose Lawn, Ind., the engine and first two cars of a passenger train were derailed and the engine and express car were overturned; six persons were injured.

rc, 14th, Northern Pacific, Sandpoint, Idaho, eastbound passenger train No. 4 ran into the rear of a work train standing on a side track, wrecking the caboose and five cars of the train on the siding. The engineman of the passenger train was fatally injured.

xc, 14th, 1 a. m., New York Central & Hudson River, Buffalo, N. Y., a train consisting of an engine and a caboose, the engine running backward and pushing the caboose, collided with some freight cars, making a bad wreck. One trainman was killed and three were injured.

unx, 14th, Chesapeake & Ohio, Buchanan, Ky., a work train drawn by two engines was derailed, and both engines were ditched. One man was killed and three were injured.

rc, 15th, Grand Trunk, Holly, Mich., a freight train which had been stopped at the crossing of the Pere Marquette was run into at the rear by a following freight, drawn by two engines, and one man was fatally injured.

xc, 15th, Erie road, Port Jervis, N. Y., a passenger train ran over a misplaced switch and into a locomotive standing on a side track, pushing the locomotive along some distance into another engine, which was overturned. One engineman was killed and two other trainmen were injured. It is said that the switch was maliciously misplaced.

dr, 15th, Great Northern, Chiwaukum, Wash., an eastbound passenger train was derailed at a point where the track had been distorted by the heat of the sun, and the engine and first three cars were overturned.

bc, 16th, Gulf, Colorado & Santa Fe, Plantersville, Tex., butting collision of freight trains, making a bad wreck. The northbound train is said to have disregarded a meeting order. One engineman and one fireman were killed and three other trainmen were injured, one of them fatally.

dr, 16th, Philadelphia & Reading, Philadelphia, Pa., a passenger train was derailed at a defective switch and two passenger cars were badly damaged by running against coal cars on a side track. Two passengers and two trainmen were injured.

unx, 16th, Southern Railway, Maben, Miss., a freight train was derailed and the engine and several cars were wrecked. Two trainmen were injured, one of them fatally.

unx, 16th, Central of Georgia, Marshallville, Ga., a freight train consisting of a locomotive and two cars, was derailed while running at high speed, and the whole train was ditched. The engineman, fireman and one brakeman were killed.

dr, 18th, Colorado & Southern, Forbes Junction, Col., a passenger train was derailed and several cars were ditched. The engineman was killed and the fireman injured.

unx, 18th, 11 p. m., Louisville & Nashville, Pilot Knob, Tenn., freight train No. 74 was derailed and seven cars were wrecked; one man was killed.

unx, 20th, 8.30 p. m., Southern, Salisbury, N. C., a freight train running at high speed was derailed at a point where the track was not in good condition, and the engine and six cars fell down a bank. The fireman was killed and two other trainmen were injured.

dn, 21st, Wheeling & Lake Erie, Warrenton, Ohio, a passenger train was derailed while running fast over track not suitable for high speed. The engine was overturned and one passenger car was badly damaged. The engineman was fatally injured and one passenger was injured.

unx, 21st, St. Louis & San Francisco, Guin, Ala., a freight train was derailed and the engine was overturned. One brakeman was killed and the fireman was injured.

bc, 22d, Central of Georgia, Fort Valley, Ga., butting collision of freight trains, wrecking both engines and 11 cars. Two brakemen were killed and two other trainmen were injured. It is said that the eastbound train disregarded a meeting order.

†bc, 22d, 9 p.m., Seaboard Air Line, Hamlet, N. C., butting collision between eastbound passenger train No. 44 and a westbound freight train, making a bad wreck. Twelve passengers and four trainmen were killed and 29 passengers and two employees were injured. The collision was due to failure of operator at Rockingham to deliver a despatcher's order to the passenger train. The order was put out at Rockingham, the meeting point, by the despatcher in violation of rules.

†unx, 22d, Great Northern, Maneta, Wash., the rear car of a passenger train was derailed near a trestle bridge, and after running some distance on the bridge was overturned and fell to the canyon, 50 feet below. Four passengers were killed and seven were injured.

unf, 23d, Kansas City Southern, Shreveport, La., a freight train was derailed by running over some cattle, and the engine was overturned. The engineman was killed and the fireman was injured.

unx, 23d, Great Northern, Camden, Wash., an eastbound passenger train was derailed while running at high speed over a curve and the engine and first three cars fell down a bank. The engine was submerged in deep water. The engineman, fireman, mail clerk and express messenger were killed, and three passengers were injured.

24th, 11 p.m., Northern Pacific, Hobart, N. Dak., a freight train was derailed at a switch and eight cars were wrecked. Two employees were killed and four injured.

bc, 25th, 10 p. m., Nashville, Chattanooga & St. Louis, Cartersville, Ga., butting collision of freight trains, wrecking both engines and 12 cars. Four trainmen were injured.

dr, 26th, Erie road, Jersey City, N. J., a freight train was derailed and the engine was overturned; engineman, fireman and one brakeman killed. The derailment is said to have been due to poorly ballasted track.

26th, St. Louis & San Francisco, Springfield, Mo., a passenger train was derailed at a switch and one passenger car was overturned. Twenty-five passengers were injured, two probably fatally.

unx, 26th, St. Louis, Iron Mountain & Southern, Ironton, Mo., a passenger train drawn by two engines was derailed at a curve, and both engines and three cars were ditched. One engineman was killed and three other trainmen were injured.

rc, 27th, Louisville & Nashville, Clanton, Ala., a freight train standing at a water tank was run into at the rear by a following passenger train, making a bad wreck. The fireman was killed.

xc, 28th, 4 a. m., Southern Railway, Spencer, N. C., collision of freight trains; one brakeman killed, two other trainmen injured.

bc, 29th, Cleveland, Cincinnati, Chicago & St. Louis, Rushville, Ind., butting collision between a freight train and a work train, due, it is said, to misunderstanding of orders. One employee was killed and several others were injured.

unf, 29th, St. Louis & San Francisco, Antlers, Ind. T., a passenger train was derailed by a spike which had been fastened on the track and the engine and one car fell down a bank. The fireman was killed and three other trainmen were injured.

unf, 29th, 11 p. m., New York Central & Hudson River, New Hamburg, N. Y., a northbound passenger train was derailed by a landslide and the first two cars were wrecked. The engine fell down the bank and lodged partly in the waters of the Hudson River. The engineman and fireman were killed and 12 passengers were injured.

bc, 30th, Pittsburg, Cincinnati, Chicago & St. Louis, Columbus, Ind., butting collision of passenger trains; six passengers injured.

rc, 31st, 1 a. m., New York Central & Hudson River, Newark, N. Y., rear collision of freight trains wrecking one engine and 15 cars. The foremost train had been unexpectedly stopped by the breaking of a coupling in the middle of the train. One engineman was killed.

dr, 31st, Atchison, Topeka & Santa Fe, Shawnee, Okla., a freight train was derailed by spreading of rails and nine cars were wrecked. A brakeman was killed and one brakeman and an unknown man were injured.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

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With the Pennsylvania Railroad taking in $170,000 yearly for every mile of its road from Pittsburg to Philadelphia, 354 miles, it is no wonder that Mr. Ramsey can find capitalists ready to back him in building a rival railroad. The Pennsylvania's line, nearly all four-track, is already filled with trains so nearly to its capacity that the company is building a second and separate railroad of two tracks from the Susquehanna river to New York bay. Moreover, Mr. Ramsey's claim that he can improve greatly on the Pennsylvania, both in grades and distance, between Pittsburg and New York may not be so wild as it seems. It is easy to believe that a grade of 20 ft. to the mile need not be exceeded from Pittsburg to New York, but in claiming to have found this easy grade, while at the same time saving 65 miles in distance, a promoter must expect to encounter incredulity. There are too many mountains in the path. Still, the ground, or most of it, has been gone over by many surveying parties during the past 20 years, and if Mr. Ramsey is claiming too much, there will be competent engineers to dispute him. As the whole announcement seems for the present only a feeler, intended for financiers' consumption, it is perhaps hardly worth while to analyze it; when Mr. Ramsey really wishes to inform the public he will give out something definite in place of the very round figures now published. But, really, he might be a trifle more definite, even in giving the reporters a hot weather "filler." An average cost of $150,000 a mile, Pittsburg to New York, is an estimate with no meaning. What is the average, excluding terminals? And what is the cost of new terminals in cities where the existing lines have cost $500,000 to $1,000,000 a mile? Terminals are vitally necessary for securing the four or five hundred cars of freight a day necessary to pay the interest on the cost of the road—even at the low figures of cost which have been given (fifty millions). And there is another necessity that may cost a new road more than its terminals, the friendship of the shippers. The anthracite coal field is mentioned as fertile ground for tonnage; but what new railroad could get within hailing distance of the mines? Railroads which are within a mile of rich traffic and yet cannot get hold of it, are too common not to be a warning to any investor who is at all cautious. However, we write all this, not to throw cold water on Mr. Ramsey's project, but merely as an invitation to him to make public some of the really interesting portions of the reports that have been made to him by his engineers during the past three years. As we have said, it is not surprising to hear that he has had capital offered him; but why not give the facts which will invite still more capital and thus reduce the rate of interest which will have to be paid for it?

What does it cost to build a railroad? We have been asked this question many times, and have replied that it depended on three principal factors: the cost of real estate for route and terminals, the nature of the country, and the kind of a railroad that it is desired to build. Yet in spite of the tremendous variations which these elements present, it is distinctly possible to make an off-hand estimate, taking each of the elements into consideration, which will roughly approximate the sum that the finished work is likely to cost. There are many occasions when a railroad officer who is not an engineer—or indeed a railroad officer who is an engineer—wants just such an approximation for projected new work, without waiting for a careful, finished estimate based on the detail cost of cuts, fills and rock work. It seems desirable, therefore, to print such information as can be gathered relative to the costs of finished output in specified localities—a method having the same analogy to the engineer's hand book that the case system of teaching law has to the text-book system. With this end in view, we have requested a large number of railroads actively engaged in new construction, to state the cost *per mile* of some of their new road, including preliminary surveys, clearing right of way, roadbed, ties, rails, ballast and side tracks, but not including real estate, stations, equipment or signals, since these latter items belong in the highly variable group. To make this "case system" of railroad costs more definite and easy to grasp, we have in each case asked for photographs of the section referred to. Following the principal study of the cost of the finished line, we propose to give supplementary data with regard to the cost of the items that go to make it up—ballast, rails, ties, earth and rock excavation, tunnels, etc., and to express the cost of these items in terms that can be grasped, in the largest possible units, by readers who have not had engineering training. The success of the study depends largely upon the assistance we receive, but in any case it

should be possible to formulate a series of rule-of-thumb estimates that will have considerable value. The first instalment of these papers is printed this week, and deals with the finished cost of certain stretches of high-class railroads in the East.

## GRAVEL WASHING PLANTS

The work of the Lake Shore in developing plants for washing gravel in quantities sufficient to furnish an adequate and continuous supply of ballast is of material interest to all roads using gravel ballast to any extent and thereby suffering more or less from dust. The good results from the application of the washed ballast as a dust-covering on the Lake Shore are quite apparent in riding over the part of the line already treated, becoming even more so, by contrast, in passing to the portion not yet covered. Even to a person riding on the rear platform of a fast train there is practically no dust perceptible, while such a station is for the most part untenable over the unwashed ballast during any but wet weather.

The mitigation of the dust nuisance undoubtedly had become a vital matter with the Lake Shore, with its large number of fine limited trains daily. It has always been a gravel ballasted road practically throughout and has maintained a splendid roadbed with this material, the easier riding qualities of which make it preferable to stone in this respect. By the removal of the dust-producing constituents the only serious objection to it is overcome, yielding an ideal ballast, which the figures given in the article printed elsewhere show to cost approximately one-half what rock ballast does, with a washing plant the size of that at Pleasant Lake, and under the average conditions there assumed. With a possible source of profit present in the enormous quantities of sand produced, opportunity exists for materially reducing the cost of the ballast. This, of course, is dependent on the proximity of the washer to a city of sufficient size to furnish a market for building sand, as otherwise the freight charges, or engine service charges, would absorb the profits.

A point especially worth noting in connection with the Lake Shore's experience with its two plants is the desirability of electric power for driving, alternating-current apparatus being preferable to direct-current because of the absence of commutators. Where power is not available from a source similar to that at the Rupel plant, experience seems to indicate the advisability of installing an electric generating plant, in preference to the method used at Pleasant Lake. Another detail of primary importance is the pump, which should be of sufficient capacity to allow an ample margin above the estimated consumption of the plant; an adequate water supply, being, of course, one of the most important requisites in the successful operation of the plant. For this same reason proper care should be exercised in providing the pump drive, an individual motor being best where practicable, making the pump independent of the other mechanism.

## STATE RAILROADS—THE LESSON OF BELGIUM.

In the May number of the *Revue Politique et Parlementaire*, the place of honor is given to an article dealing with the results obtained on the State Railroads of Belgium as compared with those on the companies' lines in France, more especially the Nord.

The writer is apparently unbiased, and the article is written with a view of enabling the French public, before whom the question of the purchase of the Western Railroad of France has recently been mooted, to form some conclusion on the relative advantages of company and state control. He first of all points out the fact that, generally speaking, in democratic countries such as France, Great Britain and the United States, the railroads are worked by companies, whereas in monarchical countries—Germany, Austria and Russia—they are worked by the state, and he points out that the fact that the most businesslike nations all have their railroads managed by companies is a strong argument in favor of that course.

It is six years since Monsieur Renkin, of the Central Section of the Chamber of Representatives in Brussels, made his historic attack upon the Belgian railroads, and the writer of the present article shows that instead of improving, things have gotten even worse since that date. In order to be perfectly fair he chooses the Northern Railroad of France as the nearest to Belgium and the one under the most similar conditions. He shows that the cost of administration in every department has gone up since the state acquired control, that whereas the French railroad is operated for 52 per cent. of its receipts, the working of the Belgian Railroad absorbs 60 per cent., and this in a country where the population is three times as dense, where iron is considerably cheaper and where the receipts per mile are much higher. He gives endless figures to show that this does not arise from better service, that the trains are much slower and much more unpunctual than over the frontier. He shows that the wages paid in Belgium and the conditions of the employees are not a whit better than in France, and that, in fact, the only people who benefit have been a number of higher officials whose posts did not previously exist, as well as the members of the Chamber of Deputies.

That he is not alone in his contention he shows by quoting from members of all political parties, including the socialists, one of whom showed that whereas the average speed of the best express trains on the Nord Railway was from 44 to 59 miles per hour, it dropped to 31 as soon as the trains crossed the frontier, in spite of the fact that the levels were much better.

The second instalment of this article is continued in the June number of the *Revue*. In this the writer shows that the one and only excuse for nationalization has been that the workers themselves are better off under the state than under a private company, but his figures show that whatever may be the case in other countries, in Belgium quite the contrary has taken place. The insufficiency of wages paid, which are in many cases as low as 42 cents to 57 cents a day, show this. As the result of a great deal of agitation, the ministry has now fixed the minimum salary at 2 francs 40, or, say, $3.25 a week, and this in a country where living is none too cheap. Guards get 83 francs, say, $16 a month, while brakemen start at 53 cents a day. The hours of work are apparently as bad in Belgium, if not worse, than elsewhere; 15, 16 and 18 hours a day are worked by guards, and the writer shows that frequently the regular allowance of eight hours' rest between the two services is interrupted. In short, neither the taxpayer nor the worker, nor the traveling public appears to derive any advantage from the fact that the Belgian railroads are owned and worked by the state.

## THE PENNSYLVANIA SALE.

It was announced September 3d that the Pennsylvania Railroad Company had sold 400,000 shares of Baltimore & Ohio and 160,000 shares of Norfolk & Western to Kuhn, Loeb & Company. The official circular said further that these stocks were purchased some six years ago for the purpose of establishing such relations with the managements of those properties as would incline them to join the Pennsylvania Railroad Company in an effort to do away with secret rebates and preferences, but that the desired result having been fully realized and the management entertaining no fears that the railroads of the country would ever fall back into the old practices, the directors of the company thought it wise to reduce its ownership in these roads, which has been done by selling approximately half its holdings in them. The circular adds that on account of the allegation repeatedly made that the Pennsylvania was seeking to control the tidewater bituminous coal traffic, the directors took action in deference to the present state of public opinion upon such matters, although there was no foundation for the charge and although it was confidently believed that the company was entirely within its legal rights in purchasing and holding these stocks.

This sale has several aspects of quite unusual interest. When the Baltimore & Ohio stock was put on a 6 per cent. basis a short time ago, it was generally thought that this had been done to increase the income of the Pennsylvania derived from its securities held—an increase which was perfectly justifiable, inasmuch as the Baltimore & Ohio earns on its stock at the present time about twice the amount now to be paid in dividends—but in view of recent events, it is probably safe to assume that it was the sale of this stock and not the income from it that was the primary occasion for the increased dividends. This, too, is in no wise open to criticism, except that it tends to weaken the impression, just now very strong, that the great earnings of 1906 necessarily mean increased dividends, regardless of hidden policy. The other aspect of the case most worthy of attention is the plain and consistent stand taken by the Pennsylvania in support of the anti-rebate movement and of anti-rebate legislation. The company says perfectly openly that these roads, in the management of which it secured a large voice several years ago, used to be bad, but that they are good now and it believes that they will stay good. The Pennsylvania has

also been in the van of the movement to do away with free transportation, even at considerable cost, as in Ohio.

We have always maintained that the cure for most of the evils in the railroad world, brought on by the irresponsible conduct of the weak neighbors, was a perfectly steadfast attitude on the part of the stronger roads. The Pennsylvania evidently believes that the present Interstate Commerce act furnishes the necessary legal backing for such an attitude, and in its new policy of publicity and of conformance with the outer reaches of public opinion—as in the case of the sale of the Consolidation Coal properties by the Baltimore & Ohio—it clearly intends to take a position not only above reproach but also above suspicion. On no other grounds is it possible to see the wisdom of the sale of the Consolidation Coal Company. As regards the recent sale, we do not pretend to express an opinion that the company was more influenced or less influenced by public opinion than by the fact that it needed funds to complete its New York tunnel work and did not care to undertake new financing at present. Nevertheless, in these times when railroads are a general target for hostility and criticism, a little obvious piety of attitude is surely not going to do any harm. Strong railroads all over the country naturally wish to see the whole fabric of rebate and discrimination crushed. They have their opportunity now to come forward prominently on the side which is at once the politic and the popular one, and the Pennsylvania is surely taking the best measures to set at naught the devices of the professional anti-corporation agitator. What looks now like a considerable political issue may quite conceivably melt away like snow in the sunshine, if a group of the strong roads of the country take pains to put themselves not only on the windy side of the law, but of public opinion as well.

## NEW PHASES OF RAILROAD FINANCE.

Among the large railroad systems of the country no corporation has pushed the theory of consolidating branch lines more systematically than the New York, New Haven & Hartford. The official list of the lines of that system, either merged already or under lease, number no less than 31, all of them originally independent; and of the 31 lines, large and small, 22 roads have either been actually merged already or that merger—barring legal technicalities not likely to prove serious—is near at hand. That steady process and policy of merging has of late had a variation which introduces us to a somewhat new phase of railroad finance, which may hereafter have both examples and meanings beyond the bounds of the New Haven system.

Some months ago we had occasion to point out, in connection with the "bond period" of American railroad finance, when lavish issues of bonds, most of them of high quality, were thrown upon the market, how those issues had, if we may use the term, "saturated" the local markets. It was a fiscal condition that has measurably continued until the present time. Stated briefly, almost every great railroad system, especially a system in our states of the East or Middle West, must rely largely on capital within its own territorial area for placing new bonds. Such marts for the new securities are not merely the large cities. They include also the smaller provincial cities, the savings banks of the smaller country towns, and even those little country towns where there dwell individual capitalists, large or small. In such a region of its own, let a great railroad corporation issue an abundance of new securities, and sooner or later comes an inevitable fall in the quotations. It is not so much a decline in credit, using that word in the absolute sense, for general confidence in the strength of the corporation and the endurance of its prosperity is as strong as ever. It is simply the logical outcome of the law of supply and demand. The communities have not the money to take up the excessive supply of new bonds; and added to this is the mental scruple of the investor based upon the saw, "too many eggs in one basket," and the acquiring of large interests, directly or indirectly, vesting in one corporation—an argument specially effective with savings banks and trustees forced periodically to make returns of fiduciary funds.

This was exactly the fiscal situation which has faced the New Haven Company in seeking new funds for its extensive improvements and the extension of its electric railway holdings. It found a "saturated" market for its securities bearing the title head of the main corporation. Just before taking the recent steps for the merger of the Naugatuck, the Northampton and the Air Line divisions, and the extinction of their corporate existence, the New Haven Company announced considerable issues of mortgage bonds on those lines and under their own old corporate titles. The purchaser of the new security thus holds a bond not only secured by a special mortgage, but bearing a separate corporate title. He escapes, in form at least, his mental scruple against "overloading." On the other hand, the parent corporation profits by the higher price and consequential lower fixed charge, the enhanced security being a small consideration for a corporation which regards all its own securities as gilt-edged. Many great railroad systems of the country besides the New Haven have subsidiary lines which they want to merge. It will be interesting to mark, in the future development of railroad finance in this country, how far this example of the new divisional mortgage, as a preliminary to merger adopted by the New Haven, will be followed. No doubt it will depend much on the condition of the bond market, the rates for money, and the general fiscal situation. If the present "bond period," already protracted, continues long enough, we may yet see the device reach large dimensions and possibly some great railroad corporations regretting that they have extinguished the subsidiary corporations prematurely—especially as the old underlying divisional mortgages fall in, are paid off and leave the divisions free from original debt.

Another novel and striking situation in connection with steam-trolley finance is presented by the same New Haven Company in handling its great electric holding corporation, the Consolidated Railway. The latter company in its rapid extension reaching over into Massachusetts, has been financed on a basis of "debenture" bonds of a somewhat peculiar character. According to the last report of the Connecticut Railroad Commission these debentures outstanding, running for long periods, and most of them four per cents, amount to $12,070,400, and, if we are not mistaken, have somewhat increased since. As debentures they are unlimited as to issue, but, as under their terms no mortgage can be placed ahead of them, they practically represent all the equity of the consolidated (street) railway system and have a pretty definite mortgage quality. Several months ago the parent steam corporation offered its own stock in exchange for these debentures on a convertible ratio of two for one, i. e., five shares for each bond of $1,000, the option expiring July 31, 1906. Here was a unique situation. In the first place was the novelty of proposed exchange of trolley for steam securities on a large scale. Again, at the time, several months ago, when the New Haven directors made the offer, the stock of their road was selling at about 201 a share, the Consolidated Railway debentures at 98, or 196 as immediate price in debentures of the stock—a clear profit from quick sale of the stock and purchase of the debentures by the proceeds and the substitution of an assured eight per cent. interest rate for a contingent eight per cent. dividend rate. Moreover, if the stock had risen during the period of convertibility, there would have been for the new bondholder opportunity for a fresh profit by making the conversion. In fact, the stock fell, and only a small fraction of the bonds were converted. But, had the convertible scheme succeeded, the security of the remaining bondholders would have been greatly enhanced, subject, however, to the peril of new debenture issues at an increased price. A kind of endless chain of convertibility and new issues is thus suggested as a method of sustaining the market value of the debentures—though suggested as a mere possibility.

In such processes of steam-trolley finance there is also the further evidence of the definiteness and permanence of the street railway purchases made by the Eastern railroad corporations. That those purchases must ere long become part of the general capitalization—either in stock or debt, or both—of the steam roads is undoubted. To accelerate the mergers we are likely to see some special inducements offered to street railway security holders, and, as in the case of the New Haven Company, the readjustments following some novel lines.

### The Work of the Interstate Commerce Commission.

The pamphlet which has been printed by the Interstate Commerce Commission containing the revised Act to Regulate Commerce, serves to call attention to the fact that the Commission is now charged with a considerable variety of duties; for it contains in its 59 pages no less than 15 laws—not including the Sherman anti-trust law of 1890. Evidently the whole of the seven commissioners will have ample opportunity to fill up with work the seven hours a day that the government requires of its servants in Washington. Besides the Interstate Commerce law itself, and the Elkins law of 1903 (which is still kept separate from the law of 1887), there are three supplementary acts and two others of a local nature; and two concerning the coal and oil investigation, which made such

a stir on the Pennsylvania Railroad, the Safety Appliance laws, the law requiring monthly accident reports, and the resolution calling for an investigation of the use of the block system in the United States. Lastly, we have the law of 1898, providing for arbitration of labor disputes on railroads, in which the chairman of the Commission is charged with important functions.

It may prove that none of these laws are dead letters. The arbitration act of 1898 has been quite generally regarded as dead, up to the present year, but now the Brotherhood of Railway Telegraphers is making a determined attempt to apply it to one or two roads in the South—not on the arbitration issue, but to enforce section 10, forbidding an employer to discriminate against employees on account of their membership in a labor union.

The block system resolution, radically different, in subject matter, from any general law which has been prominent in the Commission's activities heretofore, has this week been made the text of a circular sent by the Commission to all the roads of the country calling for information concerning their practice. The circular asks for information concerning the number of miles in use on each road of each kind, manual and automatic; the percentage of road block signaled; and the rules for the operation of trains under the block system. Information is also asked concerning automatic stops, if any are in use, and as to whether crossings and drawbridges are interlocked with block signals. A clause in the order requires special information concerning divisions on which block sections are more than four miles long, and each road is asked to answer the question whether the block system is economical, aside from its use as a protection to life and limb; also to what extent the block system has reduced collisions, and to what extent it has increased the capacity of lines.

This investigation should result in useful enlightenment of the public, for the information which it contemplates has long been needed. The *Railroad Gazette* has gathered similar information, but not with the completeness of detail that the government can command; and the *Railroad Gazette* has preached the virtues of the block system, but often to unresponsive hearers. We hope that the government can put our efforts in the shade, as it has already done in accident records. A large majority of the Commission's circulars must come back with blank answers, for not one-tenth of our companies have block signals; but those roads which have something to report and have made progress in the use of the block system deserve the commendation which a government report can give them.

It seems likely that the enlarged Commission may have plenty of work to engage its energies in administering the Interstate Commerce law itself, leaving block signals, labor questions and air brakes out of the account. Already the merchants of Spokane and the cattle men of Texas have reappeared with their grievances, which have been investigated in past years, but have failed of settlement because the Commission lacked mandatory powers. It is clear that the adjustment of little irregularities and the punishment of secret practices do not constitute the only field in which a stronger Federal law was wanted; these cases illustrate the demand for actual, radical and bald reductions of rates; and there are numerous others like them. The Texas complaint is against the railroads running from that state to Chicago, concerning their rates on cattle and also the rates for delivering cars to the stock yards in Chicago. The Interstate Commerce Commission long since decided that these rates ought to be reduced, and appeal was made to the courts, but no decisive result was accomplished. The Spokane case is in form a complaint against the long and short haul law, and involves the perplexing question of competition by ocean vessels; but essentially it involves the question of the absolute justice of the railroad charges from the East to Spokane. The merchants of Denver again complain that dry goods and other high-class commodities are carried from the East to California cheaper than to Denver; and fruit commission merchants of Macon, Ga., complain of exorbitant rates on peaches to northern cities. This complaint not only sets forth the rates now charged, but declares that such and such lower rates would be reasonable. Complaint is made of the refrigeration charges also, and it is declared that the railroads ought not to farm out the refrigerating business to a private company and compel shippers to make two contracts. A firm in Chicago has presented a complaint against the Wells-Fargo Express Company.

The first order issued by the Interstate Commerce Commission under the revised law is one permitting the Boston & Maine to reduce rates on ice from Maine, New Hampshire and Vermont to Boston without giving 30 days' notice; a five days' notice will be accepted. This is on account of an urgent demand for ice because of the shortage of the ice crop "and for other good reasons." Can it be that we are going to have rate-regulation by telegraph? A committee of Chicago merchants recommends that a road desiring to meet a competitor's rate be allowed to do so without notice, provided that it sends word by telegraph to the Commission and that it takes care not to go below the competitor's figure; and this Boston decision seems to be almost equally "fly." Surely, if changes are to be made while a piece of ice is melting in an August sun, something at least as speedy as the telegraph will be needed. And why not? The Texas commissioners have made emergency rates on scrap iron; and of how much more worth is a mint julep!

## Railroad Accidents in Great Britain in 1905.

The "General Report" of the British Board of Trade, reviewing the railroad accident records of the United Kingdom for the year (1905), made by Mr. Herbert Jekyll, gives a very intelligent summary of the salient facts shown by the statistics and, we may say in passing, is presented in better shape than in former years. The principal totals for 1905 and for the year preceding are:

| | 1905 | | 1904 | |
|---|---|---|---|---|
| | Killed. | Injured. | Killed. | Injured. |
| Passengers, in train accidents | 39 | 396 | 6 | 534 |
| Passengers, other causes | 109 | 1,972 | 109 | 2,135 |
| Employees, in train accidents | 6 | 112 | 7 | 114 |
| Employees, other causes | 393 | 3,688 | 409 | 3,807 |
| Other persons | 552 | 291 | 542 | 299 |
| Total | 1,099 | 6,459 | 1,073 | 6,889 |

The number of passengers killed in train accidents in 1905 was greater than in any year since 1899, and 38 of the 39 are attributed to four accidents: Hall Road, 21; Witham, 10; Cudworth, five; Huddersfield, two. The first three were reported in the *Railroad Gazette*. The number of passengers *injured* in train accidents was much below the average, and reviewing the accidents for many years the conclusion is reached that there is no relation between the numbers killed and the numbers injured from this cause. The number of employees killed in train accidents, six, compares with an average of seven for the preceding four years. Before that the numbers were larger; but even at the largest the totals are phenomenally low as compared with the figures for the same class of accidents in America. There is no profit in controversy concerning the differences between England and America in the matter of safety on railroads, but it is perhaps pertinent to suggest to those who have tried hard to make instructive comparisons and who have been bothered by the uncertainties that beset most of the factors of the problem, that this item—employees killed in train accidents—is more free from fluctuations than any other in the list, and therefore would furnish more satisfactory illustrations. Unfortunately for America, however, the record in England is so much better than ours that the satisfaction is likely to be all on that side. Our train mileage is about 2½ times theirs, but our fatal accidents to employees in train accidents total so large that we shall refer the reader to the Government reports for the figures.

Concerning accidents on and around trains, exclusive of train accidents, the report says: "In this class there is little change. The casualties to passengers are much more numerous than those caused by train accidents, but they mostly arise from the carelessness of the passengers themselves. The casualties to employees from this cause are unhappily always numerous. More close and continuous attention is given [by the government] to this than to any other class of accident, because it includes a proportion, though not a large one, of accidents that may be termed preventable. It is therefore satisfactory to note the diminishing frequency of these casualties. Analysis of the casualties in 1905 shows that out of every hundred, 57 were due to misadventure, 32 to want of caution or misconduct on the part of the injured persons, and five to want of caution or breach of rules on the part of other servants, leaving only six attributable to preventable causes. It follows that unless men can be induced to take the reasonable precautions which the conditions of their occupation among moving vehicles call for, there is little room for any substantial reduction of these lamentable accidents."

The number of collisions and derailments in 1905 was 199, while the average of the previous 25 years was 217. The average per train mile is, of course, much larger than here shown, as the train mileage has increased. The reduction in frequency per train mile is, in fact, nearly 34 per cent. This is attributed to improvement in permanent way, to the use of continuous brakes, and to increased vigilance and care on the part of the workmen.

Of the 24 train accidents inquired into by the officers of the board, 21 were due wholly or partly to misconduct or negligence. Other causes figuring in this list are, excessive speed (in seven cases) and foggy weather (two). Accidents to passengers in other than train accidents continue to show no marked change in totals. Most of these accidents are "due to want of common care and caution on the part of the passengers themselves." The number of employees killed and injured on or around trains, aside from train accidents, shows a gratifying improvement. Comparing 1905 with the previous nine years, the casualties happening to employees under this head were in the following proportions:

| | 1905 | 1896-1904 |
|---|---|---|
| Goods guards and brakemen | 1 in every 21 | 1 in every 18 |
| Permanent-way men | 1 " " 209 | 1 " " 235 |
| Engine drivers | 1 " " 78 | 1 " " 60 |
| Firemen | 1 " " 49 | 1 " " 41 |
| Shunters | 1 " " 19 | 1 " " 15 |
| Porters | 1 " " 100 | 1 " " 84 |
| Passenger guards | 1 " " 80 | 1 " " 60 |
| Laborers | 1 " " 333 | 1 " " 279 |

The diminished frequency of accidents to freight train men and

yard men is attributed to the general use of the coupling pole and to better lighting of yards, though it is remarked that the coupling pole introduces a new danger, and has accounted for 21 accidents in 1905. The causes of accidents to employees on or around trains, excluding train accidents, are further classified as to causes in the following table:

| Causes. | Inquired into. | Not inquired into. | Total. |
|---|---|---|---|
| A. Misadventure or accidental | 120 | 2,200 | 2,320 |
| B. Want of caution or misconduct on the part of the injured person | 334 | 995 | 1,329 |
| C. Want of caution or breach of rules on the part of servants other than the injured person | 118 | 75 | 193 |
| D. Defective system of working, dangerous places and conditions of work, etc. | 83 | 18 | 101 |
| E. Defective apparatus, want of appliances or safeguards, etc. | 39 | 74 | 113 |
| F. Neglect or non-observance of Rules under Prevention of Accidents Act | 23 | 2 | 25 |
| Total | 717 | 3,364 | 4,081 |

Of the 190 casualties to trackmen some are attributed to failure of the boss to provide an efficient lookout, which is an infraction of Rule 9 of the Prevention of Accidents Rules.

A newspaper correspondent in New Mexico reports that the route of through passenger and freight trains over the Atchison, Topeka & Santa Fe between Chicago and the Pacific Coast, is to be changed for nearly 800 miles, or more than one-third of the total distance of 2,265 miles between Chicago and Los Angeles; and the new line is in some places 250 miles south of the old one. It appears that this report, although premature, has a basis of truth. The completion of the Atchison's line from Belen, N. Mex., 30 miles south Albuquerque, eastward 250 miles to Texico, N. Mex., gives the company an alternate through line from Rio Puerco, N. Mex., which is 34 miles west of Albuquerque, eastward to Florence, Kan., 173 miles west of Kansas City. The distance from Florence by the old line via La Junta and the Raton Mountain to Rio Puerco, is 780 miles. The distance saved by the new line is inconsiderable—11 miles, it is said—but the saving in locomotive power is marked. By the existing line long grades of 187 ft. per mile have to be surmounted in the Raton Mountains, while on the new line the maximum grade eastbound is 32 ft. to the mile, except for about 25 miles, where there is a grade of 66 ft. to the mile, and where helping engines will have to be used. While the 250-mile connecting link between Belen and Texico is nearly ready for use, the existing lines east of Texico will have to be changed a great deal before they will be suitable for heavy and fast trains, and the company has not yet decided upon any date for changes to be made in through traffic. The management does intend, however, to use the new line for through freight and for the fast mail trains; also possibly for other through trains. This will probably be one of the most extensive changes of the kind ever made. Apparently no less than ten important towns are likely to suffer some diminution in their through passenger accommodations.

## NEW PUBLICATIONS.

*The Elements of Machinery.* Constituting Vol. 1 of an illustrated technical dictionary in six languages: English, German, French, Russian, Italian and Spanish. Compiled after a novel method by K. Deinhardt and A. Schlomann, engineers. With 823 illustrations and numerous formulas; 403 pages; cloth. The McGraw Publishing Company, New York, 1906. Price, $2.00.

It is fair to say that this is the most remarkable technical dictionary in foreign languages which has ever come to our attention, and its conception and the method in which the task has been carried out are worthy of the highest praise. The essential characteristic is that the topics are treated under separate branches, while at the same time a sketch or diagram is introduced. This latter is of very great value in dealing with foreign terms the meaning of which is not quite clear, especially where the use is wholly technical and the changes of practice introduce frequent variations. Volume 1, in addition to its words dealing with the elements of machinery, includes also the tools most frequently used in metal and wood working, and the definitions are carried out most explicitly and in great detail. For example, under the general heading "hammer," twenty-eight kinds of hammers are given, and nineteen of these are illustrated. Such technical terms as "degree of eccentricity" not only have their equivalents given in the six languages, but are made perfectly clear by the accompanying illustrations. At the back of the book there is a vocabulary in each of the six languages, which refers to the page on which the illustration and corresponding terms are given.

So far as we know, nothing like this has been attempted before in a technical dictionary, and yet it is clearly the way that all technical dictionaries should be made. We are glad to know that Volume 1 is to be followed by subsequent volumes dealing with electrical apparatus, with steam boilers and steam engines, with hydraulic machinery, with hoisting and conveying machinery, with small tools and machine tools, with railroads and railroad appliances, with structural iron work and bridges, with metallurgy, with architecture and with naval construction. The authors are to be much congratulated on undertaking this line of work and carrying it through in so useful a manner.

*Catechism on Producer Gas.* By Samuel S. Wyer, M. E. Forty-two pages; pocket size; cloth. The McGraw Publishing Company, New York, 1906. Price, $1.00.

This is a useful and convenient discussion of the elements of gas manufacture in the clear form of a series of questions and answers. While primarily a technical hand-book, it is expressed in terms readily understood by the layman.

*Directory of the Alumni of Stevens Institute of Technology.* Published by Stevens Institute Alumni Association, Hoboken, N. J., 1906. Price, 50 cents.

This directory is valuable in that it supplies a classified list of highly trained engineers. Following an alphabetical list of the alumni of the Institute, in which the year of graduation is given after each man's name, a geographical classification is made, and there is also a business directory or classification, arranged according to industries.

# CONTRIBUTIONS

## The Golden Rule in Handling Freight Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your two articles calling for the exercise of the Golden Rule in the handling of foreign cars will, I hope, have a good effect, although they come pretty near the old transcendental injunction, "Be good and you will be happy, but do not be good in order to be happy."

I think I can safely say for the Golden Rule, that after having tried both the Golden and Iron Rule on our system, I find more foreign cars are sent to us to-day when we are handling foreign cars decently than were sent to us last year when we were handling forign cars outrageously.

It may be that the trend of traffic has turned, or it may be that we are more successful in making our people use foreign cars for foreign loads than we were, but it certainly is a coincidence that points to the idea that honesty in car handling may be the best policy.

I am a little troubled by the possibility that if everybody were honest there would not be enough "best policy" to go around. There are only so many cars in the country, and if we all handle them well we cannot all be rewarded by an extra supply of cars. On the other hand, the opportunities for quickening the movement of freight cars are so immense that a very little improved movement will go a long way in car supply, not only in home, but in interchange traffic.

BOX CAR.

## Railroad Law in August.

The following abstracts cover the principal decisions, handed down by the Federal courts in railroad cases, during August:

*"Last Chance Doctrine".*—The rule of law recognized by some courts which makes a railroad company liable notwithstanding the negligence of the injured person—such negligence ordinarily defeating his recovery—if the operatives of the train could have prevented the injury, notwithstanding such negligence is not a rule without exceptions. It is without application to a case where the person injured at a crossing deliberately drove upon the track in the day time immediately in front of moving cars which he could have seen in the exercise of ordinary care, and the circumstances were such that the trainmen were justified in believing that he did see the cars and would stop before reaching the tracks, and when it was discovered that he would not stop it was too late to stop the train. Illinois Central Railroad v. Ackerman, 144 Fed. Rep. 959.

*Railroad Aid Bonds.*—A county having contested the validity of railroad aid bonds, first in a suit to compel this issuance in a State court and again in the Federal court, in a suit to recover the contents of coupons on the bonds, is concluded by the judgments rendered in these suits, and cannot again raise the question of validity in a proceeding to compel a levy of tax to pay the bonds. Estill County, Kentucky, v. Emory, 144 Fed. Rep. 913.

*Injuries to Mail Clerk.*—A mail clerk while engaged in the performance of his duties in that capacity is regarded as a passenger, and a railroad company is held to a higher degree of care in his transportation than though he were a servant. In case he is injured, the mere happening of the accident raises a legal pre-

sumption of negligence against the company, which it must disprove. Southern Pacific Co. v. Cavin, 144 Fed. Rep. 348.

*Bills of Lading Not Necessary.* An oral contract of shipment, in the absence of fraud or imposition when susceptible of proof, is as obligatory on both the carrier and shipper as a written one. Hence, a shipper seeking to evade a condition in a bill of lading limiting the value of the shipment in consideration of a reduced rate, cannot urge that the bill was not signed as a reason for his contention. Neither can he claim that his servant who accepted the bill did not read the condition limiting the value, where such shipper accepted and rated on the bill given his servant. Missouri, Kansas & Texas Railway Co. v. Patrick, 144 Fed. Rep. 632.

*Property Taken Without Condemnation.*—A property owner whose property is appropriated by a railroad company without right, who sues the company for the value of land so taken, is bound by his judgment in such an action and cannot reopen the matter as against a railroad company purchasing the railroad at foreclosure sale. Zimmerman v. Kansas City Northwestern Railroad Co., 144 Fed. Rep. 622.

*Safety Appliance Act.*—A terminal company receiving cars of coal coming from another state and delivering them within its yards to the engines of a railroad company, is engaged in moving interstate commerce within the safety appliance act. Under this statute it makes little difference whether the car contained at the time any commodity being carried as freight or not, if the car was one being used for that purpose. United States v. Northern Pacific Terminal Co., 144 Fed. Rep. 862.

*Unauthorized Use of Hand Car.*—The principle that an employee is not liable for the wrongful acts of his servant outside the scope of his employment, though the servant at the time is using facilities belonging to the master, is applied in a case where a gang of construction hands used a hand car after working hours, and on returning after dark without a light collided with another hand car rightfully on the track, and injured a person on this car. It was held that the railroad company was not liable under the rule. St. Louis Southwestern Railway Co. v. Harvey, 144 Fed. Rep. 806.

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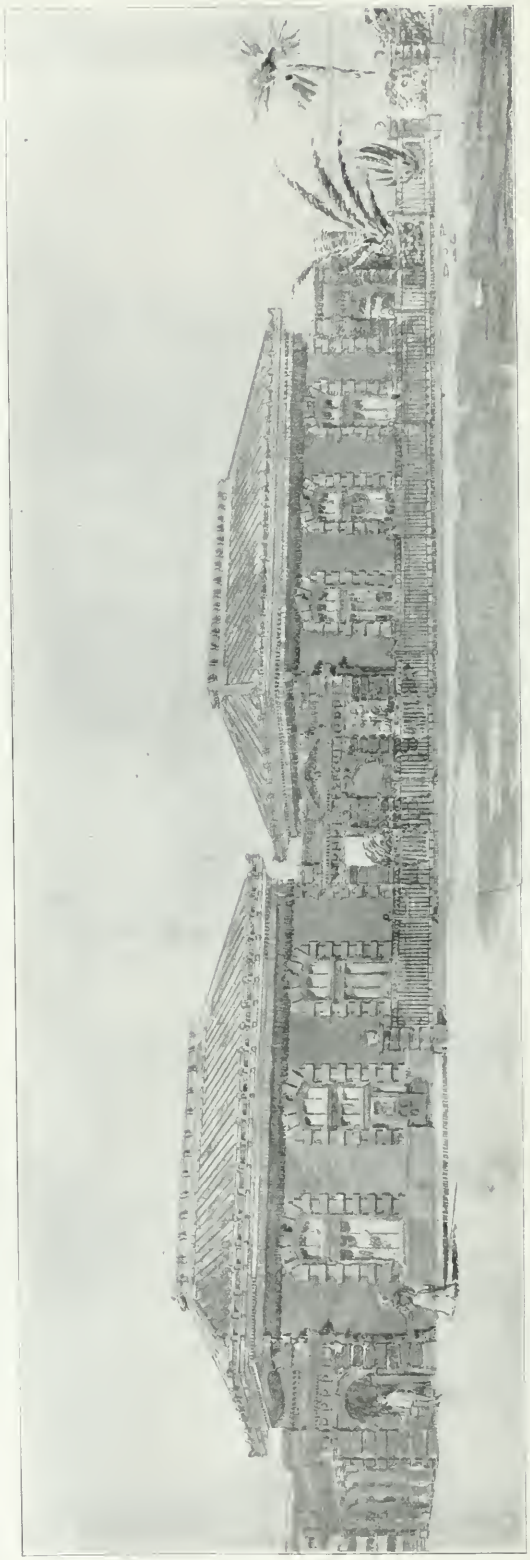
## Southern Pacific Station at Berkeley, Cal.

The new Southern Pacific passenger station at Berkeley, Cal., for which plans and specifications have just been prepared in Assistant Chief Engineer J. H. Wallace's office, in San Francisco, by Architect D. J. Patterson, show that the college town where the University of California is located will at last have a station in keeping with the fine architecture of the adjoining structures on the campus. The hulding, which is of French Renaissance design, consists of two wings, being 190 ft. in extreme length and 41 ft. wide with an arcade 11 ft. wide extending along the west front and both ends. The color scheme of the structure is red pressed brick, light buff terra cotta trimmings and copper roof and cornice. The arcade is in the Doric order, made of reinforced concrete covered with terra cotta. The cost of the main structure is estimated at about $40,000 and the remaining area of the two blocks devoted to the station grounds will be appropriately parked. The north wing contains the smoking room and baggage room. The south wing contains a waiting room, ladies' retiring room and the ticket office. Between the two wings is a grass plot with cement walks and a fountain. The surrounding grounds will be arranged with additional grass plots and cement walks. The interior of the waiting room, which is 45 x 25 ft., with a 23-ft. ceiling, is to be finished in light buff brick and terra cotta trimmings and to have an elaborate terra cotta fireplace with an ornate hammered copper hood at one end. There will be panel designs in the waiting room by a famous sculptor, executed in terra cotta by local manufacturers. The insignia of the Southern Pacific, in terra cotta, will adorn one of the end walls and a handsome clock will be placed on the opposite wall.



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The illustration was obtained through courtesy of D. J. Patterson, Southern Pacific architect.

## Relation of Warehousing to Transportation.*

If the church bell drew the people like the dinner bell, and a freight car were emptied like a passenger car, I would enter the ministry, for preachers would then be in great demand, while cars would, in my generation, be superabundant, and the term "car demurrage" be obsolete. Ideal, you say? Yes, both of them, and practically impossible of attainment, but both teach a lesson by contrast. Necessity compels response to the dinner bell, but not to the church bell, while inanimate objects cannot unload themselves like passengers, and yet, to refuse to approximate the ideal is to content ourselves with present conditions instead of aspiring toward a commercial or other sort of paradise.

A few years ago, we heard much of "over-production" of cereals, fruits and other products of the farm, but such a statement to-day would be considered an absurdity. Transportation facilities and scientific system of storage have made it practicable and profitable to care for any temporary surplus of agricultural productions. The oldtime method of storing cereals on the premises is out of date. Farmers to-day in the United States are sowing millions of acres and reaping billions of bushels, and it is a practical impossibility to market such a crop immediately. Therefore, the imperative necessity for storage facilities and the development of the elevator system, in which regard America already exceeds any other country in the world. When will the great staples of the manufacturing world, such as coal, iron, steel, copper, tin, lead, lumber, etc., be likewise scientifically stored and systematically used? The answer is, when necessity compels it. These articles are the basis of all manufacture—non-perishable, and can be stored at trifling cost as compared with agricultural produce.

Taking the country and commodities as a whole, we find that production and transportation have outrun consumption and reservation, in other words, we produce and transport faster than we consume and store. Her annual commercial surplus is America's white elephant. The wider the margin between production and consumption, the greater the tax upon either transportation or reservation. How shall accumulations be preserved and future necessities be provided for? An abundant harvest must not be prodigally consumed or wasted, but, rather conserved and stored for future trade or prospective need. Joseph in Egypt filled storehouses during the seven years of plenty to tide over the expected seven years of famine. In times of antiquity, the shores of the Adriatic, the Mediterranean and of Italy vied with each other as storage centers, for the commerce of the Orient. Many ancient cities maintained public stores to prevent destitution and the extortion of scarcity prices. In our own arid west, the government is redeeming that barren waste by the storage of surplus water during the rainy season and the distribution of it later along, so that the Great American Desert may blossom as the rose. An up-to-date farmer stores ice in the winter that his summer fruits, vegetables and dairy products, may be kept from deterioration and be more profitably marketed. A modern city could scarcely exist without cold storage plants for its surplus perishable products. This is the day of the refrigerator, the elevator and the reservoir. Vessels by the hundred ply the ocean carrying thousands of carcasses and all kinds of produce in cold storage; a modern hotel has its refrigerator plant as a part of its equipment, while every town, village and side track has from one to dozens of elevators, for grain held for speculative purposes or awaiting transportation. In the storage of perishable goods and grain, commendable progress has been made and this process must be extended to the raw materials and finished product of individual industries.

Warehousing in the United States is far behind that of foreign countries. The Imperial Bank of Germany has fourteen warehouses of its own for merchandise deposited with it as collateral. The bank seems to have gone into the three ball pawnbroking business on a large scale. On account of lack of available storage facilities in this country or the high rates charged, instances are cited where goods have been shipped across the ocean, stored abroad and returned when needed, and money saved. The use of cars at our seaboard for the storage of export grain must stop.

A ship or train is simply a warehouse in motion, but how differently the two are treated upon arrival at destination! Marine rules are seemingly inexorable and no one is ever rash enough to combat them. Vessels are for transportation and bankruptcy would face the man who would consult his convenience as to the removal of the lading. If he has a ship and a car, too, he lets the car go and unloads the cargo. Marine demurrage is exorbitant and prohibitive, while car demurrage is nominal and permissive, nor has marine insurance its counterpart on rail. The unloading of vessels is immediately performed and the cry of "No place for the goods" is never heard, while the unloading of cars depends solely upon how long the railroads and the public will permit them to stand loaded. Railroads should be required to get out of the storage business, to eliminate from their professional vocabulary the terms "storage," "storage period," "storage freight," etc. The public, on the other hand, must stop urging an extension of "free time" and demand that railroads stick to the transportation business and allow others to engage in the storage of goods. Whenever involuntary warehousemanship is forced upon railroads, their demurrage should correspond to marine demurrage and be sufficiently remunerative to compensate for the interference with public service.

It is only within comparatively recent years that railroads commenced charging demurrage. Their unwholesome zeal for tonnage caused them to ignore the weighty question of how such tonnage was to be handled by shippers, and the infant evil of free car storage grew to gigantic proportions, before any systematic effort was made to overcome it. The shipping public have not yet grasped the eternal truth that they are perpetuating an insidious and death dealing system when they countenance and encourage storage in cars; death to the whole commercial interests of society. Cars cannot be built for use without limit, nor can tracks upon which they run. Even with subway, surface and elevated, the desirable metropolitan spots of earth are inadequate upon, under and over which, to store the commerce of our cities. Warehouse space, on the other band, is not limited to three stories, but can reach below and above terra firma as necessities may require.

The year 1905 was a production record breaker. In grain alone the farmers produced an ordinary wagon load for every man, woman and child in the United States. The railroads, lake freighters, canal boats, and ocean liners, moved masses of food stuffs to the markets of the world, while the country elevators groaned and their sides bulged. Did the consumer, because of this condition, care for an increased volume? No. Did he build bins, rent sheds and hasten the release of cars? No. Did he even use his available storage capacity to its limit? No—it was a few cents cheaper to use direct from the car than to elevate and back again. What did he do? He petitioned the legislature to pass laws to compel the railroads to furnish more cars, to haul them faster and to grant him the great American privilege of holding them longer without charge. While grain dealers have outstripped all other interests in the storage of their commodity, yet their customers—the consumers—have done nothing but kick, and knock and petition and continue business from hand to mouth or from car to hopper.

It is not a question of transportation that is afflicting America's commercial interests to-day. Railroads have equipment and facilities for transporting all the business that can be offered, provided, after transportation has been completed, their cars are immediately released for further service. And by this term "immediate" I mean only such diligence as is exercised in unloading vessels. It is very much easier to unload from cars than from the "holds" of ships: the mechanical appliances are more numerous and the opportunities to use them less circumscribed; for instance, coal, ore and similar freight may be unloaded by dropping car bottoms or turning the car upside down, while from vessels such commodities must be removed by "grab" or clamshell buckets, a few tons at a time, or in the case of metals, by lifting magnets through the aid of electricity. The devices for handling materials are so numerous, ingenious, simple and inexpensive, and their use so beneficial in releasing cars, that failure to install and use them is both a public and a private shame. From gravity, side hill and trestle systems, which require no machinery, to the most elaborate moving-platform, link belt, electrically operated plant, the one result is obtained, namely—the "immediate" unloading of cars.

For how many long years have we listened to the wail that soft coal could not be stored in quantities without danger of fire from spontaneous combustion. The docks at Lake ports could contain thousands of tons in one pile, but the "poor consumer" must hold his reserve supply in cars for first, he has no place to put it, and second, it would vitiate his insurance if he had. Such lies have been repeated until they were believed. But hark! There was a rumor of a coal miners' strike April 1. What became of those combustible fears? They vanished into thin air from whence they came and the early part of 1906 saw more soft coal stored by consumers than ever before in the history of this country. How long will industries remain dependent upon scarcity conditions? General prosperity requires that the basic materials of industry be accumulated far enough in advance to prevent scarcity and scarcity prices. Were this the practice, such a thing as "a corner" in markets would be all but impossible.

The Interstate Commerce Commission has decreed that there shall be no discrimination or elasticity in the time allowance for the removal of goods from the railroad company's possession; that it must state in their tariff the time to be allowed and enforce the rule uniformly. It is self-evident that more cars will be required

*From a paper read before the St. Louis Railway Club by Ashley J. Elliott, Manager Illinois & Iowa Car Service Association.

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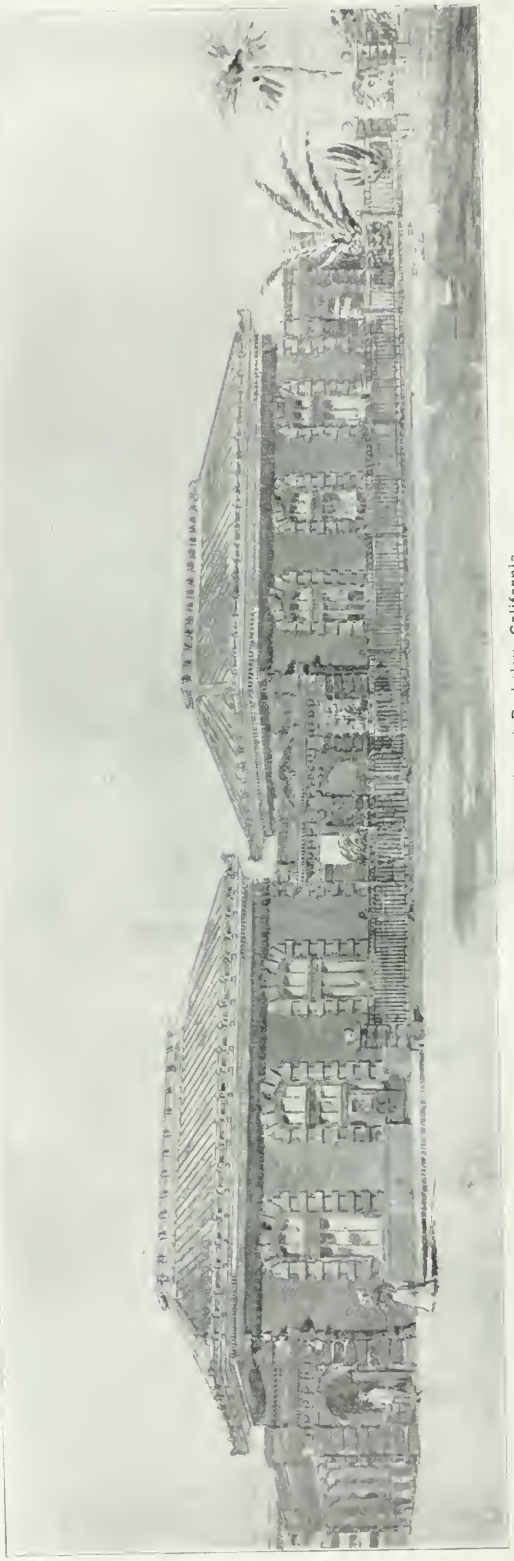

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The year 1905 was a production record breaker. In grain alone the farmers produced an ordinary wagon load for every man, woman and child in the United States. The railroads, lake freighters, canal boats, and ocean liners, moved masses of food stuffs to the markets of the world, while the country elevators groaned and their sides bulged. Did the consumer, because of this condition, care for an increased volume? No. Did he build bins, rent sheds and hasten the release of cars? No. Did he even use his available storage capacity to its limit? No—it was a few cents cheaper to use direct from the car than to elevate and back again. What did he do? He petitioned the legislature to pass laws to compel the railroads to furnish more cars, to haul them faster and to grant him the great American privilege of holding them longer without charge. While grain dealers have outstripped all other interests in the storage of their commodity, yet their customers—the consumers—have done nothing but kick, and knock and petition and continue business from hand to mouth or from car to hopper.

It is not a question of transportation that is afflicting America's commercial interests to-day. Railroads have equipment and facilities for transporting all the business that can be offered, provided, after transportation has been completed, their cars are immediately released for further service. And by this term "immediate" I mean only such diligence as is exercised in unloading vessels. It is very much easier to unload from cars than from the "holds" of ships: the mechanical appliances are more numerous and the opportunities to use them less circumscribed; for instance, coal, ore and similar freight may be unloaded by dropping car bottoms or turning the car upside down, while from vessels such commodities must be removed by "grab" or clamshell buckets, a few tons at a time, or in the case of metals, by lifting magnets through the aid of electricity. The devices for handling materials are so numerous, ingenious, simple and inexpensive, and their use so beneficial in releasing cars, that failure to install and use them is both a public and a private shame. From gravity, side hill and trestle systems, which require no machinery, to the most elaborate moving-platform, link belt, electrically operated plant, the one result is obtained, namely—the "immediate" unloading of cars.

For how many long years have we listened to the wail that soft coal could not be stored in quantities without danger of fire from spontaneous combustion. The docks at Lake ports could contain thousands of tons in one pile, but the "poor consumer" must hold his reserve supply in cars for first, he has no place to put it, and second, it would vitiate his insurance if he had. Such lies have been repeated until they were believed. But hark! There was a rumor of a coal miners' strike April 1. What became of those combustible fears? They vanished into thin air from whence they came and the early part of 1906 saw more soft coal stored by consumers than ever before in the history of this country. How long will industries remain dependent upon scarcity conditions? General prosperity requires that the basic materials of industry be accumulated far enough in advance to prevent scarcity and scarcity prices. Were this the practice, such a thing as "a corner" in markets would be all but impossible.

The Interstate Commerce Commission has decreed that there shall be no discrimination or elasticity in the time allowance for the removal of goods from the railroad company's possession; that it must state in their tariff the time to be allowed and enforce the rule uniformly. It is self-evident that more cars will be required

*From a paper read before the St. Louis Railway Club by Ashley J. Elliott, Manager Illinois & Iowa Car Service Association.

in order to reduce the locomotive brake cylinder pressure. When making the final release just before the stop is completed, the locomotive brake cylinder pressure should be retained; therefore, the release of train brakes may be started a little earlier than with other types of engine equipment, insuring the righting of trucks before the stop is completed. Final release of train brakes before the stop will be found practicable with trains of considerable length on account of the locomotive brakes being held.

The straight air brake installed on many passenger engines, in combination with the automatic, may also be used to advantage in preventing the slack running out hard when a release is made at slow speeds, but when used for this purpose should be applied moderate before the train brakes are released and handled with sufficient care to prevent shocks to the train.

When a brake release is desired on a train moving at comparatively slow speed and the cylinder pressure on the locomotive is not sufficient to prevent the slack running out hard the locomotive brake power may be increased with the ET equipment independent brake valve before the release is made, its handle then being returned to the automatic brake valve. The automatic brake valve handle should be placed in release position the usual length of time, namely, until all train brakes are releasing, then moved to the holding position and left there until the brake force on the train has reduced sufficiently to permit the slack to adjust itself, after which by moving the valve handle quickly to running and back to holding position a few times the locomotive braking power will be gradually reduced to any desired amount.

When stops are made on moderate descending grades sufficient pressure should be retained in the locomotive brake cylinders, by the use of holding position, to prevent the train from starting, as this position keeps all brakes charged. However, if the train brakes are released on ascending grades the locomotive brakes should be released by the time the stop is completed so as to prevent the slack from running back harshly. The independent or straight-air brakes may be applied gradually to hold the train.

When stopping on moderate descending grades with the ordinary form of train brake equipment and the combined automatic and straight-air or the ET equipment on the locomotive, the second application should be held until the stop is completed, after which the engine and tender brakes may be applied with the straight-air or independent brake valve with sufficient force to prevent the train starting. The automatic brakes should then be released and recharged. Heavy applications of the locomotive brakes, with either the independent or straight-air brake valves, should always be made gradually to gather the slack if the train is in motion, otherwise rough handling will result. This is particularly true if the speed is low when the application is made.

We cannot expect the uniformly smooth braking for water and coal stops that is possible at stations and other similar stops, owing to the accuracy required, but heavy shocks to the train can and should be avoided. The roughest stops made at coal chutes and water spouts are when the brakes are released at slow speeds just before the stopping point is reached, causing the slack to run out hard, and the final reduction is made in the emergency position. One of the worst features of this kind of a stop is that the brakes on the forward end of the train apply so heavily that the engineer does not feel the slack run is hard, due to the rear brakes applying moderately, and therefore, does not appreciate the seriousness of the results at the rear of the train. He should encourage advice from the conductor concerning rough handling and the conductor should give it in a gentlemanly manner without awaiting a request.

The brakes on the forward end of a long train will start to release in practically the same length of time with either a low or high excess pressure, but those at the rear end will begin to release much quicker with high excess pressure; therefore, to obtain the most uniform release of brakes throughout a long train and reduce the shocks to a minimum when releasing, a high excess pressure must be had at such times. Returning the brake valve handle from release position to running position before all brakes have commenced to release, increasing the time required for the air to flow to the rear end of the train, is more serious in its effect on the release of brakes than is low excess pressure and is frequently the cause of the slack running out hard, causing heavy jerks and breaking-twos, and of brakes sticking.

Many passenger trains have been broken in two and given heavy shocks for which the action of the brakes or the manner in which they were operated were held responsible, but which were actually caused by opening the engine throttle before the brakes at the rear end had been given time to release. It should be remembered that a few seconds must elapse before the brakes can begin to release after the brake valve handle is placed in release position and several additional seconds are required for all brake cylinder pressure to entirely discharge. If trains are to be handled smoothly and safely any error in the period of time elapsing between placing the brake valve handle in release position and opening the throttle should certainly be on the safe side; therefore, we should instruct the engineers to allow a few seconds to elapse after they think the brakes are released, as their experience and judgment shows they should before opening the throttle.

## The Lake Shore Four-Cylinder Simple Inspection Locomotive.

The Lake Shore recently completed at its Collinwood shops and now has in service a new type of inspection locomotive which is of unusual interest because of its novel features. It is a four-cylin-

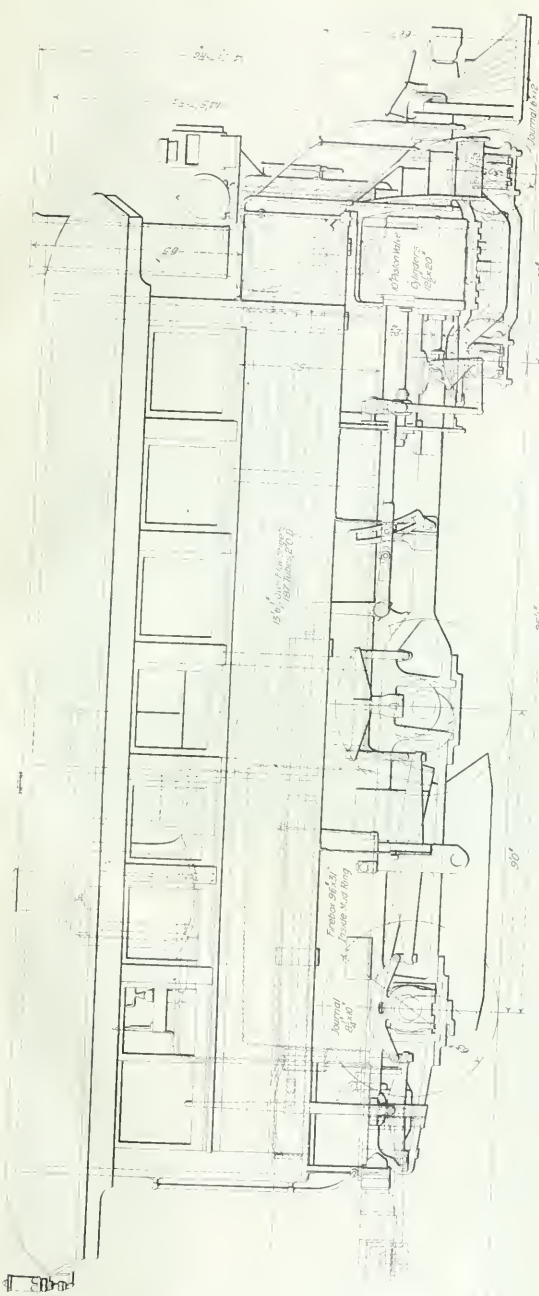
New Inspection Locomotive Built for the New York Central at the Collinwood Shops.

der simple locomotive with Walschaert valve gear. Detail drawings and engravings from photographs are shown herewith.

Easy riding is, of course a primary requisite of a locomotive of this character, hence the use of the four-cylinder balanced principle. The engine was not made compound, however, for two reasons. In the first place there are no compounds on the Lake Shore, the road not being favorable to them. And then there was the important practical reason of restricted space in which to dispose the cylinders, considerable difficulty having been experienced, as it was, to get a satisfactory arrangement of the simple cylinders in the space at the disposal of the designers. The larger low-pressure cylinders of a compound would have added to this difficulty.

Each pair of cylinders has a single 10 in. piston valve of the type standard on the Lake Shore. In order to admit steam to the opposite ends of a pair of cylinders simultaneously it was necessary to cross the ports for one cylinder. This was done for the inside cylinder for the reason that the passages could be better heated by the live and exhaust steam. This arrangement makes the ports for the inside cylinder much longer than for the outside, but the areas of all ports are large relative to the size of the cylinders. The clearances, however, are practically no greater than for the ordinary type of slide valve engine. To equalize the steam distribution the ports are so designed as to enable the steam to have connection between the two cylinders even when the valve is over the port. The cylinders are 12½ in. x 20 in., and all four drive on the forward axle.

The design of the locomotive required a special arrangement of the Walschaert valve gear, with certain novel features. The location of the steam chest necessitated the use of the rocker arm from which the combining lever is supported. This arm is quite short



General Elevation, New York Central Inspection Locomotive.

and was made double to furnish a sufficiently substantial support for the lever. Also at the back of the radius rod an unusual construction is employed, the valve stem being operated by a cross-head arrangement on the rocker arm working in a yoke on the valve stem. Details of this rod and of the reverse shaft are included in the illustrations. All of the valve gear had to be placed low in order to go under the running boards. This necessitated working out this peculiar form of radius rod to avoid interference with the main rod.

A number of other special features of detail were made necessary by the clearance limitations. For example on the truck the frames are dropped and a low construction employed throughout to enable it to go under the cylinders. The truck brake cylinder is fastened to the center casting, this being the only location affording the proper clearances. The wheels and axles were made by the Schenectady works of the American Locomotive Company. The crank axle is of the solid type similar to the one used on the Cole compound of the New York Central. (*Railroad Gazette*, May 13, 1904.)

The boiler is wagon-top type with 1,422 sq. ft. of heating surface. The grate area is 21 sq. ft., the firebox being 31 in. x 96 in. There are 187 tubes 13 ft. 6½ in. long. The working pressure is 180 lbs. The firebox has a Franklin automatic fire-door opener.

The tender has capacity for 10 tons of coal and 4,300 gals. of water. The tank is entirely covered over. With the old inspection engine, which has the same sort of cab roof as this, it was found that the wind coming along this roof would pick up the coal dust in the tender and blow it into the engineman's cab. To avoid this trouble on the new engine the coal space was roofed over. The tank is equipped with a water scoop.

The interior of the cab is finished in mahogany, inlaid, presenting much the appearance of the latest passenger coaches. A runway 5 in. wide is provided on each side of the boiler for the convenience of persons moving along the cab when it is occupied. The space beneath the runway is utilized for steam heat. There is a large locker at the rear of the cab and a small locker at the front between the windows for stationery. It is designed to carry different sizes of stationery as well as pens, ink and pencils. A man sitting on the right-hand side of the cab at the front has the following equipment in easy reach: Air signal, conductor's brake valve, an air-controlled valve for blowing the steam whistle, and a push button for electric signals to the engineman. In front of him is a Pullman folding berth lamp, which opens and lights by pressure on a push button. This is for reading messages or train orders at night. When not in use it is kept closed, as the front cab must be kept perfectly dark on account of the engineman. There is also a Boyer speed recorder and a clock at the front of the cab. There are eight chairs in the passengers' cab, one for each window. There is also room on the flat-topped boiler casing for a number of persons, the runway serving as foot rest. The engineman's end of the cab is also finished in mahogany, with the usual seats, and there is also a large clothes locker attached to the partition between the two rooms. The engine has an electric headlight.

The total weight of the engine is 126,600 lbs., of which 85,100 lbs. is on drivers. It was built from designs prepared by Mr. H. F. Ball, formerly Superintendent of Motive Power, and Mr. R. B. Kendig, Mechanical Engineer. We are indebted to Mr. Kendig for the data for this description.

## Philippine Labor.

BY L. E. BENNETT.

Many accounts of the performances of Filipinos as laborers have been written, showing them in a most favorable light. These have, we think, for the most part been the work of persons interested in Government contracts actuated by the ulterior motive of saying something flattering to please the Government authorities. On the other hand, a great many writers have taken the opposite point of view in such a way as to make it appear that the Filipinos are hopeless as laborers and otherwise quite worthless. The truth probably lies between these extremes.

It is proposed in the present treatment to outline a conception obtained at first hand of the assets and deficiencies of the native Filipino as a workman. The writer has had 1½ years' experience in dealing with the Philippine labor problem, and most of that time has directed engineering works on which considerable numbers of natives, as well as Chinese and Japanese, have been employed. In this way a basis of comparison has been afforded.

It is quite as difficult to generalize regarding native labor throughout the archipelago as it is to generalize concerning the labor problem in any country where there exist side by side marked racial distinctions. There is, moreover, a decided variation dependent upon locality and environment. Nearly all that has been written thus far on the subject applies solely to the labor situation in and around Manila, where the foreigner has had the best opportunity for observation.

Now the labor conditions at Manila are the most favorable in the islands, excepting Cebu and Iloilo, so it is not fair to take them as a criterion for the whole of the Philippines. Then, again, there is the distinction between municipal and rural element in the laboring class quite as marked as is to be found anywhere. In Manila, Iloilo and Cebu those conditions obtain which are characteristic of nearly all large cities. The poorer class of natives must either work or starve. On the other hand, in the rich farming provinces, food is plentiful, shelter and clothing may be almost entirely dispensed with, and there is little incentive to steady and regular work. It is the difficulty common to all tropical countries.

In certain of the more thickly populated provinces of Luzon,

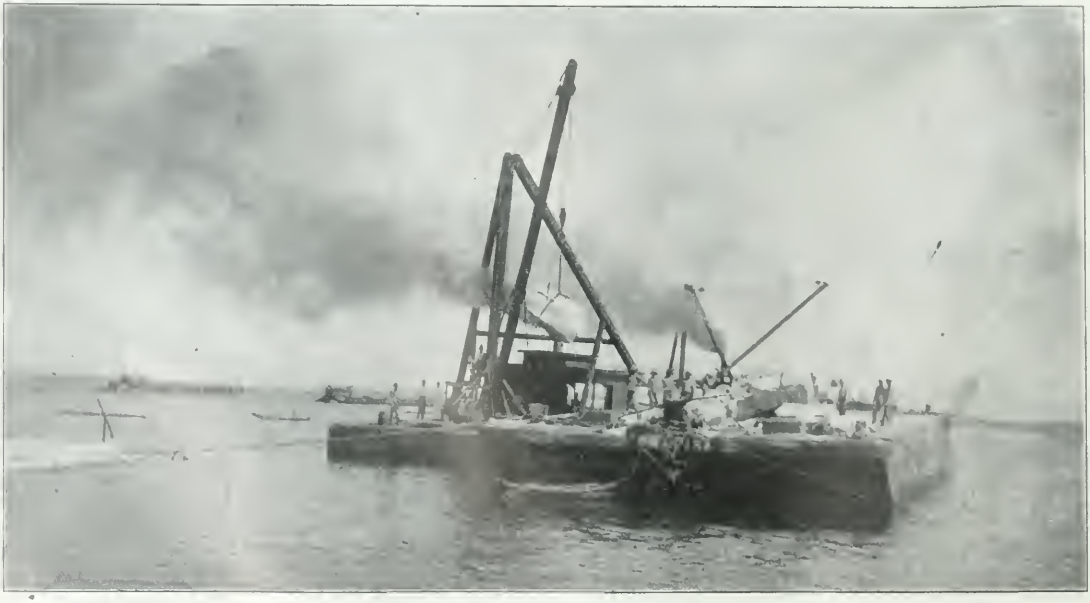
such as Ilocos, Tarlac, Pangasinan, Batangas and Laguna, there holds, however to a certain extent the necessity of working to live. Here there is found a good labor supply, and public works on a large scale can be undertaken with full confidence that the labor demand may be filled. These conditions obtain also in the large Visayan Islands, Cebu, Negros and Panay.

The abundance of labor supply in the centers of population is testified by the success which large engineering companies have met with on certain works. Messrs. J. G. White & Co., of New York, have recently completed elaborate harbor improvements for the Government at Iloilo and Cebu in the Visayans, while the Atlantic, Gulf & Pacific Co. has carried out similar undertakings at Manila and Cavite. In railroad work the Manila & Dagupan Railroad has built and now operates 200 miles of steam line. Dependence is placed almost entirely upon the natives, even the engine drivers, section foremen and telegraph operators generally being Filipinos. However, the main line passes through a thickly populated district where labor is plentiful and it is hardly to be expected that the same success would be met with in continuing their line northward, as has been proposed by the Government, into Isabella and Cagayan provinces. In fact, the railroad has constantly refused to bid for contracts for the construction of these extensions, and it seems probable that the deterring factor is the fear of difficulty with labor.

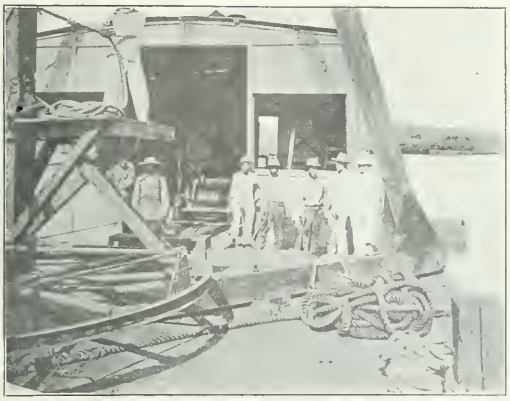
Besides the Manila & Dagupan there is one other modern traction system of magnitude in the islands. This is the Manila Electric Street Railway, in the building and operation of which dependence was placed, as with the steam railroad, almost entirely on natives for the rank and file. J. G. White & Co. were the engineers and contractors for the entire plant, and the operating department of the same organization is responsible for the operation of the property, which is the most extensive electric traction and lighting system in the Far East. Service was inaugurated in April, 1905, and the property began to earn dividends the first of 1906. In thus establishing the system on a paying basis within the first year, the Filipino operatives have aided materially. All the motormen and conductors are Filipinos, and give considerable satisfaction considering the exacting conditions of the service, which is much more exacting than is characteristic of electric street railway service in western cities.

As applied in various fields of industry, there seem to be marked distinctions under the general topic of the adaptability of Filipinos to the use of modern mechanical appliances and tools. The quality of receptiveness in the field of engineering enterprise contrasts oddly with the predilection for old methods and antiquated tools in the agricultural vocation. It may be, however, that more general contact with foreigners in the latter field will ultimately develop the state of affairs existing in the former. Filipinos taken from rural environment where they have been accustomed to use the most rudimentary mechanical implements, quickly learn to operate not only steam and electric railroad machinery as above noted, but also construction auxiliaries such as pile drivers, cranes and dredges. I have seen this quality strikingly demonstrated in connection with the construction of the jetties and sea walls and the extensive dredging being carried out at Iloilo and at Cebu. It must be admitted that a quick wit and a steady nerve are requisite in the operator of a hoisting engine and his co-workers when setting large blocks of stone accurately in place on sea wall construction, even in still water. When the ele-

On the Route of the Benguet Road.



Placing First Course of Rubble Wall in the Harbor of Iloilo, Panay.



Native Laborers on a Floating Derrick.

ment of motion of the derrick floats is introduced, however slight it may be, there is a demand in addition for great patience.

I have seen a gang of natives perform under this combination of trying conditions, calling for alertness, steadiness and patience with quite as great efficiency, under the direction of a white foreman, as would have been displayed in the same situation by an average gang of white workmen. These native workmen were Visayans, who are rather less excitable and generally more trustworthy than other natives of Malay extraction such as the Tagalos, Macabebes and Moros. It is thus fortunate that the first elaborate work of railroad construction will be undertaken on the Visayan islands. In this work J. G. White & Co. will place reliance for the bulk of the labor on natives, who will be engaged to the number of nearly ten thousand before the construction is completed. It is planned, moreover, once the work is fairly launched, to eliminate all racial distinction so far as possible in the organization, first of the engineering and construction corps and later of the operating staff. The grade of the office will be immaterial. This impartial plan of action should do much toward inspiring the natives with a national loyalty irrespective of its virtue as an industrial educational institution.

The question seems to resolve itself in any case, largely into a matter of careful tuition by competent foreigners. It is difficult to account otherwise for the performance of the employees of the Manila Street Railway, because the native sometimes exhibits characteristics quite the antithesis of steadiness, tact and resourcefulness.

In certain rural districts where foreign influence has not been brought to bear directly, and where conditions of life are easy, as previously noted, the average native is a shiftless ne'er-do-well and absolutely childlike in his lack of balance. To work and accumulate property rarely plays any part in his estimate of the requirements of life. If a native, for example, by some windfall should suddenly come into the possession of an unwonted sum of money, the chances are that instead of buying something useful, a little furniture, a little respectable clothing, and perhaps a good farm animal or two, he would take his children to the Chinese trader and purchase a lot of cheap finery, and then he might give a dance or celebration of some sort to commemorate the anniversary of the death and burial of some relative whose demise was conveniently coincident. In any case, he would reserve a goodly portion of the whole to bet on the cock fight, for he is a born gambler, and lastly he would feel that he was well repaid for the dissipation of his inheritance merely by the pleasant memory of a good time while it lasted.

Superstition and suspicion are among the characteristics of the raw and untutored laboring element, and only at the expense of much patience, time and money, is it always possible to effect a transfer of labor from points of abundant supply to points of demand. They have a deep rooted objection to working and to travel where they have not before worked or traveled. Unfortunately the weaknesses of the ignorant natives are made stock of very frequently by unscrupulous native Government officials, much to the detriment of the interests of the Government and those honestly trying to advance the cause of civilization.

In the name of the Government at Manila these local officials sometimes levy upon the people, appropriate their farm animals and force them to work or perform some service for the personal benefit of the official himself. They give insufficient remuneration or nothing at all, declaring then that the service performed is compulsory for the Government and there is no pay available. The ingenuous victim accepts these statements verbatim, and comes consequently to regard the Government with a cordial hatred.

There is, however, a strong element of good opposed to the corrupt tendency among native administrators. I was once able, through the assistance of honest native officers to frustrate the efforts of a dishonest town council in Northern Luzon, which was plotting to defraud the Government of a sum set aside for road construction under that appropriation known as the "$3,000,000 Congressional Relief Fund."

Surfacing Track in Cebu.

The well wishers enabled me often to anticipate difficulties before they arose, thus greatly ameliorating them. It was my pleasure to meet on another occasion the presidente of an interior town, who devotes all his personal salary as mayor to the support of a school in his town. Again, at Hoilo, the Governor, Senor Melliza, a full blooded native Filipino, is a most honorable and intelligent official, who knows his people and does only what is best for their interests, without regard to personal gain. He has been, and will doubtless continue to be, of the greatest assistance to organizers of industrial enterprises in his province.

The childish innocence of the average native has already been touched upon. Too great precaution we could never take in providing against disaster from this source. When working in the interior we frequently lined up our corps of laborers half a day before starting for the mountains, and had their own foreman give them a personal lecture, explaining that they were going where there were no stores, that they could buy no tobacco, salt and other necessities, and that only their houses and staple foods would be provided by their employers, so they must

Mixing Concrete for the Manila Street Railway Power House.

go beforehand and buy all the small articles. Every man was asked if he understood the situation and answered in the affirmative. Upon arrival at their new work it turned out that not 10 per cent. of them had provided themselves as we directed and were crying and complaining like children, and asked to be sent back. Generally we have found the natives very obedient and easily handled as long as they are kept away from native agitators and the malign official influence. Moreover, they are generally sober and respectful and most of what appears to be dulness on their part when working under American foremen is in reality only inability to understand what the foreman wants done, due to confusion of dialects. Illustrative of their obedience, if the foreman were to tell the gang of laborers to go and steal something, the chances are they would obey without hesitation, never thinking of anything but the fact that their boss had ordered it done.

Returning again to the matter of skilled labor, there is an under supply of really skilled laborers in the islands. Practically all the efficient workmen have been developed by the companies previously noted, but there is in addition a large element of half trained men who masquerade as skilled labor and pull down the average of quality. However, enough has been accomplished to show that the native possesses qualities which, properly cultivated, will serve to develop a skilled working class. One trouble with the Filipino is to induce him really to learn a trade thoroughly from A to Z. He frequently makes a start, and after six months throws up his apprenticeship and strikes out to find a job as a full fledged skilled laborer, with the result that the shops are flooded with applications from laborers applying for work as machinists, etc., who can do little more than spoil good material.

A great deal of the educational work thus far done has unfortunately inculcated in the native mind an idea that it is lowering to labor and soil the hands. The result is that a great many youths are being brought up in the public schools who cannot be induced to take up and learn any useful trade, but prefer to seek employment as clerks, office boys, servants and the like. The towns and cities are quite overrun with this class already, and the applications for minor clerkships is so much in excess of the demand that standard wages are but $7.00 per month for that class of work, while the machine shops, boiler shops, fitters shops and similar engineering establishments are searching the islands for artisans and offering oftentimes as much as $20.00 a week for men who understand some useful trade. Contractors are sometimes compelled as a last resort to import men from Japan to earn the good wages and to do the work which the Filipinos should be doing for themselves.

Throughout the Oriental countries generally the superiority of the carpenter in the skilled labor class is marked and the rule has held good in the Philippines, certainly until very recently. The untutored Filipino carpenter knows but one tool, the bolo. It is simply a knife with a blade about 15 inches long, three inches wide and one-eighth of an inch thick, single edged. It serves as a plane, hatchet, chisel and hammer, and with it the native carpenter, left to himself, will build an entire house, not of the native variety merely, but in accordance with the design characteristic of foreign houses in the Philippines, which are frequently quite elaborate in construction and finish.

The Filipino carpenter has been compelled to adopt the nail first among modern auxiliaries of the trade, and, unless otherwise provided, the blunt back of his bolo, one-eighth of an inch wide, is made to serve as a hammer face with much better success than would be supposed. In his original cult the nail plays no part and all attachments between members of a structure are made with bamboo strips or rattan. Nearly all the native houses, and many foreign, are even now built in this way, and apparently the only serious defect as compared with nailing is the time consumed in the construction. The native carpenter has much difficulty in mastering the operation of foreign tools at first, and it is necessary always to guard against a return to his beloved "bolo."

It is rarely more difficult, and is generally less so, to teach an absolute novice, if he be of the same natural intelligence, the use of modern tools of carpentry, than an artisan wedded to the use of the bolo. This probably accounts for the rapidity with which other craftsmen, such as machinists, masons, etc., have overcome the early lead of the carpenters. They were unhandicapped by predilection of any binding sort, unless we except earth and rock excavation. The native method of rock excavation is to build a fire to heat the rock. Then cold water is thrown on and the cracked stone removed, when the process is repeated. This process, as it does not imply practice in the use of a certain tool, is readily discarded by the native for the drilling and blasting method. They quickly learn the use of mining hammer and bar drill and the best of the natives will get out as much as the average white workman. On earth excavation there is reticence about adopting one of the white man's tools, his shovel, chiefly because of injurious effect on the soles of bare brown feet.

As a machinist the native shows decided aptitude, but fails in steadiness as a general rule. Otherwise he displays, as do also the carpenter and the mason, the deep rooted fault of wastefulness of materials. So great is this fault now, that the saving to the employer in cheap wages as compared those paid to white workmen is oftentimes swallowed up in waste of materials. This is but another manifestation of immaturity which may perhaps be rectified wholly or in large part by suitable manual training at an early age.

With regard to relative efficiency of white and native labor in the skilled trades in the Islands, my experience has been that a Filipino does about one-half as much work in a day as a white man in that country, and about one third as much as a white man does in his own country, with the advantage on the side of the white man that he thinks farther ahead of his job than a native and is not so wasteful of materials. An outline of the scale of wages for various classes of labor may be interesting.

Farm hands earn about 20c. a day on the average. This same element employed on public works is paid from 30c. to 40c. a day. Rock men and semi-skilled workmen receive 40c. to 50c. per day. Of the really skilled artisans carpenters are the most plentiful and they receive from 60c. to $1.50 per day. Blacksmiths are paid from $1.00 to $2.00 per day, boilermakers $2.00 and more, and machinists from $1.50 to $2.50. Steam engine drivers and plant operatives are paid on a monthly basis of from $30.00 to $75.00 per month.

The only marked defect applying to all classes of workmen is that of instability. The Filipino is not steady and may not be depended upon as a regular laborer until he makes up his mind to feign sickness less frequently and until he manages to reduce materially the hypothetical death rate recorded among his relatives. Instances are known where single workmen have lost dozens of imaginary aunts and uncles and several such fathers and mothers in the course of a single year.

The application of the Chinese exclusion act in the Philippines is a policy of questionable merit. A little competitive stimulus would probably be of great benefit to Filipino labor. Competition in labor is just as necessary to development as competition in trade. The Chinese in the Philippines now do not compete with the natives as regards the price of labor, but only as to quality. Close observation would seem to indicate that Chinese might be admitted in limited number and under certain restrictions simply to supply the example to a people less advanced in the conception of the value of consistent work. Chinese could lead the way into undeveloped regions where the Filipinos are loath to go on account of antipathy to immigration. This does not apply strictly to Luzon, and bears very little on the situation in the Visayan Islands where the new railroads are to be built. It does, however, apply to Mindanao and her unmeasured and apparently immeasurable resources. Settlers capable of aiding actively in the physical work of developing the Islands can come only from China. Americans and Europeans are debarred from severe physical work by the climate, while the Japanese have never made a success in the tropics, and are in reality about as little likely to settle extensively in the Philippine Islands as ourselves.

It resolves itself into a question of accelerating progress in the Islands, not of insuring their future. That has been insured by the active measures being taken otherwise in the way of railroad development, etc. However, the success of the present railroads is in turn assured by the well populated and rich country they will traverse. It is to the less densely peopled, but none the less rich areas in the archipelago that the Chinese labor question applies with particular emphasis.

## Case Hardening Wrought Iron.*

Wrought iron is nearly pure decarbonized iron, and is not possessed of the property of hardening. Articles made from wrought iron may be externally converted into steel without depriving the interior of its natural character or structure. The process is called "case hardening."

The object of case hardening is to obtain an external steel encasement with a core of fibrous iron in the center. The effect is produced by a perfectly air tight box and animal carbonizing ingredient. The box should be of plate or cast iron from $\frac{1}{2}$ in. to 1 in. thick, the size and thickness of the box depending on the articles to be operated upon. The articles are put in the box in alternate layers with the carbonizing ingredients, commencing at the bottom of the box, say, with a layer of granulated bone of the thickness of 1 in., upon this a layer of the article is placed, then another layer of bone about $\frac{3}{4}$ in. in thickness, and so on until the box is nearly filled, finishing with a layer of bone on top of the articles, which should be 1 in. deep so as to well protect the first or top layer of articles and prevent blistering. The packing completed, the lid is put on and hermetically sealed or luted with loam or fire clay.

The box or boxes are now placed in a suitable furnace. The furnace should give a uniform heat of about 1,350 deg. F. Over-

*A paper read before the annual convention of the Railway Master Blacksmiths' Association, by George F. Hinkens.

heating is injurious, and will crystallize or make the articles brittle.

In heating wrought iron or case hardening there are several considerations, the principal one being heat and duration of time for carbonization, same being governed by the size or bulk of the work to be case hardened.

Heating: In point of importance it stands first, for if the primary cause of bad case hardening could be traced, its origin in a majority of cases would be found in bad heating. There is no operation connected with case hardening which requires more watchfulness and gives more anxiety than proper heating. It may therefore repay us to examine with ease the conditions to be observed in obtaining results. As to heat, we must have a thorough admission, uniform and exacting to a degree; the heat must be constant and uniform and should not exceed 1,350 deg., for the degree of heat will have a bearing on the fibrous structure of the material. A high and excessive heat will render the material brittle, and if the article is light in structure it is apt to break easily in service; therefore, it behooves us not to overheat or unevenly heat articles to be case hardened. Consequently keep the furnace at a regular or constant temperature, for if the articles to be case hardened are overheated the damage is done so far as a fibrous structure is concerned; the article is hard, but the interior is brittle and crystalline when it should be fibrous and showing a dark or black appearance of its natural structure with a fine grained surface analogous to tool steel.

Where I am employed we do a great deal of case hardening all of which is done under my supervision and direction. We case harden as high as five tons of wrought material in 24 hours, same requiring 10 furnaces. We are exceedingly particular about the heat treatment, as much so as we are in the heat treatment of tool steel when tempering.

Some years ago I was employed where the general foreman had charge of case hardening. Of course a general foreman has, and should have, that right or privilege. However, this particular individual thought he was the "only" in that particular branch—case hardening was his "long suit." He arrived at his conclusion from the great depth or case or shell of hardness and the quickness of time in which he accomplished the result, never taking into account the preservation of the natural and proper structure of the material. Well, he got a very deep shell or case, and very hard, but the articles were more akin to pig than wrought iron, due to an excessively high heat. They case hardened crank shafts in this manner: The crank pins were of the solid rod type with a projecting thread end. Their method of putting crank in the driving wheels was by placing a sleeve over the threaded end of the pin, sleeve butting against the shoulder or crank pin. A battering ram was then brought into service, striking the sleeve. Of course this method produced a great shock at the weak point of the pin, which was at the small, or nut end. Often the end in question would drop off while driving in the pin. Upon examination I found the structure of the material as friable and brash as cast iron. The amazing part of it was that the general foreman blamed the material and of course the material was bad, but not until this particular genius put the finishing touch on it by his peculiarly wrong method of case hardening.

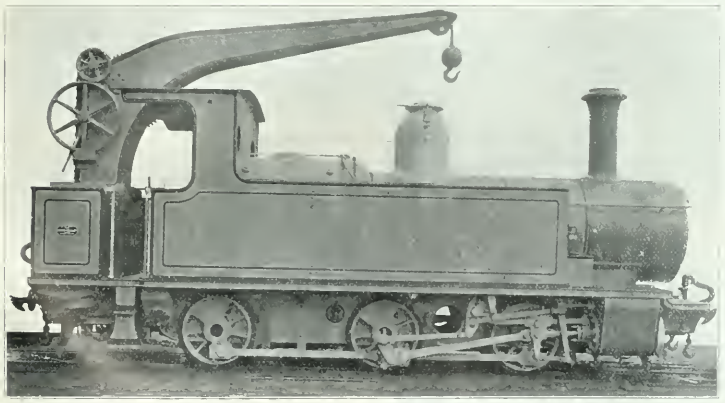
The furnace is an important factor. An oil or gas furnace to work successfully should be so constructed as to secure proper mixture of gases, a thorough and even combustion in every part of the furnace. The furnace should be constructed with roof arched throughout its entire length in order that the heat may be reflected directly and uniformly upon the boxes. The passage to the chimney is formed underneath the hearth, causing a down draft, the action being to throw the heat down upon the boxes. There are six flues, separated from each other at the end farthest from the fireplace. These flues run parallel toward the fireplace or combustion chamber, where they are connected downward with the main flue underground, thence into the chimney.

It will be seen that this arrangement of furnace insures as near as possible an even heat throughout every square inch of heating parts of furnace. The furnace thus described can be heated with either oil or gas and has a capacity of 8 boxes 12 in. wide, 20 in. long and 8 in. high. The size of the box is, of course, governed by the size of the articles to be case hardened.

A quick method for case hardening consists of heating the material to be hardened to a red heat and submerging in a bath of molten cyanide of potash, leaving it from one to five hours, according to bulk of material to be hardened. Cyanide of potassium gives off poisonous fumes, consequently the vessel containing the cyanide of potassium should be placed in a furnace with a draft. This method is dangerous for the operators and should, if used at all, be used in a very careful manner.

## Crane Locomotive.

The Vulcan Foundry Company, Limited, of Newton-le-Willows, in Lancashire, England, build a locomotive crane that is of a somewhat different design from those in common use in the United States, where these machines are merely traveling cranes intended for use in and about yards and are not expected to do any hauling. The Vulcan machine, on the other hand, is a complete switching engine fitted with a swinging crane at the rear that is capable of lifting and slewing by steam a weight of three tons at a radius of 14 feet. In addition to this it can be used for regular switching service for light work. It is, therefore, especially well fitted for service about industrial works where there is an inter-shop system of narrow gage tracks, the gage of the engine shown being 3 ft. 6 in. The weight and capacity of the machine is, however, pretty well up and would have been considered very heavy not so very many years ago. The cylinders have a diameter of 14 in. with a piston stroke of 20 in., and a total weight in working order of 84,500 lbs.



Crane Locomotive, Built by the Vulcan Foundry, Lancashire.

The Walschaert valve gear is used, so that all of the machinery is readily accessible outside the frames and the small driving wheels occasion no inconvenience.

The crane post is footed in a heavy base, bolted between the frames at the back, and is stayed by a strong bearing on a line with the top of the coal bunker.

The other principal dimensions of the machine, in addition to those already given, are:

| | |
|---|---|
| Diameter of wheels | 36 in. |
| Wheelbase | 12 ft. |
| Heating surface, tubes | 675.5 sq. ft. |
| " " firebox | 77.5 " |
| " " total | 753.0 " |
| Grate area | 12.8 " |
| Total height to top of stack | 11 ft. 6 in. |
| Tank capacity, water | 600 gals. |
| Tank capacity, coal | 67 cu. ft., or about 1½ tons |

## Unit Costs of Railroad Building.

I.

The first paper of this series, to which further reference is made in the editorial columns, deals with eastern railroads of a first class character, with steel spans, concrete abutments and piers, 80-lb. rail, stone or gravel ballast, a solid and permanent construction throughout.

(A) UPPER HEADWATERS OF A LARGE RIVER IN PENNSYLVANIA.

(1) Length of new railroad, 9.06 miles main *single* track, 5.45 miles sidings.

(2) Year built, 1902.

(3) Cost for a distance of 9.06 miles, including preliminary surveys, clearing right of way, roadbed, ties, rails, ballast and side tracks, in shape for operation but not including real estate, stations, equipment or signals, $26,300 per mile.

(4) Brief description of physical characteristics of country traversed: The line follows the course of a large river in western Pennsylvania, with considerable side hill cut and fill, with cast-iron pipe and concrete arch culverts, with no tunnels and very few bridges. Excavated material largely loose rock and

earth. Sidings amount to 60 per cent. of main track mileage.

(B) HEADWATERS OF A LARGE RIVER IN PENNSYLVANIA BELOW LINE "A."

(1) Length of new railroad, 15.77 miles main *single* track, 3.61 miles sidings.

Line A.

Line B.

Line A.

Line B.

(2) Year built, 1903.

(3) Cost for a distance of 15.77 miles, including the items above mentioned in "A," $37,014 per mile.

(4) Brief description: This line lies in the valley of one of the large rivers in western Pennsylvania, below line "A" as above described, the character of the side hill construction being quite heavy, material consisting of earth and loose rock, with three crossings of the river, only one of which, however, is of an expensive nature. Sidings amount to 23 per cent. of main track mileage.

(C) MIDWATERS OF A LARGE RIVER IN PENNSYLVANIA.

(1) Length of new railroad, 30.08 miles main *single* track, 6.64 miles sidings.

(2) Year built, 1901.

(3) Cost, including the items above mentioned, $60,628 per mile.

(4) Brief description: This line parallels the same large river in western Pennsylvania as lines "A" and "B," along the midwaters thereof below line B, where the side slopes are very steep, with sinuous alinement, three crossings of the river which in this section is 300 to 500 ft. in width, and four piercings of mountains with tunnels aggregating 1.33 miles in length. Sidings amount to approximately 22 per cent. of the main track mileage.

(D) DETOUR AROUND LARGE CITY IN EASTERN NEW YORK.

(1) Length of new railroad, 3.6 miles main *double track;* no sidings.

(2) Year built, 1903.

(3) Cost complete, including the items above mentioned, for a distance of 3.6 miles, $76,336 per mile.

(4) Brief description: This line consists of a double-track, low grade connection between the two main lines of the company, and involves heavy work at the crossings of the main four tracks of the New York Central, overhead and underneath crossings of several highways, and the crossings of two deep ravines. Permanent construction was used throughout; nature of material, sand and gravel.

(E) CONNECTION BETWEEN TWO MAIN LINES IN EASTERN NEW YORK.

(1) Length of new railroad, 1.57 miles main *double* track; no sidings.

(2) Year built, 1899.

(3) Cost, including the items above named, $105,186 per mile.

(4) Brief description: This line consists of a low-grade double-track connection between two main lines, involves crossings of the four-track main line of the New York Central, Mohawk River, Erie Canal

Line C.

Line C.

Line C.

Line D.

Line D.

Line C.

Line F.

Line E.

and a highway, all of which required heavy embankments, extensive bridging and change in the grade of the New York Central.

(E) DETOUR AROUND LARGE CITY IN WESTERN NEW YORK.

(1) Length of new railroad, 11 miles main *double* track; no sidings.

(2) Year built, 1898.

(3) Cost complete, including above named items, $50,000 per mile.

(4) Brief description: This double-track line crosses under five

Line F.

trunk line railroads at the northerly end and over four trunk line railroads at the southerly end, necessitating heavy cuts and heavy fills, long hauls of material and extensive bridging at crossings of railroads and three intersecting streams.

## American Railroads—A German View.

In 1904 Mr. W. Hoff and Mr. F. Schwabach, two railroad men of high standing in the Prussian railroad council, traveled over part of the United States and spent several months in studying American railroads. The result of their studies was published a few months ago in a volume of 378 pages. The shortness of their stay allowed some incorrect statements to creep in, but in reading the book as a whole one is impressed by the honest desire of the authors to be fair and just and to estimate circumstances new and strange to them, as well as they could.

Particularly interesting to American railroad men are two chapters, of the twelve forming the book, containing remarks of a more general character, and we think it is worth while to translate them as completely as space permits rather than to give a more detailed review of the book in general. In so doing, we have picked out especially strong criticisms of American methods and comparisons with German ways, because of their interest to American readers, but it should be understood that the book is not written in an unkind spirit, and that the authors are generous in giving credit, when they believe credit to be due.

The itinerary of the visitors covered a round trip from New York to Boston, Buffalo, Niagara, Albany and New York, and a more extended one to Pittsburg, Chicago, St. Paul and Minneapolis, Yellowstone Park, Northern Pacific, Portland, Oregon; San Francisco, Southern and Union Pacific, Denver, Lincoln, Neb.; Kansas City, St. Louis, Pittsburg, Cleveland, Washington, Baltimore, Philadelphia, New York—about 9,669 miles.

The first chapter is devoted to a general outline of both round trips. The second chapter contains the following comment of a general nature.

A phenomenon of American practice, more pronounced than in any other country, is uniformity, based upon a characteristic trait of the American people, the endeavor to repeat successful experiments. It cannot be denied that carrying out this idea the Americans owe part of their success in different fields, especially in the industrial field, to the German mind. This necessitates the loss of individuality, which does not suit us.

So far as we could observe, the towns—and in absence of purely local settlements, all villages will in due time become towns—in their exterior upbuilding generally have followed the system of streets, intersecting avenues at right angles. The reason for this lies in the fact that, differing from Europe, where historical development, war troubles, etc., have forced location and layout of streets upon towns, the American towns, being modern creations, could develop as they pleased. Their layout alongside of lakes and rivers—which is much more common than in the old world—was solely determined by the fitness of the selected location for commerce and industry. This had one disagreeable consequence: factories and works of all kinds are undoubtedly more numerous in the interior of cities than they are in Germany. The streets are mostly given numbers, instead of names, as with us, and are therefore more easily found. The buildings, especially the big ones, show a decided similarity, for example, the state capitols, with their uniform domes, shaped after the Capitol at Washington. The same trend of American taste dominates the building of hotels and their interior equipment; even the way of living is cut to a pattern, and to us Germans is the less welcome, as it robs us of the freedom of will and imagination, which we wish to have even in traveling. In spite of the variety of nations, which have contributed towards forming the American people, there exists a surprisingly uniform disinclination to walk through the streets. In American villages, which in Germany would be considered too small to keep up a street railway, because the German citizen would look upon spending 10 pfennigs for a short ride as extravagance, street railways are developed; even in small towns the service is managed the same way that it is in capital cities. On the other hand, it is surprising in a country in which inventive genius, especially in the technical field, has achieved such great things, to find other arrangements dating from a time when street railways were yet in their infancy. In railroad travel through America, wherever human settlements have penetrated one finds the endeavor to substitute for human muscles mechanical equipment. Even the smallest railroad stations have their trestles from which to dump freight (especially coal) from the cars, of which a great number are fitted with doors in the bottoms. Other ingenious landing arrangements are not wanting, and even insignificant quarries are fitted up with hydraulic or electric machinery. Whether this be always economical, we do not care to discuss. If in Germany we do not always pay enough attention to labor-saving devices, it is to be feared that American energy and enterprise does not remain entirely free from extravagance.

A man traveling in America, who is not primarily a railroad expert, is first of all pleased by the type of passenger cars. * * * For traveling up to medium distances this type of car certainly is not unfit; for traveling over longer distances it hardly answers just requirements. Sitting during long intervals with bent legs is uncomfortable. One is continually disturbed by people moving through the middle passage, even if all other passengers keep their seats. Our third class cars undoubtedly are better adapted to the customs of the German population than are the American chair cars. Relatively few persons in our cars are housed in one compartment; they have a toilet; there are special ladies' compartments, etc. That the ordinary American wagons cannot be compared to our second or first class is so obvious that further explanation is unnecessary.

Nevertheless, Americans generally are satisfied with their chair car, and if there is no pressure exercised by the public the railroads will certainly not voluntarily give up the present system, because it is undoubtedly advantageous to them in every way, especially in economy of space.

* * * That the German traveler is not satisfied with the Pullman cars arises from the manner in which the service is offered. It is not agreeable to us to be obliged to wash and dress together with several people, entirely strangers to us, after having waited perhaps half an hour before our turn comes, while we ourselves hurry involuntarily because of the others who are waiting. The American is not disturbed in the least by all this. We saw several men shaving at the same time quite oblivious of their surroundings. This explains, too, why the American does not see the deficiency in the relatively small number of washing arrangements. There is usually enough time, and so he waits till his turn comes.

* * * The way the window is put in the wall of a Pullman car leaves much to be desired. It is set so low that a person of even medium height cannot look out of the window. One sees the bulge containing the upper berth, and a traveler not used to American arrangements is sure to hit his head against that bulging part in trying to look out of the window. It is also difficult to open the window during the daytime, because it must be raised instead of lowered.

* * * So far as we could observe, the servants in the Pullman cars—conductors excepted—are all negroes. The service generally is good, if one is able to overlook the ill smell peculiar to negroes, and the fact that the black servant is apt suddenly to take his place alongside of a traveler and try to start a conversation. He feels himself a gentleman, if he happens not to be busy. Surely the service is ample, there being at least two servants to a car.

Lighting of the trains seems not to be up to the full standard of excellence, except in the very latest Pullman trains de luxe. In those trains it corresponds about to the equipment which has for some time been provided in Germany in a number of fast trains, consisting in an electric light over the head of each traveler. A considerable number of otherwise very good trains are even today equipped with oil lamps, so that it is impossible to read in the evening. Lighting in ordinary cars we found very poor. From Buffalo to New York we rode in a car on a fast train in which it was impossible to read even large type. Luxury of travel is manifestly absent in most trains run without Pullman equipment in non-competitive service, except in short suburban runs. Where there is competition, however, every effort is made to provide comfort.

We were disposed to think that in the absence of it the railroad was willing to economize in the equipment furnished, to further the use of Pullman cars. Such trains are often defective in cleanliness, water supply, etc.

As regards sleeping cars, the American berths are better than ours, and are considerably broader, so that it is possible even for two persons to find room in the same berth. The arrangement of berths in the direction of the train is also an advantage in the American cars, since the traveler is less shaken about than in our cars, where the berths are set across the car. In consideration also of the very heavy passenger coaches, the tight coupling, alternate rail joints, and the greater number of ties—all of which things favor quiet riding—the highest degree of perfection would be reached in America if other details did not partly counterbalance these good points. Among the disadvantages may be mentioned first of all the use of the whistle and the constant ringing of bells. This by itself is exceedingly disturbing, especially at night. The passenger hears not only the whistle and bell of his own locomotive, but also those of others entering the station at the same time.

The station buildings, according to our observations, frequently failed to comply with traffic requirements. This may be partly attributed to the rapid growth of the towns and cities, with which traffic facilities have not been able to keep pace. Where there is competition, again, especially at large points, the station accommodations are generally equal to those in Germany; but on the average the American, so very particular about his home, is satisfied with the most simple stations, bare of every luxury, except in regard to sanitary arrangements. It is noteworthy, also, that the barber shop, which to such a remarkable degree forms a life necessity to the American, is seldom missing, and there is also quite universally a bootblack stand. The ticket booths are usually placed in the general waiting room, and it was only rarely that we found a booth where it was not necessary to use artificial light during the daytime. Even in the smaller stations we were especially struck by the presence of the so-called quick lunch rooms, which, in accordance with American habits, are extensively found throughout the country. In general, it is not in accordance with our notions of comfortable living to imitate the American haste in eating but it cannot be denied that when a railroad connection leaves only a few minutes for refreshment, quick lunch rooms would be decidedly useful in Germany, especially at tourist stations, with heavy traffic and short stops.

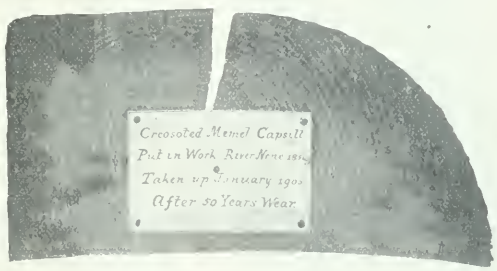
Punctuality seems to be a sore spot with American railroad traffic. In that respect American railroads stand without doubt considerably behind the German roads. It cannot be said, off hand, to what extent American traffic arrangements are at fault. In America, as well as in Germany, travel develops in lines not always expected, and it is not easy to provide for all emergencies as liberally as might be desired.

As regards time tables, we noticed two principal differences from our practice—the way the time table was worked out and the way local train despatching is arranged. With us, the graphic time table, which gives to each passenger and freight train its definite location and time, is so made that train despatching—extraordinary cases excepted—regulates itself smoothly by the time table and can be managed independently from each station as a radius. In the German time table from the start a sufficient number of extra passenger and freight trains are provided so that in case of emergency it is only necessary to decide whether an extra train shall be run or not; its time table is already in existence. It is obvious that this system involves considerable extra work in making the time table, but it is also obvious, in view of the necessity of smooth running of trains, without interruption and with public safety, that some such device is quite indispensable; yet such a time table, regulating like clockwork the smallest detail of the train movement and providing for all sorts of contingencies, is unknown on most American railroads. Of course, American time tables fix the running of passenger trains as exactly as possible, and the times of arrival and departure of freight trains are also set; but we found nowhere time tables as precise as the ones in use in Germany. The order of the train despatcher everywhere, seems to govern train movement more than the fixed, unchangeable time table, and the train despatcher is in charge of traffic movement, notwithstanding the fact that with successful introduction of mechanical signaling, etc., the stations in America would be quite as well adapted to take the responsibility for train movement as are our German stations. Where signaling apparatus has been locally concentrated and the safety of train traffic has been secured by mechanical devices, the service is similar to ours, but even in such cases the train despatcher is in evidence, while with railroads which run few trains, especially in the West, he reigns supreme. It also struck us as strange that so little was made of graphic time tables. The graphic form seems only to be used in making the original time table in the superintendent's office, and is not to be found in the hands of a single employee along the road. Service time tables are generally not constructed for a whole railroad system, but only for a single division, so that every irregularity reaching beyond the limit of the division calls for an explanation between the two divisions affected. With increasing traffic the extent of the division becomes less, sometimes not more than thirty miles, and the arrangement often works slowly, especially because the method of reporting is much more extensive and complicated than in Germany.

Equally different from our method is the management of outer station service. The controlling action of the despatcher makes it impossible that the station master should have the authority of our station superintendents, consequently upon arrival stopping, or departure of a train at an American station, there seems to be no one who has the train in hand. That is to say, there is no single employee who has full charge of this part of the service. Yet American experts see in our service superintendent only a species of policeman, who leads the public in strings and for whom there is no room with the American public. The entire management of traffic at stations, in connection with the carelessness of the public, undoubtedly offers one of the causes to which the unproportionately large number of accidents on American railroads can be attributed.

## Fifty-Year Old Creosoted Timber.

Half a century ago the docks at Wisbech, Cambridge, England, were piled and sheeted with Pinus sylvestris—otherwise known as memel fir, baltic fir, or Scotch pine. The creosote, as the photograph of a specimen shows, was not driven deeply in the wood; indeed, it is probable that this kind, well seasoned, was simply dipped in a tank of creosote and allowed to soak for about one day. The specimen shown is a section sawed from a capsill, so that during this long period of use it was exposed to the air and all the changing conditions of moisture and temperature. The wood is still absolutely sound. The wide check opened out in the thin section after the specimen was sawed for Mr. Von Schrenk, and it should not therefore be taken into account.




Creosoted Pile Section after 50 Years' Service.

## Regularly Assigned vs. Pooled Engines.

The following note is taken from a report presented before the Traveling Engineers' Association by the committee on this subject, Messrs. C. F. Richardson, chairman; H. L. Bartels, F. B. Childs, W. J. Stuart and P. H. Stack:

It has been the privilege of the chairman of your committee to have had a somewhat varied experience with both pooled and regularly assigned engines. In each case when the pooling was resorted to the power was in good condition and the crews were interested in their engine, so if a nut came loose, a wedge came down, or a brass needed keying, you would find the engineer giving these parts his personal attention, and you would find him at the roundhouse looking after work reported to be done to see that it was done, and in many cases engineers would themselves make like repairs. After the engines were pooled these same men became discouraged and those who could afford it would lay off rather than run the engines after they had been in the pool several months, owing to their bad condition.

When they were first pooled there was a marked increase in the mileage of the chain-gang engines, but this was of short duration. After they had become somewhat worn and flues began to get weak and needed good handling, much difficulty was experienced as the men had become indifferent about their work, and the average mileage became less than that of the regular engine. From my observation of different roads, I believe engines can in most cases be regularly assigned. A greater part of the year the crew will be able to follow the engine. There may be short periods when this could not be done, but with an ample extra board to draw from, those conditions could be taken care of. A freight engine with a regular crew will have more trips credited to her where she has handled full tonnage over the division, or if in

passenger service she has made up time and arrived oftener at the terminal on time than if she had been handled by all the different crews. An engine handled for seventy-five per cent. of the time by regular men, means the interest and co-operation of those men, which must naturally result in the benefit of the service. If we take into consideration the delays that occur which could be eliminated by having regular crews, the money paid for overtime due to these delays would go a long way toward paying the interest on the cost of a few more locomotives. You might add to this a good big percentage for repairs due to the indifferent manner in which the machine is handled without a regular crew.

If you examine the reports made to the Interstate Commerce

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What's What in Russia.

Commission by the different trunk lines showing the amount of money expended to keep each locomotive in repair for the year ending June 30, 1905, you will find two of the large trunk lines where they keep regular crews on their engines making the best showing of all railroads in the United States, and these two roads have a reputation second to none in point of good service.

### Supplies for the Grand Trunk Pacific.

The Transcontinental Railway Commission has let the following contracts for material: Dominion Iron & Steel Co., 33,000 tons rails, $1,127,000; Nova Scotia Steel & Coal Co., 1,217 tons splice bars, $57,247; Gananoque Bolt Co., 310,000 lbs. track bolts and nuts, $10,635; Toronto Bolt & Forging Co., 208,800 lbs. track bolts and nuts, $7,300; Peck Rolling Mills Co., 1,188,200 lbs. track spikes, $29,705; Hamilton Steel & Iron Co., 729,000 lbs. track spikes, $18,589, Toronto Bolt & Forging Co., 728,900 lbs. spikes, $18,586; Montreal Rolling Mills Co., 728,910 lbs. track spikes, $18,536.

### A Popular Phase of Government Ownership.

There are reproduced herewith two pages from the official Russian railroad guide. At first glance at the left-hand table the reader might be justified in feeling that there is, indeed, a great gulf fixed between the east and the west. But a closer study reveals a bond of sympathy which is felt all the more strongly when it is observed that in choosing the naïve symbols representing peace and refreshment to the weary traveler the Imperial Government has selected a typically American ante-prandial rejuvenator. The *entente cordiale* being now established, it appears on further exam-

Приплаты въ пп. 1 и 2 см. 411, 419, и 420.

## 90. Москва - Брестъ (до Смоленска) и обратно.

пересадки { Москва—Варшава I—II кл. въ пп. 1 и 2, I—III кл. въ пп. 3, 4, 5
Москва—Рига I—II кл. въ пп. 3 и 4.

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8 0 — 604 пр *Москва* Ник. 0м — 9. 0 11. 0 4. 0

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| — | 10 11 | — | — | Нѣмчиновскіи постъ | — | 6.51 | 9. 0 | 10 1 |
| — | 10 21 | — | — | Платформа 20 вер. | — | 6.38 | — | 9 53 |
| 9 44 | 10 27 | 11 54 | 23 | Одинцово ℣ | 1003 | 6.32 | 8.47 | 9 48 |
| — | 10 36 | — | — | Юдинская (пл.) | — | 6.13 | 8.35 | 9 38 |
| — | 10 46 | — | — | Платформа 34 вер. | — | 5 58 | 8.25 | 9 28 |
| 10 18 | 11 — | 12 37 | 41 | Голицыно ℣ | 984 | 5 42 | 8.11 | 9 14 |
| — | 11 11 | — | — | Сушкинская пл. ⅄ | — | 5 23 | — | 9 3 |
| 10 45 | 11 33 | 1 14 | 60 пр | **Кубинка** ℣ 0т. | 966 | 4 58 | 7.37 | 8 43 |
| 10 53 | 11 42 | 1 24 | 0т. пр | | | 4 49 | 7.27 | 8 35 |
| 11 7 | 12 — | 1 54 | — | Мухино А | — | 4 24 | 7. 5 | 8 14 |
| 11 32 | 12 21 | 2 15 | 81 | Шелковка ℣ | 945 | 4 — | 6.51 | 8 1 |
| 11 50 | 12 39 | 2 33 | — | Шаликово ⅄ | — | 3 34 | 6.36 | 7 40 |
| 12 6 | 12 55 | 2 49 | 103 пр 0т. | **Можайскъ** ℣ 0т. пр | 922 | 3 10 | 6. 7 | 7 21 |
| 12 16 | 1 — | 3 — | | | | 2 45 | 5 55 | 7 13 |
| 12 36 | 1 21 | 3 47 | 114 | Бородино А | 912 | 2 24 | 5 36 | 6 56 |
| 12 56 | 1 41 | 4 4 | — | Колочь | — | 2 — | 5 20 | 6 40 |
| 1 5 | 1 49 | 4 33 | 130 | Уваровка ℣ | 896 | 1 45 | 5 6 | 6 25 |
| — | 2 24 | 5 — | — | Сычки | — | 1 6 | 4 32 | — |
| 1 45 | 2 40 | 5 27 | 150 | Ватюшково | 876 | 12 53 | 4 20 | 5 51 |
| — | 2 56 | 5 47 | — | Колесаики ⅄ | — | 12 28 | 4 — | — |
| 2 14 | 3 16 | 6 5 | 169 пр 0т. | **Гжатскъ** ℣ пр | 857 | 12 — | 3 34 | 5 10 |
| 2 24 | 3 26 | 6 20 | | | | 11 46 | 3 20 | 5 — |
| — | 3 46 | 6 39 | — | Красицкая А | — | 11 28 | 3 1 | — |
| 2 54 | 3 52 | 7. 1 | 186 | Серго-Ивановская | 840 | 11 10 | 3 — | 4 34 |
| 3 13 | 4 11 | 7.28 | — | Тумаково | — | 10 44 | 2 47 | 4 18 |
| 3 37 | 4 31 | 8. 6 | 210 | Мещерскъ | 816 | 10 13 | 2 14 | 3 55 |
| — | 4 53 | 8.25 | — | Комягино ⅄ | — | 9 51 | 2 — | — |
| 4 7 | 5 8 | 8.44 | 228 пр | **Вязьма** М.-Бр. ℣ 0т. | 798 | 9 30 | 1 30 | 3 24 |
| — | 6.30 | — | | 0м **Вязьма** Ник. 104 пр 244 | | 7 — | 12 10 | — |
| — | 4.25 | — | | 244 пр *Литославль* 0м — | | 9.40 | 3.15 | — |
| — | — | 12.30 | | 0м *Вязьма* М.-Бр. 107 пр 279 | | 4. 0 | 11 40 | 2 47 |
| — | — | 11 10 | | 279 пр *Тула* 0м — | | 5 16 | 9. 0 | 5.10 |
| 4 22 | 5 28 | 9.28 | 228 пр 0т. | **Вязьма** М.-Бр. ℣ пр | 798 | 9 0 | 12 30 | 3 4 |
| 4 44 | 5 50 | 10. 0 | — | Гредякино А | — | 8 38 | 1 4 | 2 47 |
| 5 1 | 6. 9 | 10.26 | 249 | Сашѣгино | 770 | 8 10 | 12 45 | 2 29 |
| 5 21 | 6.29 | 10.52 | 262 | Алферово | 764 | 7 58 | 12 32 | 2 16 |
| 5 28 | 6.48 | 11.23 | 272 | Издѣшково ℣ | 754 | 7 41 | 12 — | 1 47 |
| — | 6.59 | 11.37 | — | Митино | — | 6 51 | 11 50 | — |
| 6 9 | 7.21 | 12. 8 | — | Дурово ⅄ | — | 6 27 | 11 30 | 1 17 |
| 6 22 | 7.34 | 12.21 | 297 пр 0т. | **Дорогобужъ** ℣ пр | 729 | 6 14 | 11 17 | 1 1 |
| 6 30 | 7.44 | 12.30 | | | | 5.50 | 11 — | 12 51 |
| 6 56 | 8.10 | 1. 9 | — | Вышегоръ А | — | 5.22 | 10 46 | 12 30 |
| 7 9 | 8.25 | 1.32 | 318 | Михайловская | 708 | 5. 4 | 10 31 | 12 15 |
| 7 22 | 8.38 | 1.49 | — | Милахово | — | 4.39 | 10 15 | — |
| 7 43 | 9. 2 | 2.22 | 334 | **Ярцево** ℣ | 693 | 4.17 | 9 58 | 11 44 |
| 8 10 | 9.30 | 2.58 | — | Присельская | — | 3.36 | 9 27 | 11 15 |
| 8 33 | 9.54 | 3.32 | 361 | Каменка ℣ | 665 | 3. 1 | 9 1 | 10 50 |
| — | 10. 6 | 3.51 | — | Переваловo | — | 2.40 | 8 41 | — |
| 8 59 | 10.23 | 4.16 | 376 | Духовская | 649 | 2.16 | 8 30 | 10 22 |
| 9 14 | 10.38 | 4.34 | 385 | Колодая ⅄ | — | 1.56 | 8 10 | 10 3 |
| 9 26 | 10.52 | 4.53 | 392 пр | **Смоленскъ** ℣ 0т. | 638 | 1.35 | 8 — | 9 53 |

Through Dampest Russia.

ination that the time-table which we have taken the liberty of designating, "Through Dampest Russia," covers the line from Moscow to Smolensk. The letters "Врс" at the head of the familiar mileage column mean *versts*. A *verst* is two-thirds of a mile, and the road is therefore, according to our calculation, 16 drinks, or 260 miles long. At the favored city of Viazma (the hiatus about four inches from the top) the legal limit appears to be one on arrival and one on departure, but it seems as if an earnest man might pick up one or two more in the jungle of type in between. Incidentally, the insertion of arrows showing the direction of train movement, on time-tables arranged in this manner, is a simpler and more effective guidance to the average traveler than the notes "read up" and "read down" used in this country.

The second page shown herewith we are not quite sure of, but we opine that it is an index of stations and points near them with which connections are made. Here the artist's skill has been called upon to lure the prospective commuter or retired Cossack to secluded suburban retreats. The little boat means a ferry and the dainty, spirited pony takes the place of our disheartening "stage connection with Pierson's Corners."

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 11. FRIDAY, SEPTEMBER 14, 1906.


The Pennsylvania Railroad's tunnel under the Hudson River at Thirty-third street, New York City, is now open through from New Jersey to New York, though it is not yet lined, and will not be ready for trains for a year or two. This tunnel has been pierced in 12 months' less time than was stipulated in the contract, and the work has been done so quietly that people have given it but little thought—the East River tunnel, and its numerous obstacles and dangers, taking everyone's attention. Moreover, the contractors, the O'Rourke Engineering Construction Company, say that there has been no loss of life among the workmen under the Hudson except from causes which would happen in the same way on above-ground work—and there have been but few fatalities from any cause. The alinement and grade lines that were run from the east side are said to have matched those from the west side to within ⅛ in. and ¾ in., respectively. The lines were checked, by using tubes driven through the mud, when the opposite headings were still 125 ft. apart, so that when the shields finally met they were brought practically to a perfect union.

Those who contemplate the substitution of metal railroad ties for wood will do well to study the experience of the German railroads, which has been not only extensive but long. As early as 1868 a report on metal ties was made to the technical convention of the German Railroad Union, and in 1889 no less than 9,902 miles of railroad in Germany had iron or steel ties. In this early period it was hoped to make practically a continuous rail by substituting longitudinal metal sleepers for cross-ties; and at this date 6,181 miles of the total 9,902 had such sleepers. But these lost favor, and by 1900, while the track laid with iron cross-ties had increased to 10,695 miles, the longitudinal sleepers had largely disappeared. In 1903 more than one-fourth of the through tracks in Germany had steel cross-ties, namely, 11,534 miles out against 32,192 on timber ties. The increase since 1889 seems inconsiderable, and there certainly is no such tendency as formerly to abandon wood for iron; but on the other hand the metal ties are not condemned, as is clearly shown by the fact that from 1900 to 1903 the additions to track on steel ties amounted to 1,349 miles, against 3,549 miles on wood. The iron interests in Germany naturally advocate the substitution of steel for wood, and much use is made of the argument from the early impending exhaustion of the forests. Doubtless, in this country at least, we are consuming more timber than we are growing. It should not be forgotten, however, that iron ore and coal are also exhaustible materials, and that while, in course of time, we can grow more timber, we cannot in all time grow more coal and ore.

The tremendous increases in the number of passengers carried by the transportation systems of Greater New York furnish an unfailing source of interest and astonishment, with each recurring quarter. After the subway was opened for traffic in the fall of 1904, both the Manhattan Elevated and the surface lines showed decreases in traffic, although the sum total was greater than ever before. This is shown by the following table:

*Paid Fares.*

| | 1905. | 1904. |
|---|---|---|
| New York City Ry. (surface) | 379,721,637 | 380,749,591 |
| Elevated roads | 249,965,166 | 292,646,674 |
| Subway | 116,209,313 | 16,241,869 |
| Total | 745,896,116 | 689,638,134 |

The New York Railroad Commissioners have now published returns for April, May and June, 1906, and these show that the surface lines have passed all their previous records, in spite of the subway competition, and that the elevated lines are nearly in their former position, and will presumably pass their 1904 high record in another season. The figures of this traffic, printed below, possess the highest interest to the student of the complex transportation problem in New York:

*Paid Fares Three months Ended June 30.*

| | 1906. | 1905. | 1904. |
|---|---|---|---|
| Surface lines | 101,971,383 | 99,059,455 | 100,047,585 |
| Elevated lines | 69,164,266 | 64,551,793 | 75,751,031 |
| Subway | 37,161,607 | 26,942,295 | ..... |
| Total | 208,297,256 | 190,553,453 | 175,798,616 |

In two years, that is to say, the *increase* in the paid fares during a given three months' period amounts to nearly 32½ millions. If we assume, roughly, that every traveler paid two fares on each of the 91 days comprising the period considered, it appears that 178,564 *more* persons were using the New York transportation lines in the spring of 1906 than in the spring of 1904, and that the total number of travelers (not trips) per day was something like 965,926 in 1904 and 1,144,490 in 1906. In other words, a throng of travelers equal in number to the population of Boston plus that of Cleveland rode twice daily over the lines in the spring of 1904, and were augmented in 1906 by the entire population of Rochester! Supposing the same rate of increase to keep up for the next fourteen years (and there are no indications that it will not keep up, and increase the rate besides) the transportation lines of 1920 will have to face a movement of 3,759,225 persons taking 7,518,450 rides daily.

What are all these people going to ride on? Taking the aggregate of the heaviest days in 1904, 1905 and the first half of 1906, it appears that about 3½ million rides can be accounted for without materially straining existing facilities. There remain four millions to be accounted for, and it would take eight additional subways like the existing one to carry them, at the present basis of travel.

## GROSS EARNINGS AND DIVIDENDS.

The commercial prosperity of the country has been so great this year, and the railroads, with a mild winter to keep their expense account down and tremendous traffic to bring their earnings up, have been making a remarkable showing for so long that the news of it has become commonplace. But with the close of the summer months, the annual statements of most of the principal companies are now available, and they furnish a record which demands fresh comment, even after all that has been said and written on the subject. The accompanying table shows the gross earnings, in two cases partially estimated, of 21 companies, for the year ending June 30, 1906, in comparison with the previous 12 months. In several instances, it must be observed, this is not the fiscal year of the road concerned, but the comparison will serve equally well.

| Company. | Gross earnings—1906. | 1905. |
|---|---|---|
| Atchison, Topeka & Santa Fe | $78,044,342 | $68,375,834 |
| Baltimore & Ohio | 77,392,656 | 67,689,998 |
| Canadian Pacific | 61,669,758 | 50,481,882 |
| Chesapeake & Ohio | 24,602,986 | 20,724,368 |
| Chicago & North-Western | 63,481,575 | 57,745,273 |
| Chicago, Burlington & Quincy | 73,500,000* | 65,973,046 |
| Chicago, Milwaukee & St. Paul | 55,149,000* | 49,884,000 |
| Chicago, Rock Island & Pacific | 51,237,854 | 44,051,509 |
| Cleveland, Cincinnati, Chicago & St. Louis | 23,649,295 | 22,372,312 |
| Great Northern | 49,505,383 | 41,608,430 |
| Illinois Central | 51,636,405 | 49,508,650 |
| Lake Shore & Michigan Southern | 41,040,962 | 36,189,749 |
| New York Central | 89,785,260 | 81,289,967 |
| Norfolk & Western | 28,487,763 | 24,089,257 |
| Northern Pacific | 62,140,410 | 57,729,362 |
| Pennsylvania Lines East | 142,317,467 | 123,424,367 |
| Pittsburg, C., C. & St. Louis | 28,361,771 | 25,029,370 |
| Southern Railway | 53,641,438 | 48,145,108 |
| Southern Pacific | 105,619,114 | 95,515,158 |
| St. Louis & San Francisco | 38,626,399 | 35,319,478 |
| Union Pacific | 67,281,543 | 59,324,549 |
| Total | $1,267,170,781 | $1,122,472,067 |

Increase, $144,698,714, equal to 12.9 per cent.

*Approximate.

This increase takes a more graphic aspect when we realize that it is larger than the 12-months earnings of the Pennsylvania Railroad for the current year; larger also than the entire earnings of the railroads of the United Kingdom from merchandise traffic in the year 1905. This 1905 year was a bumper one in England, so far as railroad results were concerned, and the total United Kingdom system earned $551,848,140; an increase of nearly 1½ per cent., which received much comment. We have a basis of comparison, therefore, in showing that in one bumper year, 1906, the increase in earnings on a group of our representative roads was somewhat more than ten times as great as the increase in the earnings of an equally representative group of British roads in their bumper year, 1905. Moreover, 1905 was a good year with us also, while 1904 in Great Britain was not an especially good year, so that we had, so to speak, a more difficult take-off for our leap in earnings than Great Britain had.

What is going to be done with this great piling up of new values? Is the money going to be turned back into the property again, as has been so consistently the practice since the lean years of a decade ago, or are minority shareholders all over the country going to come into their own with Union Pacific-like suddenness, when directors meet this fall? And which of these things should be done? There has probably never been a time in American railroad history when these questions were quite so prominently agitated as they are now—or a time when there was as much honest doubt in the minds of directors regarding the course which they should take. The American theory of the dividend is directly involved, and the attention of the public is so sharply fixed on the rights of minority shareholders that many companies will doubtless find it expedient to give this theory, now rather intangible, the definite form of a doctrine.

Let us assume, then, the unwritten rule of American railroad dividends, as applied by conservative companies in the present generation—that the property must be so maintained out of earnings that at the end of the year it will be in as good shape to meet conditions to come as it was at the beginning of the year, not only as regards the average age of its ties and the tonnage capacity of its locomotives, but also as regards any new circumstances of traffic or of competition which may have arisen. After that, floating debt, sinking funds, car trusts and other miscellaneous charges must be looked after, and these also should be left in fully as sound condition as when they were last taken up, 12 months previous. Then comes the dividend, to be declared at a rate that can be maintained, so far as ordinary foresight can determine, and will presumably not be subject to immediate unfavorable fluctuations, and after the dividend has been paid there should remain a good round surplus to add to the profit and loss balance carried forward as a provision for special needs or hard years.

This is the theory, but the practice in these years of great prosperity has been to put far more value back into the road than wear-and-tear and traffic conditions have taken out of it. The present Lake Shore & Michigan Southern is to all intents and purposes a railroad built new from its surplus earnings; the average charge for locomotive repairs and replacements on the Southern Pacific is nearly $4,000 per locomotive per year. Atop of such excessive prudence and ultra conservatism come the great earnings of 1906, with the certainty that surpluses will be not merely greater, but much greater, than ever before. An attempt has been made, in the table which follows, to estimate how much each of the roads listed is earning on its common stock. The results are not guaranteed, and might conceivably vary considerably according to the temperament of the estimator. Moreover, full returns are not at hand, in some cases. But the idea has been to apply the dividend theory as expressed above, omitting only the item of surplus to be carried forward. The results are as follows:

| | Common stock—Earns, per cent. | Pays, per cent. |
|---|---|---|
| Atchison, Topeka & Santa Fe | 11 | 4 |
| Baltimore & Ohio | 12 | 6 |
| Canadian Pacific | 14 | 6 |
| Chesapeake & Ohio | 7 | 1 |
| Chicago, Milwaukee & St. Paul | 11† | 7 |
| Chicago & North-Western | 20 | 7 |
| Chicago, Burlington & Quincy | 19 | 7 |
| Chicago, Rock Island & Pacific | 10 | 6¼ |
| Great Northern | 17 | 7 |
| Illinois Central | 11 | 7 |
| Lake Shore & Michigan Southern | 25 | 8 |
| New York Central | 6 | 5 |
| Norfolk & Western | 12 | 2 |
| Northern Pacific | 14 | 7 |
| Pennsylvania Lines East | 12 | 6 |
| Pittsburg, C., C. & St. Louis | 7 | 3 |
| Southern Pacific | 10 | 5 |
| Southern Railway | 1½ | 0 |
| St. Louis & San Francisco | 1 | 0 |
| Union Pacific | 18 | 10 |

†Both classes.

It is impossible to take up in detail the study of each of these cases; the method employed has been to estimate maintenance needs liberally, not by any general standards, but by the local standards in the section of the country where each of the roads operates, with due allowance for special conditions, such as bad water, preponderance of light equipment, etc. It is at least safe to say that English practice would find the sums as listed—and probably considerably greater sums—available for dividends.

Some of the items on the list require comment, however. It is evident that the sum available for dividends on the New York Central depends directly upon the dividends paid by other Vanderbilt properties in the stock of which the New York Central is a large investor. The long policy of over appropriation for maintenance and replacements on all the Vanderbilt lines would enable the Lake Shore or the Michigan Central to increase their dividend rate many points, thereby adding to the available revenue of the New York Central just as the Southern Pacific was made to add to the revenue of the Union Pacific. Mr. Harriman emphasized this state of affairs in dividing the Union Pacific net income into two parts—income from operation and income from investments. In the case of the Canadian Pacific, the 14 per cent. listed does not attempt to show the rights of the common stock ("equities," in stock exchange parlance) in the tremendous land holdings in the northwest, sales from these holdings being credited direct to profit and loss, in a separate account. Nobody knows what the ultimate sale value will be of the 13,000,000 acres of land which the company owns, and many years must pass before it is disposed of, unless a land company is formed to take over the entire holdings. In the case of the Southern, of the St. Louis & San Francisco and certain other lines on the list, notably the Atchison and the Great Northern, a tremendous amount remains needed to fully develop the properties. Prosperity for the Southern roads is a new thing, and the long struggle for existence of most of the roads now forming the Southern Railway has left them in poor condition, with large requirements that should properly be met out of the earnings of the present good years. In the northwest, it has not been lack of prosperity but rapidity of development which has accounted for the general condition of under-maintenance. The Hill lines are

showing in miniature the physical history of American railroads, year by year—rough track, hastily built into undeveloped country, and perfected gradually, to meet the needs of rapidly increasing traffic.

But with all these qualifying facts in mind, it remains evident that the majority of the roads listed herewith, together with many others not on the list could, this year, pay their dividends on the common stock twice over without incurring a deficit, and that some of them could do considerably better than that. And it is becoming every year more apparent that traffic growth which has its basis in the general development of manufacturing interests throughout the country is very different from one-crop or one-commodity traffic growth not otherwise supported. To quote a recent statement by an officer of a railroad operating in the central and eastern states, "Nobody can realize how many new industries have started up all along the lines, each adding its little extra demand on us, until the aggregate total is staggering." It is evident that this is going to check the violent fluctuations which have always characterized American railroad traffic. The change must be gradual, with plenty of lean years ahead, but the lines built to haul grain, or lumber and forest products are year by year getting higher percentages of the manufacturing business that is not killed by drought or exhausted when the forests are cut off.

The coal roads, especially the bituminous roads, may properly be grouped more nearly in the "one crop" classification than any other special carriers, under present conditions. The great current earnings of the Baltimore & Ohio would have been materially reduced under the market conditions and existing rates of a few years ago, and the sources of bituminous output are so scattered and the underlying tonnage so tremendous that no community of interest exists similar to that among the anthracite roads. But the coal will always be there—always, at least, during any period of time with which we need concern ourselves—and the manufacturing industries will need more and more of it every year, to say nothing of the great and constantly increasing fleet of steamships on the ocean and the lakes. The two new Cunard steamships "Mauritania" and "Lusitania," now building, are scheduled to burn 1,200 tons per day, each, and will take on board at New York for every trip enough coal to load four trains made up of thirty 50-ton cars.

Suppose that we roughly divide the demands upon net income, after satisfying fixed charges and taxes and taking proper care of the floating debt, into three heads—maintenance, strategy and surplus. It is apparent that the extraordinary maintenance needs which have followed the bad years of the 1897 period will not long continue, except in certain special cases as mentioned. The application of earnings and of credit to strategic purposes, as in the case of the Reading holdings of the Lake Shore, is a matter of much less certain limit, and must always vary in accordance with the policy of the management, tempered by the strength of minority stockholders' organizations. The "surplus" item seems already well taken care of in most instances, and surplus is cumulative. Have we not arrived at the period, therefore, when the stronger companies will inevitably find it expedient to increase dividends? Wall Street evidently thinks so, as witness Lackawanna, a 10 per cent. stock selling around 550; Great Northern, paying 7 per cent. and selling above 300; Atchison, with its 4 per cent. common stock selling nine points above its 4 per cent. preferred. If it is true that British shareholders have been taken care of at the expense of the railroad, it is also true, especially in recent years, that American railroads have been developed at the expense of the shareholder. The best course lies somewhere between the two, and there are present day indications that we are tending towards it.

## THE PUBLIC ATTITUDE TOWARD RAILROADS.

The philosopher who watches the changes of affairs and of men must often, vaguely or definitely, have reflected how in these days the old proverb about familiarity breeding contempt must be modified. Especially is this true when we try to fit the proverb to great civic or physical questions in national life. For the word "contempt" in the old saw must, in such cases, be substituted nouns like criticism, exaction, regulation, system—any one of a dozen nouns more or less abstract. The thing of original terror, wonder, curiosity and profound interest becomes by familiarity, and as it gets to be an institution, a thing to be watched, studied, criticized. It passes not merely from a formative to a scientific stage but also to a status controversial and censorious. And in that process, often long and complex, there is the old danger of extreme and radical policies with another proverb as to the wisdom of the midway course—in the Latin *in medio tutissimus ibis*—coming to our rescue.

Nothing has more strikingly illustrated the point than the history of the railroad, and particularly of the American railroad. At its outset, three-quarters of a centnry ago, the railroad, of course, encountered opposition, but it was almost exclusively the opposition of interests—turnpike companies, stage owners and the like. Communities and men, in the bigger sense, were in favor of the railroad enthusiastically, and that support long continued. It even reached, for a period not brief, something of reverence vague and blind. Men do not have to be white haired to recall the intensity of public and personal interest in the old-fashioned railroad. The conductor was not in uniform but eke in his plain and dingy vestment was a little god on wheels whose pleasant word was like the off-hand dictum of a prime minister. The engineer was not only a god on wheels but a god behind the machine. The car might be narrow, its seats rough and its "express" speed fifteen miles an hour, but, in popular and individual vision, it eclipsed the majesty and pace of the modern Pullman. The small boy, who now views with placid interest the coming of the huge locomotive pulling its dozen passenger coaches, in those days put his fingers in his ears and ran howling behind the station as the wood-burning smoke stack drew up. Broader forces for several early decades contributed to deepen sympathy as well as reverence for the railroad. Except the telegraph no great invention came in to dim the railroad novelty in contrast with the later times of the telephone and of electricity as a motive power; and a great country with a vast frontier constantly pushing westward to the popular cry for more railroads promoted the spirit of concession to the railroad corporation.

We have changed all that. From an object of isolated grandeur and awe the railroad has become familiar not to say commonplace. New triumphs of electricity have impaired what we may call the railroad's dramatic power; and it has entered more deeply into relations of public convenience and necessity. As a secondary but most important sequel we find it the object of systematic attack from many directions—federal, state, municipal, and partisan as well as individual. The major causes of this wide swing of the pendulum of public opinion we do not now recount beyond those named, and the statement that there have been abuses on both sides. But a situation may be outlined that suggests the argument for moderation.

In the first place may be noted as a fact that the existing period of railroad prosperity has its drawbacks—one and the most serious of which is its tendency to lead to popular misjudgment—a misjudgment in which it is painful to see some thinking minds share. We see here again that old and so often misleading argument of coincidence—the synchronism which leads people to infer wrongly a relation of cause and effect. This present time of railroad restriction and regulation happens also to be a time of exceptional railroad prosperity, therefore the policy of restriction may be pushed far. Such is the reasoning that reminds one of Bastiat's ironic simile that because the higher culture of French sheep was indicated by smaller heads, sheep culture would reach its ideal when French sheep had no heads at all. How many persons, not a few of them intelligent and educated, realize that the large face profits of the first part of the present epoch of "prosperity" were used by the railroad companies to make good belated repairs or improvements, some of them on a vast scale and involving expenditures—like those of the Pennsylvania company in New York city—as to which untold years must elapse before even a moderate return on cost. In some cases with those improvements completed there have come dividends new or increased. But have they yet reached a size or an assurance that sanctions the arguments that, so long as they continue, the policy of sharp restriction should be indefinitely pushed and pushed often, in the shape of general legislation or policy that affects the struggling railroad, the unimproved railroad and the prosperous railroad all alike? As regards the public attitude toward railroad prosperity there is here a clear call for discrimination and coolness in opinion as well as the consequential policy.

This brings us to the often mooted question of the nature of that prosperity itself and its warning to both sides—the railroad finances on the one hand and the "anti-railroad" public on the other, east and west, but particularly at the west. Many signs seem to suggest that the prosperity of the railroads is pretty enduring or that, at least, a period of industrial depression will find them ready for successful economies. But the signs are far from conclusive. The historical rule as to the periodical recurrence of financial crises following high tides of prosperity has, during the last decade been falsified owing chiefly to the quick combinations of capital to resist

them. As a result of those combinations the financial tides have risen and receded slowly without a destructive break, and in the face of disclosures and influences which ordinarily would have spelled panic. But has that experience been long enough and deep enough to assure the future and confuse those prophets who have been telling us of the coming time, soon or late, when the depth of the trough of the sea will correspond with the crest of the present high wave of prosperity? It is, of course, a speculative question. But it is grave enough to call halt on those who cry railroad prosperity as justification of their attack. And, at the other extreme, far more sharp is its rebuke of those railroad financiers and combinations who use a railroad prosperity which may, after all, be but transitory, to coin their own profits in the street with equal offense to public sentiment and injustice to the *bona fide* stockholder. With so recent an example as the Harriman dividends do we need to go farther in stating a force more provocative than original grangerism or socialism in rousing unduly public sentiment against the railroads and stimulating the call for public ownership?

In viewing the general situation one is impressed also by the variety of the lines of attack. In New Hampshire it has been specifically railroad influence in the state legislature and the too free use of the railroad pass; in Massachusetts executive resistance to steam railroad acquisition of the street railway lines; in Ohio and elsewhere reduction of general passenger rates to two cents a mile; and in many states movements of varying magnitude in favor of state or federal ownership. Not all of these attacks bear the ear marks of demagogism, but many of them do and, almost throughout, the utterances and arguments, while aimed sometimes at a real evil, are crude, unstudied, the expression of an impulse rather than of basic conviction. Collectively, no doubt, these various assaults reinforce each other in creating immature public sentiment on the railroad question. But in spite of that fact there is considerable safety in the distributive character of these diversified attacks. They at least localize the questions at issue and let them be examined at short range. If, in the ultimate result, the bad failed and the good prevailed one could view these state outbreaks with complacency; but, in fact, usually at last both good and bad go down together as some new and more dramatic issue swerves the commonwealth. Yet, after all, some residuum of good is apt to remain as a basis of principle, solidified by new experience, for working out a solution along conservative lines. On that conservatism, apt to be slow but also apt to be sure, checking on the one hand the incursions of the demagogue, and, on the other, the selfish tactics of predatory wealth, must our hopes of a sane public attitude toward the railroads rest.

On the New York, New Haven & Hartford recently, three prominent citizens—a former governor, a president of the State Business Men's Association and a lawyer—refused to pay their fare on a crowded train from Bridgeport to New Haven because they couldn't get seats, and the company has issued a public statement reminding the dignified (?) violators of the law that they ought to have been arrested. The statement says:

"A common carrier of passengers is bound to furnish reasonable seating accommodations for the average number of passengers carried by it. It is not bound to buy enough passenger cars to furnish seating capacity for a few days in the year when travel is at its height if such cars would remain unused at other times of the year. A passenger has a right to a seat in a train, but he has not a right to a seat in any particular train, and if he boards a train and finds the seats are exhausted, he has no right to insist upon a seat before paying his fare. It is his option to travel on that train without a seat, or to get off and take the next train upon which he can get a seat. If he insists upon remaining upon a train where there is no seat, he must pay his fare, or be subjected to the statutory penalties for the evasion of fares. This doctrine is supported by Baldwin's American railroad law and by other decisions."

We commend Mr. Mellen's action to other roads. To the conductor the question of carrying out his instructions and compelling such passengers to pay their fares is always an embarrassing one—as well it may be, for the legal controversy *appears* to be so much like a civil case and so little like a criminal one that he has no sympathy from the public. The railroad can, indeed, well afford in most cases to proceed as in a civil case. To fully record the facts, however, and then give them to the public with names, as was done in this case, inflicts on the offenders an appropriate punishment, while the only satisfaction that they have got is that to be found in forcing a conductor to disobey his instructions, and in saving a little money; in this case the magnificent sum of 75 cents—25 cents apiece.

But a railroad that desires to live on pleasant terms with the people who travel in its cars must be very careful not to test this law too often. An aggrieved passenger who must come into court and prove that a railroad has not supplied itself with an adequate supply of passenger cars for its average business is at a great disadvantage, and judges, as well as juries, will for that reason sympathize with him. Therefore, to maintain a fair standing with the public a railroad must furnish more cars than a precise interpretation of the common law would require; and a *good many* more. To take an illustration familiar to all, many new passenger cars which were ordered soon after the beginning of the present period of activity in business were delivered from six to eighteen months after they were needed. We are not blaming any manager for not ordering new cars before he could see where he was to get the money with which to pay for them; but the fact remains that the public will, if it can, hold a carrier strictly responsible for providing vehicles well in advance of the need for them. Where the public cannot get what it believes to be its rights, it takes, in place thereof, anything belonging to the railroad that it can get hold of. Again, a heavy responsibility rests on the trainmaster or other officer who assigns the cars to different districts and trains. The task of a coal-car distributor in West Virginia would be easy, compared with this one, except for the fact that quite serious failures and errors in the passenger-car field are necessarily unpunishable because no one can crystallize the grievances of the ill-used passengers. The passenger-car distributor not only should be skilful and alert, keeping his records accurately and watching the needs of different stations every day; he should also have a sensitive regard for his duty to the public, for the reason, just mentioned, that the public is powerless to get even with him for a failure. Perhaps the hardest detail to deal with is the case of a heavy local train which is used by a very regular patronage. The numbers being regular, day after day, and filling, say, six or seven cars with not over 25 seats to spare, it seems a waste to furnish another car for the sake of providing 50 seats, when the 50 passengers will not appear more than once a month. There must be many trains, we should think, where the carrying of two or three dozen light camp chairs in the baggage car would be the means of allaying much friction. Of course, it would not do to relax the effort to provide a reasonable supply of regular seats; for that would lead to charges of stinginess. In a real emergency, an emergency known to be such, there would be enough passengers to accept camp chairs cheerfully. And this suggests that frankness with the public is a very good thing. Conductors ought to be taught to manifest it more freely. The ideal conductor is on pleasant speaking terms with a sufficient number of passengers, of different temperaments, to make it easy for him to be affable with any reasonable passenger at any time. With such a conductor, passengers who are asked to put up with camp chairs will not be so likely to "sass" back. To some conductors the suggestion that a man in such a position can be constantly affable will be resented. Their stern and unpleasant duties make affability seem incongruous. They will laugh at us, and almost laugh at their own superintendent if he listens to us. But do you not, after all, Mr. Conductor, entertain in secret, a warm admiration for those conductors to whom affability is natural?

## Chicago & North-Western.

The pioneer granger line—the first railroad in Chicago—presents a report interesting not only because of its evidences of great prosperity, but also because it points to a certain change in characteristics, shown this year rather more clearly than before. Earnings, both gross and net, were far in excess of previous records, and the usual economy of operation was manifested. The road earned, gross, $63,481,578, as against $55,745,275 in 1905, and net, after taxes, $21,265,302, as against $17,095,964. The year's dividends, 8 per cent. on the preferred stock and 7 per cent. on the common, absorbed less than half of the net income, and out of the balance the striking sum of $6,000,000—nearly one-tenth of the gross earnings—was appropriated for construction and betterments. During the five years just ended the company has taken in the aggregate $24,310,473 for these purposes; just about the same amount that has been paid out in dividends during that period. As we point out in another column, the company, had it so chosen, could this year have paid 10 per cent dividends on its preferred stock and 20 per cent. on its common.

What the future of the road is to be; whether it is to rely mainly upon local or upon through traffic, is one of the interesting questions which the current report suggests. During the latter '80s the average freight haul of the North-Western decreased, following its policy of branch line extension. This haul was 178 miles in 1887, 162 miles in 1888, and 152 miles in 1889. The Vanderbilt-North-Western-Union Pacific community of interest has since then given it a larger haul; 238 miles in 1905 and 263 miles this year, as against 175 miles in 1905 on a road which may at present be taken as typical of a local carrier in the northwest, the Chicago, Milwaukee & St. Paul. But the St. Paul has already announced its intention of creating its own route to the coast, and at the meeting of North-Western directors, Oct. 18, action will be taken on the

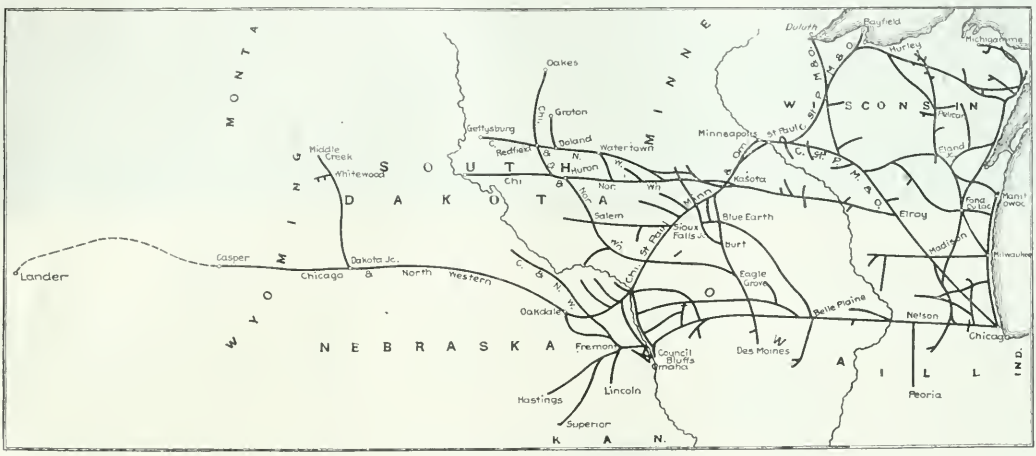
proposal that that company authorize an increase in the limit of capital stock to $200,000,000, by increasing the authorized common stock to $177,604,880. At present the preferred stock stands at $22,395,120 and the common at $77,601,045.

No announcement has been made of the purposes for which this stock is desired. It is undoubtedly true that it will in any case be to the company's advantage to have its capital limit further removed, as was done by its neighbor, the St. Paul, by the Union Pacific, the Southern Pacific, and the New York Central. But the direct use for new capital in the case of the New York Central and the Harriman roads is very plain, and the supposition that the North-Western desires to emulate the St. Paul in reaching westward is not a remote one, in view of the fact that its other immediate needs seem well provided for. What the coast connection is ultimately going to mean in the shape of increased earnings for the roads concerned is still problematical, for that part of the country is very young, but the efforts to reach the Pacific and the Canadian northwest constitute a striking epoch in American railroad development of the present day. With its own line to the coast, the North-Western would be in the unique position of receiving three types of business usually remote from each other: the long, through haul; the originating grain business of the northwestern states, and a heavy commutation passenger traffic out of Chicago.

All the road's passenger traffic, through, emigrant and commutation, is showing good increases year by year, but it is especially interesting to note that commuters constituted over half of the total number of passengers carried in 1906, while commutation earnings amounted to more than 13 per cent. of the total earnings from passengers. Passenger rates are still pretty high; in spite of the proportion of commuters, excursion and emigrant fares, they averaged 2.05 cents per mile, with an average distance traveled of 30½ miles.

It is expected that the Milwaukee & State Line Railway, giving the company a continuous four-track system between Chicago and Milwaukee, and providing for further increase in short haul passenger traffic, will be opened in October. It must be only a question of time, and no long time at that, before all such short and busy strips in the vicinity of great cities are worked by electricity, and it would not have been surprising if the North-Western had announced electrical plans in connection with the four-tracking, but Chicago does not yet feel the need of this to anything like the same extent that New York does. Other new construction during the year includes the completion of a new 102-mile line in Wyoming and the practical completion of 45 miles more of the same; also nearly 165 miles in Wisconsin. A 26-mile extension is being built in South Dakota, and 170 miles more are to be built in the same state through the medium of proprietary companies. It is not surprising, in view of this branch line development, to see that traffic density scarcely increases at all; that freight density was actually less in 1905 than in 1901, although in 1906 it is slightly greater. It may be said that the characteristic development of the company during the last decade—and indeed since the outset—has been expansion through eight thin branch lines, that have justified their construction with surprising rapidity, although the proprietary companies were for a good many years a burden.

The maintenance charges of the North-Western, in spite of this branch line mileage, are a never-failing source of surprise. We said in the *Railroad Gazette*, 20 years ago, that the company was not spending enough on track and buildings, yet the sums charged to the maintenance of way and structures account, per mile worked, have not really increased materially in that period, especially when the vast physical charges are considered. In 1906 maintenance of roadway and track cost only $750 a mile, while the total maintenance charge for bridges, buildings, track, interlocking, etc., foots up at the rate of about $1,000. The Atchison, the Southern Railway, and the North-Western used to stand about on a par for the slimness of their maintenance charges, but the Atchison in recent years has pulled ahead, while the Southern, in spite of the character of the country and traffic which its great mileage of branch lines serve, is some $25 per mile ahead of the North-Western at the present day. In maintenance of equipment, replacements were charged very liberally this year, to the extent of some $3,750,000, but actual repairs were kept down to a surprisingly low figure—$1,600 per locomotive, $500 per passenger car, and $40 per freight car. Several facts must be kept in mind in connection with this, however; the North-Western operates in a territory where water is exceedingly good, and it has a large amount of very light equipment in service. The very fact of the heavy freight car replacements this year will probably increase this account in 1907, even though the equipment is new.




Chicago & North-Western.

The principal operating statistics follow:

| | 1906. | 1905. |
|---|---|---|
| Average mileage | 7,429 | 7,408 |
| Passenger earnings | $14,441,415 | $13,339,714 |
| Freight earnings | 45,802,853 | 32,292,830 |
| Gross earnings | 63,481,578 | 55,745,275 |
| Maint. of way and structure | 6,864,898 | 7,466,944 |
| Maint. of equipment | 9,032,135 | 6,119,180 |
| Conducting transportation | 22,785,687 | 21,460,147 |
| Operating expenses and taxes | 42,216,276 | 38,649,312 |
| Net earnings | 21,265,302 | 17,095,964 |
| Net income | 14,800,533 | 10,417,822 |

## CONTRIBUTIONS

### The First Railroad Owned and Operated by a Government.

Yeadon, Pa., Aug. 31, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I value highly your recent letter expressing appreciation of my article on the old railroads of the state of Pennsylvania, which you published in the *Railroad Gazette*, August 24, and I am much pleased with the care you evidently took in its preparation for publication. The only criticism I would make is that under the line drawing of "William Penn" also appears "P. R. R. No. 1." This probably arose from a misunderstanding of the lettering on my tracing, which is arranged thus:

WILLIAM PENN.
HENRY CLAY.
P. R. R. No. 1.

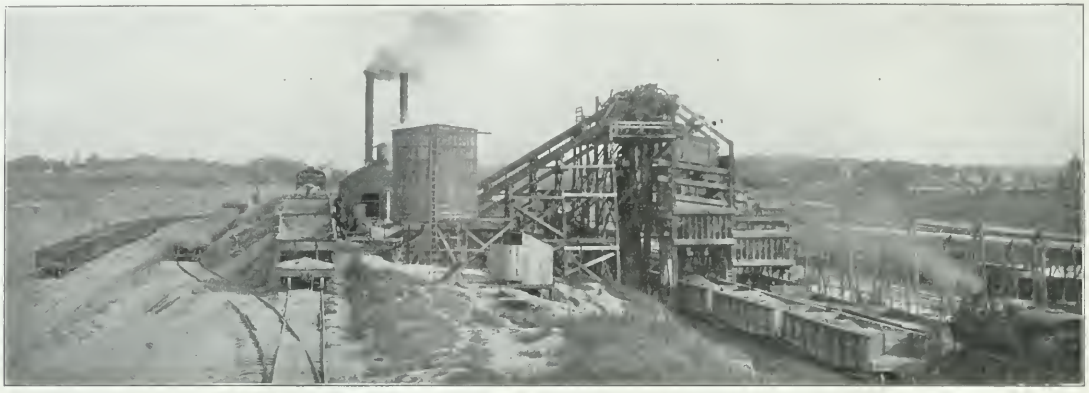
Both engines were of same type and close in succession, hence the same tracing is used for both, but the Clay was a Harrisburg & Lancaster Railway engine, and passed into the possession of the P. R. R. Company in 1850, seven years before their purchase of the Penn. I should have called attention to this on the tracing so that the "P. R. R.—No. 1" would not have been incorporated with the name of the William Penn.

C. H. CARUTHERS.

## The Lake Shore Gravel Ballast Washing Plants.

The Lake Shore & Michigan Southern now has in operation two plants for washing gravel for ballast. Both are in Indiana, one being about six miles southwest of South Bend, on the Chicago, Indiana & Southern (formerly the Indiana, Illinois & Iowa) and the other at Pleasant Lake on the Ft. Wayne branch of the Lake Shore. Both plants are working satisfactorily and are turning out large quantities of washed ballast.

The Lake Shore is a pioneer in this undertaking. As a result the first plant built was largely experimental and required a number of changes in important details before the present satisfactory working was obtained. This first or experimental plant is the one near South Bend, at Rupel gravel pit. It was built in the spring of 1905 and started work last summer. The Pleasant Lake plant has just recently been completed and embodies the results of a year's experience with the older plant. For that reason the new plant only is described here, with such references to features of the other as are of interest in connection with its development. Both drawings and photographs are shown in illustration.



General View of Pleasant Lake Plant, Taken from "Tip-Up."

The chief problem of the undertaking lay in the quantities necessary to be handled to yield an output commensurate with the requirements of the situation, no gravel washing plant for handling materials on anything like the scale required being in existence to serve as a precedent. Calculations for plant proportions were based on the capacity of the gravel pit steam shovel, which is a $3\frac{1}{2}$ yd., 75 ton machine. Referring to the drawings, it will be seen that in general the plant consists of an elevated track from which the gravel cars dump through a hopper on a conveyor delivering at the top of the structure. Meeting the water at this point, the material passes over a series of screens removing all but the sand, which passes into a settler. The sand and washed gravel are caught in hoppers over adjacent tracks, from which they are discharged directly to cars below. The plant consists of duplicate and separately controlled halves, each performing the operations described.

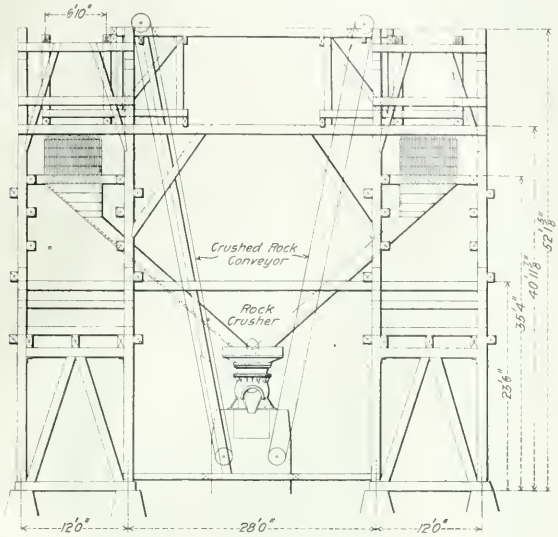
Taking up the operations and plant features in detail the receiving hoppers are so spaced as to enable two cars coupled together to be dumped simultaneously. The gravel cars between pit and hopper are handled by locomotives, two being kept constantly busy at the present rate of working. When the plant runs at a reduced rate one locomotive is dispensed with and the cars are then handled by a single locomotive in conjunction with a "tip-up" beyond the hoppers for switching the empty cars onto a track alongside the hopper track, to be drawn out later by the locomotive. The approach to the hoppers has a 2.3 per cent. grade and the hopper track has a 1 per cent. grade of opposite sign. For the one-engine handling, the gravel cars, as soon as emptied, are pushed one at a time down a 5 per cent. run-off which ends in the tip-up, having an 18 per cent. gradient and sufficient length to bring a single car to rest. The car rolls off of the tip-up through a switch onto the empty-car track. The receiving hoppers are wood, lined with sheet steel, and the pit walls and bottom are concrete. The track rails rest each on a pair of 9 in. x 18 in. timbers bolted together, supported at each of two intermediate points by a pair of 15-in. 45-lb. I beams.

The conveyor, installed by the Link-Belt Company, has a maximum capacity of 4,000 yds., or approximately 200 cars, of gravel per day of 10 hours. The "raw" gravel and water are discharged together on a flume 6 ft. wide and 8 ft. long, the water being delivered through a 8 in. pipe and a special sort of nozzle of the "duck-bill" type, of sufficient spread to cover the flume. The flume discharges on a bar screen and a $\frac{3}{4}$ in. mesh wire screen immediately beneath and parallel to it. The bar screen, which has a spacing of 2 in. between flats, removes all stones above that size and discharges them into a chute leading to the rock crusher located near the center of the structure. The crushed stone is delivered to a bucket elevator of the grain-carrying type, which discharges it into the raw gravel again on the first flume. The materials pass by successive stages over a $\frac{1}{4}$ in. mesh screen 8 ft. wide and a double screen of 3-16 in. and $\frac{1}{8}$ in. mesh, respectively, 10 ft. wide, the last-mentioned being the final or sand screen. The gravel is precipitated into the track hopper so marked and the sand passes on to the settler.

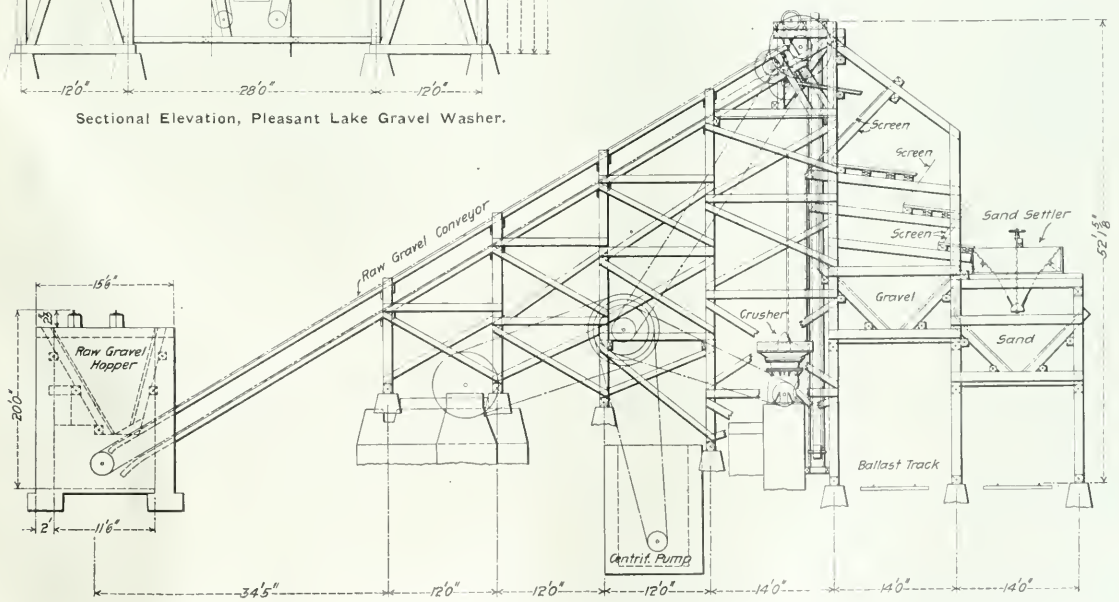
Pleasant Lake Plant from Conveyor Side.

The development of the sand settler was one of the most troublesome features encountered. Several kinds, similar to types

already in use, were tried and proved unsatisfactory, none being capable of passing the immense quantities of sand coming through the washer. Finally the scheme now used was hit upon. It is quite simple in principle, being a sort of funnel arrangement with a valve at the bottom. The sand and water flow into a wooden box which is 6 ft. x 10 ft. at its top and is hoppered down to the funnel mouth, the funnel being made of No. 10 sheet steel. The valve stem is a 1 in. bolt 9 ft. 6 in. long which is threaded at its upper end to carry a hand-wheel for adjusting the valve opening. The valve is supported from a 6 in. x 6 in. timber across the top of the box and is worked by the long wooden lever shown in the elevation of Bent 1. The sand settles down into the funnel while the water flows over the edges of the box on three sides, into troughs which convey it to the waste flume. When a sufficient depth of sand has accumulated in the settler the attendant opens the valve and allows it to flow into the hopper below. Or, if desired, the valve opening can be adjusted and the handle secured in position to permit a continuous discharge of the sand.




Sectional Elevation, Pleasant Lake Gravel Washer.




Side Elevation, Pleasant Lake Gravel Washer.

The plant is driven by a 200 h. p. Erie steam engine. Water is supplied by a Worthington 10 in. single-stage centrifugal turbine pump, rated at 2,400 gals., against a 90 ft. head. The pump has a 16 in. suction 750 ft. long and 12 ft. lift. A test of the engine driving the pump only, showed that 105 i. h. p. was required for that service alone. The total load on the engine driving the entire plant was 132 h. p. The pump capacity does not, however, indicate the daily water consumption, which has been estimated not to exceed 1,650 gals. But it was thought wise to provide ample pumping capacity and this size was therefore chosen in preference to the next smaller having a capacity of only 1,800 gals. The pump and crushed rock conveyor have rope drives.

Stationary screens are used altogether at this plant. This was after trying various kinds of revolving screens at the Rupel plant. At the latter, at the present time, a revolving screen is still used for the initial separation, performed at Pleasant Lake by the bar screen. This revolving screen, made of heavy sheet steel, is 8 ft. long, 4 ft. in diameter and has 2½ in. diameter holes. The service to which the wire screens are subjected is so severe that ordinary screening will not answer at all. The Lake Shore therefore has a screening specially made for this purpose from piano wire. It is rather expensive, but is the only thing that will stand the service.

The Rupel plant is electrically driven throughout, the power being obtained from the high tension line of the South Bend Electric Company. Three-phase current is received at 13,000 volts and is transformed down to 460. The electric operation is more satisfactory in many ways than the steam engine and belt and rope driving, and in this respect the Rupel plant has the advantage of the newer one.

As indicative of the output of the two plants, the figures for the week ending July 27 represent average present performance.

*Rupel Pit.*

| | |
|---|---|
| Raw gravel into washer | 12,825 yds. |
| Washed gravel delivered | 8,050 " |
| Sand received from washer | 4,775 " |

*Pleasant Lake.*

| | |
|---|---|
| Raw gravel into washer | 19,624 yds. |
| Washed gravel delivered | 8,010 " |
| Sand received from washer | 11,100 " |

There are required in the operation of the Pleasant Lake plant a foreman and his clerk, an engineer, fireman, shopman, carpenter, two men on the sand settlers, four laborers to unload the raw gravel, four men below on the loading tracks to keep them clean, and ten car men, which include car repairers and a force to pack the cracks of the wooden cars with marsh hay to prevent serious losses of the finer gravel and the sand in transit. Four locomotives are required, two on the hopper track for delivering to the washer, and two at the bottom for the washed ballast cars. Then there is, of course, the steam shovel and its crew, and a section gang averaging 30 men. The total operating cost is about $250 per day for ten hours, and the cost of the washing plant was approximately $25,000.

In order to arrive at an approximate net price per cubic yard for washed gravel, it will be necessary to determine a daily sinking fund and interest charge to be added to the operating cost given above. For this purpose certain assumptions are made below regarding pit and equipment costs for such a plant, many items of which are affected by local conditions to an extent that make any figures here set down of general value only.

Assuming the net cost of the land to be $15,000, and a five-year life on this, the sinking fund charge against same is $3,000 a year. Other items to be distributed over the five-year period are: Cost of grading, $10,000; bridge work, $2,500; miscellaneous, $5,000.

Assume the cost of track to be $36,000 and a 10 per cent. depreciation, and a 15 per cent. depreciation on the washer. The yearly sinking fund items are then as follows:

| | |
|---|---|
| Plant—15 per cent. | $3,750 |
| Track—10 per cent. | 3,600 |
| Grading—20 per cent. | 2,000 |
| Bridging—20 per cent. | 500 |
| Miscellaneous—20 per cent. | 1,000 |
| Land | 3,000 |
| Total | $13,850 |

The working season in Indiana is about 200 days, making the daily sinking fund charge about $70. The interest charge on the investment at 5 per cent. is approximately $20 a day, so that we have:

| | |
|---|---|
| Operating expenses per day | $250 |
| Sinking fund charge | 70 |
| Interest charge | 20 |
| Total daily cost | $340 |

The maximum daily capacity of a plant this size is 1,500 yds., and on this basis the cost per yard is 22.7c. There is a stripping cost at Pleasant Lake which, distributed over the average depth of gravel, amounts to about 6.5c. a yard, bringing the total cost up to slightly over 29c. a yard for the washed ballast on the car. This is without assigning any value to the sand, which sells at a good price wherever there is a market for building sand. At Pleasant Lake the sand averages one-half or more of the output, and if a market can be found for it, the cost of the ballast would be reduced by just so much. As the cost of crushed stone is 50 to 75c. a yard, depending on the locality, it will be seen that the cost of the washed gravel is very much less than rock ballast, even where there is no profit from the sand.

The Lake Shore is engaged in applying the washed gravel this year to its main lines as a light surfacing lift, which serves primarily as a dust-covering. Up to August 1 approximately 112 miles had been covered, the work, part of which was done last year, starting from the Chicago end. It is expected to complete this first lift to Toledo this year. A force of about 50 men per ballast train is required to dig out the old and distribute the new ballast. From three to four trains of the washed ballast, of 20 to 25 cars each, are distributed daily from each plant, a car covering on the average about 125 ft. of single track on double-track right-of-way, or about 1,200 yds. to the mile. It is expected to go over the line next year and give it about a 6 in. raise on the washed ballast, which will practically double the amount now being applied per mile of track.

We are indebted to Mr. S. Rockwell, Chief Engineer of the Lake Shore, and to Mr. H. H. Ross, Assistant Engineer, for courtesies extended in connection with the preparation of this article.

## Lucius Tuttle.

The alleged domination of the Boston & Maine in politics has become more or less of an issue in this year's campaigns throughout northern New England. Because the issue here differs from those of states like New Jersey and Wisconsin in being against a railroad rather than the railroads, a man at the head of the corporation in question becomes a figure of almost national importance.

Lucius Tuttle, the President of the company, was born at Hartford, Conn., March 11, 1846. His father was described as a farmer, but the boy never worked a day on the farm, and at 19, after graduating from the Hartford High School, became clerk to the probate judge of the county. Political misfortunes overtook his chieftain a year later, and the young man before he was quite 20 years old found his vocation and became a clerk in the ticket office of the Hartford, Providence & Fishkill Railroad. In this humble position he evidently showed his ability, and the great capacity for organizing, which has been characteristic of his later years, for within the year he was promoted to the office of general ticket agent. When the Hartford, Providence & Fishkill was absorbed by the New York & New England he came to Boston as Assistant General Passenger Agent. In 1878, when the Eastern Railroad was struggling to regain the prestige which had been shattered by the terrible disaster at Revere, Mr. Tuttle was appointed General Passenger Agent of that road.

The Eastern had at that time a most valuable passenger traffic along the coast of Massachusetts, New Hampshire and Maine. The stock of the railroad, after the appalling cost of the Revere calamity, had fallen to about $7 a share. During the five years of Mr. Tuttle's administration of the passenger department, the road recovered its high standing and resumed moderate dividends, and when the consolidation took place with the Boston & Maine in 1883 the Eastern was taken in on the basis of par. The stock now sells at $165. In February, 1884, Mr. Tuttle abandoned this road, of which he was destined to become the head, and became General Passenger Agent of the Boston & Lowell. This road (which was later also leased by the Boston & Maine) formed a very important link in the through line between Boston and Canada, and it was therefore by a natural transition that in 1886 he became General Passenger Traffic Manager of the Canadian Pacific, with headquarters at Montreal. Here the field of his operations was greatly enlarged; hitherto, although handling in the aggregate great volumes of traffic, he had been confined to comparatively short lines and the details related to suburban rates, commutations, and frequent trains in thickly settled districts. In his connection with the great transcontinental system, with its widely scattered stations, few but costly trains, the problem was entirely different. Nevertheless, with his power of organization he achieved great things.

In 1889 when the Trunk Line Commission was established Mr. Tuttle was made the Commissioner of Passenger Traffic, associated with Albert Fink, the Commissioner of Freight Traffic. This position, although considered highly honorable and influential and certainly very lucrative, was not altogether congenial to Mr. Tuttle. In 1890, Mr. Tuttle left the commissionership to become General Manager of the New York, New Haven & Hartford at New Haven. It is worth noting that in exactly 25 years he had completed a circle, beginning at Hartford as a clerk, progressing through Boston, Montreal and New York, always on the up-grade. He arrived at New Haven, and for the first time in his career dropped the qualifying word "passenger" from his official title.

The road to which Mr. Tuttle now came had, during his service elsewhere, absorbed his old employers, the New York & New England, including his first friend, the Hartford, Providence & Fishkill, and had a virtual monopoly of the transportation of southern New England. In 1892 Mr. Tuttle was made Vice-President, and it seemed probable that he would round out his career on the New Haven road.

But in the meanwhile the Boston & Maine system also had been growing, and the deaths of Frank Jones and James T. Furber had left it practically without a head. In 1893 Lucius Tuttle was unanimously elected President. It was some years before the public waked up to the ability of the man. One by one all the railroads of northern New England have been absorbed or taken in control of the Boston & Maine until now it is all-powerful in Vermont, New Hampshire, Maine and Massachusetts north of the Boston & Albany dividing line.

Probably the most conspicuous thing accomplished by Mr. Tuttle since he became President 13 years ago was the leasing of the Fitchburg Railroad in 1900. This lease required the consent of the Legislature. The state of Massachusetts, which built at tremendous expense the great tunnel through the Hoosac Mountain for the avowed purpose of preventing monopoly and maintaining competition in the interests of her commerce, had after some years of unsuccessful operation by the state of the short line of railroad connecting the Fitchburg at Greenfield with the Troy & Boston, sold the "great bore" to the Fitchburg Railroad, taking in payment certain shares, common and preferred, of the road. These shares constituted a controlling interest, which it was necessary to vote in confirming the lease which the directors of the two roads had negotiated. Mr. Tuttle finally persuaded the Legislature and the Governor of the great advantage to the state in transferring this costly white elephant to the corporation which he represented, and finally offered to buy outright the state stock, which had but little value except for its voting power. Mr. Tuttle is a facile after-dinner speaker, with a strong sense of humor. Physically, he is imposing. Standing a trifle over 6 ft., he weighs about 250 lbs., but is very agile and alert in his walk and movements. His eyes are keen, and are said to indicate a capacity for language, which he certainly possesses in a marked degree, being a facile writer and rapid talker, the despair of any but the most expert stenographers. His jaws are strong and well formed; nose shapely and prominent; he wears large glasses to read or write, but not on the street.—*New York Evening Post.*

## Foreign Railroad Notes.

The commissioner of Commerce of Burma strongly urges that a railroad be built into western China, as the present pack animal transit system collapses for a third of the year owing to the rains.

The recent decision in the case of the Brighton Railway Company (England) and the Sutton Water Company recalls a rather interesting case which occurred when the canal between Rochester and Gravesend was constructed. Just beyond Strood the canal passed through a tunnel of over a mile in length, now occupied by the South-Eastern Railway. Part of the hill consists of solid chalk, while the end nearer Rochester is chalk and flints. But when the canal was completed, and the salt water of the Medway was admitted to fill it, it was found that the wells in the neighborhood became strongly brackish. An action was brought in respect of the nuisance created. The canal proprietors, of course, denied liability; but during the trial it became evident that through no fault of the contractors a kind of endosmosis had taken place along the lines of flint and the canal company had to pay a very heavy compensation.

## Acceleration, and Some Locomotive Problems.*

BY WILLIAM G. RAYMOND.

There are certain locomotive problems of interest to the railroad locating and maintenance engineer, which involve the tractive power of the locomotive, train resistance, and the general principles of accelerated motion.

The most important of these problems are:

1. To determine the load a given locomotive can haul on a given grade at a given constant velocity.

2. To determine the distance on a given grade required by a given locomotive with a given load, to increase or diminish its speed from one given velocity to another.

3. The time required to produce this change in velocity.

4. The converse of 2, to determine what velocity can be acquired by a given locomotive with a given load in a given distance, on a given grade.

5. To determine the length of grade steeper than that for which a locomotive is loaded that can nevertheless be ascended by the aid of a run at the hill. This is the problem of velocity or momentum grades.

6. To determine the speed of a given locomotive with a given load throughout a given division of track.

7. To specify the principal features of the locomotive to be purchased for a given service.

In all these problems certain data which in the nature of the case are to some extent indeterminate must be assumed to be exactly known, and certain other conditions must be assumed that in reality never exist, with the result that practically all of the determinations are approximate and must be considered to be of the nature of carefully prepared estimates. This is particularly true in developing formulas applicable to different locomotives for which the several constants have not been determined by road tests.

### ACCELERATION.

Accelerated motion plays an important part in practically all of these problems, and there follows a brief statement of principles and the development of working formulas.

By the property of inertia, all bodies tend to stay in that condition of motion in which at any instant they may be. An accelerating, retarding or deviating force must be applied to change the condition of motion as to velocity or direction.

It is known that a constantly applied force of given magnitude will produce a uniformly changing condition of motion. The rate of change is called the acceleration and may be positive or negative (retardation). It is known also that the acceleration of a given mass is proportional to the magnitude of the constant unbalanced force acting. Thus, if w be the weight of a body, i.e., the measure of the force of gravity acting on it, and g be the acceleration due to gravity, and if P be any other force applied to the body, the acceleration a, produced by P, will be given by

$$a = \frac{P}{w}\ g \qquad (1)$$

from which the force P necessary to produce the acceleration a in a body of weight w is

$$P = \frac{w\ a}{g} \qquad (2)$$

Under the influence of the force of gravity the velocity of a falling body increases g feet per second, g having a value varying with the distance from the center of mass of the earth and with latitude, but usually assumed for mechanical problems as 32.16. If the body start from rest it will have a velocity of g feet at the end of the first second, its average velocity for the first second will therefore be $\frac{g}{2}$ feet, which will also be the space covered in the first second. At the end of t seconds the velocity will be t g feet per second, the average velocity will have been $\frac{t\ g}{2}$ and the space passed over will therefore be $\frac{t\ g}{2} \times t = \frac{t^2\ g}{2}$ feet. If v be velocity in feet per second, t be time in seconds, and h the space or height of fall,

$$v = g\ t \qquad (3)$$

$$h = \frac{g\ t^2}{2} \qquad (4)$$

Since from (3) $t = \frac{v}{g}$, substitution in (4) gives

$$h = \frac{v^2}{2\ g} \qquad (5)$$

Perfectly analogous to these equations, if P be a force acting on a body and producing an acceleration of a feet per second, for t seconds, covering a space of l feet

$$v = a\ t \qquad (6)$$

$$l = \frac{a\ t^2}{2} \qquad (7)$$

$$l = \frac{v^2}{2\ a} \qquad (8)$$

If a body be uniformly accelerated in a distance of l feet from rest to a velocity of v feet per second, the acceleration from (8) is

$$a = \frac{v^2}{2\ l} \qquad (9)$$

and the force P necessary to produce this acceleration, given by substituting for a in (2), its value from (9), is

$$P = \frac{w\ v^2}{2\ g\ l} \qquad (10)$$

If the velocity is expressed in miles per hour V

$$v = \frac{5280\ V}{3600}$$

and

$$P = \frac{w}{2\ g\ l} \times \left(\frac{5280\ V}{3600}\right)^2$$

and if the weight is expressed in tons W of 2,000 lbs.

$$w = 2{,}000\ W$$

and

$$P = \frac{66.9\ W\ V^2}{l} \qquad (11)$$

If a train be the body, P is the tractive effort to be exerted by the locomotive to produce the velocity of V miles per hour in the distance of l feet.

But not only is the train given a velocity of translation, the wheels are given a velocity of rotation, requiring P to be larger than indicated by the foregoing expression by an amount depending on the relative masses of car and wheels, the pattern of the wheels and the velocities. For any given set of conditions the addition to P may be determined by comparing the energy required to accelerate the car wheels in their motion of rotation with that required to give the resulting motion of translation to the car as a whole. No great precision can be attempted for a general formula. The increase of P may be as little as 2½ per cent., and it may be as high as 6 or 8 per cent. over that given by equation (11). Adopting 4.63 per cent. for simplicity of result

$$P = 70\ \frac{V^2}{L}\ W \qquad (12)$$

This force P must be in excess of the forces necessary to overcome all other resitances. It is probable that no train is uniformly accelerated from rest to any given velocity it may attain, because from a velocity of 0 + to five or six miles an hour the pull an engine exerts is nearly constant and is the tractive effort of adhesion,* while the resistances to motion rapidly decrease, leaving an increasing portion of the tractive effort for acceleration. When the velocity of five or six miles is exceeded the resistances to motion slowly increase, the tractive effort decreases, and there results a decreasing force available for acceleration, decreasing somewhat more rapidly than in proportion to the increase of velocity.

If the velocity is to be increased from $V_1$ miles per hour to $V_2$ miles per hour, the force required is

$$P = 70\ \frac{W}{l}\ (V_2^2 - V_1^2) \qquad (A)$$

If the force be known, and it is desired to determine the distance required to increase the velocity from $V_1$ to $V_2$ miles per hour,

$$l = 70\ \frac{W}{P}\ (V_2^2 - V_1^2) \qquad (B)$$

If the distance and available force are known, and it is desired to know how great a load can be carried with the required acceleration, solve A or B for W and get

$$W = \frac{P\ l}{70\ (V_2^2 - V_1^2)} \qquad (C)$$

If W, P, l and $V_1$ are known, and $V_2$ is desired, solve for $V_2$ and get

$$V_2 = \sqrt{\frac{P\ l}{70\ W} + V_1^2} \qquad (D)$$

In determining l, since P can never be constant, nor even approximately constant, through any considerable change in speed, it is not uncommon to find l for a change in speed of one mile per hour, using successively $V_1$, $V_1 + 1$, $V_1 + 2$, etc., as initial speeds, until the required change is reached, when the sum of the several values

*Reprinted by permission from *The Transit*.

*This statement may be questioned. The Pennsylvania Railroad testing department, in its estimates of maximum tractive effort of simple locomotives, counts on only 80 per cent. of the boiler pressure as available in the cylinders even at minimum speeds. If this allowance is correct, probably no simple locomotive in common use can ever exert its full tractive effort of adhesion, which is usually estimated to be as high as one fourth of the weight on the drivers for favorable conditions of track, and not usually lower than one-fifth under quite unfavorable conditions.

The Baldwin Locomotive Works states that the initial pressure in the cylinder may vary from full boiler pressure at very low speeds to 85 per cent. of boiler pressure at high speeds of 300 revolutions per minute, and uses rather better than 200 per cent. of the initial pressure when the speed is less than 50 revolutions per minute, indicating that the full tractive effort of adhesion may be realized by the cylinders at very slow speed.

Further road tests are perhaps necessary to establish the facts. The locomotive testing plants thus far devised are not adapted to tests of high tractive effort at slow speed.

of I will be the distance required. If $V_2 = V_1 + 1$, equation (B) becomes

$$I = 70 \frac{W}{P} (2 V_1 + 1) \qquad (E)$$

The load W in any problem likely to arise would be known or assigned from some estimate made as hereinafter indicated. The tractive effort P must be estimated by subtracting from the estimated total tractive effort of the locomotive, the resistance due to such grade as the train may be on, and the ordinary train resistance, an unknown, and in nature an indeterminate quantity.

Many attempts have been made to determine a rational expression or formula for train resistance, but none has yet been devised, nor is it probable that any simple formula ever will be devised that shall correctly give the quantity known as train resistance. It depends on the condition of the journals and the weight on them, on the condition of the rail surface and the weight on it, on the pattern of the wheels, on the condition of the roadbed, on the temperature, on the velocity and direction of the wind, the speed of the train, etc. It is usually estimated at so many pounds per ton of train, and some of the estimates will be given. Grade resistance, being the action of gravity, on an incline may be determined with precision, and is always proportional to the weight of train.

TRACTIVE EFFORT.

The tractive effort of the locomotive has three limits; it cannot possibly be greater than the tractive effort of adhesion which is the weight on driving wheels multiplied by the coefficient of static friction between wheels and rails; nor can it be greater than the cylinder tractive effort which varies with the steam pressure in the cylinders, the diameter of the pistons, the stroke and the diameter of the driving wheels. If the cylinders are large enough, the drivers small enough, and the steam pressure high enough, the cylinder tractive effort would equal the tractive effort of adhesion, and the locomotive should be so designed that this is the case at low speeds. As the speed increases the effective pressure in the cylinders falls, and the full tractive effort of adhesion cannot be had; moreover, with such boilers as have as yet been devised, the supply of steam at high pressure necessary to give the full tractive effort of adhesion cannot be maintained at high speed.

A boiler is capable of developing a more or less definite horse-power, and if the work performed is performed at high speed, the force exerted must be relatively small if the power exerted remains constant. Thus we have the boiler tractive effort as the limiting quantity at anything over the lower speeds of from six to ten miles an hour, the precise limit depending on the design of the locomotive.

The coefficient of static friction between wheel and rail is usually estimated at about one-fourth for favorable conditions, as high as one-third with a sanded dry rail, and as low as one-fifth or less for ordinary winter conditions.

In determining P, therefore, for low speeds under six miles an hour, either the tractive effort of adhesion, i.e.,

$T_a$ = weight on drivers × coefficient of friction

or the cylinder tractive effort should be used, and for higher speeds, either the cylinder tractive effort or the boiler tractive effort. It is practically always true that boiler tractive effort must be used at speeds of over eight to ten miles an hour. In any event, the tractive effort that is smallest must be used.

Cylinder tractive effort is given by the formula

$$T_c = \frac{C^2 L p}{D} \qquad (F)$$

in which C is the diameter of the piston in inches, L the stroke in inches, p the mean effective pressure in the cylinder in pounds, D the diameter of the drivers in inches, and $T_c$ the tractive effort in pounds.

The boiler tractive effort is given by

$$T_b = \frac{375 \text{ I H P}}{S} - F \qquad (G)$$

in which I H P is indicated horse-power, S is speed in miles per hour, F is the machine friction reduced to pounds of tractive effort, and $T_b$ is the tractive effort in pounds. The first term of this formula, although not new, is not so generally known but that its derivation may be given.

One horse-power is 33,000 ft.-lbs. of work per minute, or 60 × 33,000 ft.-lbs. per hour. Assuming no losses from friction the tractive effort multiplied by the distance through which it acts in a given time equals the work done in that time, and this divided by the foot-pounds of work corresponding to one horse-power for the given time, should be the horse-power developed by the locomotive. Therefore

$$\frac{T_b \times S \times 5280}{60 \times 33000} = \text{I H P or}$$

$$T_b = \frac{375 \text{ I H P}}{S}$$

And since there are losses due to friction of the machine parts that friction must be deducted, giving equation (G).

The horse-power of a locomotive is not usually given, but if not known it may be estimated from the heating surface.

The maximum power per square foot of heating surface varies with the design of the locomotive, but recent tests* seem to indicate that simple freight locomotives developing full power produce one cylinder horse-power for each 2.3 sq. ft. of heating surface, varying somewhat either side of this average, and that compound locomotives may produce one cylinder horse-power for each 2 ft. of heating surface with very decided variation either side of this mean value. Thus, for a simple freight locomotive, the boiler tractive effort may be expressed by

$$T_b = \frac{375 \times \frac{H}{2.3}}{S} - F = \frac{163 H}{S} - F$$

in which H is square feet of heating surface and F includes the rolling resistance of the drivers. F varies with the speed between limits of 6 per cent. and 25 per cent. of the indicated power, but with the locomotive developing full power, or a little less, it may fairly be taken at 10 to 12 per cent. for estimates. In round numbers, therefore, the boiler tractive effort is

$$T_b = \frac{145 H}{S} \qquad (H)$$

GRADE RESISTANCE.

Grade resistance, in pounds per ton of train, is given by

$$R_g = 20 r$$

in which r is the rate of rise in 100 feet, or the rate per cent. of the grade. It is a resistance or retarding force to an ascending train and an accelerating force to a descending train.

TRAIN RESISTANCE.

The work done in drawing the train behind the tender on a straight, level track, is the product of the quantity called train resistance and the distance through which the train is drawn. Train resistance is usually considered to include all resistance taxing the tractive effort of the drivers, except grade and curve resistances. It includes the rolling resistance of the driving wheels, which in later estimates, because of the character of locomotive testing plants, is included with the machine friction. Train resistance arises from (1) journal friction; (2) rolling friction or resistance; (3) resistance due to oscillation and concussion; (4) head, tail and side resistance of the atmosphere.

Journal friction is a maximum of 15 or 20 lbs. per net ton at a velocity of 0 + just after starting from rest; it is not nearly so much when slowing down from motion to 0 + or after a momentary stop. From this maximum it falls rapidly as the velocity increases to an unknown minimum possibly approximating 2 lbs. per ton. It is very much affected by temperature, and if a minimum of 2 lbs. is realized in summer temperature, it is very probable that the minimum may be 4 to 6 lbs. in winter weather. It varies very little with velocity if the speed is above six or eight miles an hour. It depends very much on the character of the lubrication and the condition of the bearings.

Rolling resistance is unknown in amount and is usually classed with journal friction. It doubtless varies much with the condition of the track, and with the insistent weight, and is little affected by velocity changes. Rolling resistance and journal friction together are assumed at from 2 to 3 lbs. per net ton in modern expressions for train resistance.

Resistance due to oscillation and concussion is unknown in amount, is believed to be very small, and probably varies with the square of the velocity.

Atmospheric resistance has been most thoroughly investigated by Professor Goss at the Purdue laboratory. Much depends on the form of the cars and the make-up of the train. A freight train of box cars moving through still air seems to be resisted by a force given by the expression $A = (13 + .01 C) V^2$, C being the number of cars in the train. For the engine and tender alone $A = .11 V^2$ and for the train alone $A = (.016 + .01 C) V^2$. For passenger trains the coefficient of C is to be doubled. At ordinary freight train speeds the whole quantity is small, but at high velocities the resistance is considerable, consuming from 10 to 20 per cent. of the tractive force of the locomotive. The foregoing values are for motion through still air. A head wind of velocity equal to that of the train would increase the resistance four times, a side wind would have an unknown effect which would be quite large.

Summarizing all we know of train resistance, it is probable that the whole may be represented by an equation of the form

$$R = \left(A + B V + \frac{C}{(V + K)^2} + D V^2\right) W + M V^2$$

in which R is the total resistance in pounds, A, B, C, D, K and M are coefficients, some of which may be zero, to be determined by experiment, W the weight of the train, and V is the velocity in miles per hour. W being expressed in tons, the parenthesis gives the resistance in pounds per ton of train, which is the usual way of stating it.

The commoner formulas for train resistance are much simpler than that just given.

*Pennsylvania Railroad tests at the Louisiana Purchase Exposition, which seem to confirm earlier results of Professor Goss.

The Baldwin Locomotive Works formula is

$$R_T = 3 + \frac{V}{6}$$

in which $R_T$ is resistance in pounds per ton of train and V is speed in miles per hour.

The *Engineering News* formula is

$$R_T = 2 + \frac{V}{4}$$

These formulas make no allowance for the fact that loaded trains have a less resistance per ton than empty trains, and they also probably include the machine friction of the locomotive. In using these formulas in connection with the boiler tractive effort, the undiminished value of the tractive effort should be used, namely

$$T_b = \frac{163\ H}{S} \text{ or } \frac{375\ I\ H\ P}{S}$$

Formulas that are perhaps better for freight train resistance are those devised by Mr. Sanford L. Cluett to fit the curves of the late Mr. A. M. Wellington; they are

$$\text{For empty trains } R_T = 5.4 + 0.01\ S^2 + \frac{70}{(S+3)^2}$$

$$\text{For loaded trains } R_T = 3.8 + 0.0076\ S^2 + \frac{16.4}{(S+1)^2}$$

The formulas give results probably much too great for high speeds, and possibly somewhat too high for all speeds. The following modifications are suggested, and while less simple than the *Engineering News* or Baldwin formulas, they are believed to fairly well fit freight train resistance curves, not including machine friction, and are applicable for speeds of from 0 + to about 35 miles an hour.

$$\text{Loaded train } R_T = 3.5 + 0.0055\ S^2 + \frac{16}{(S+1)^2}$$

$$\text{Empty train } R_T = 5.0 + 0.007\ S^2 + \frac{8}{(S+1)^2}$$

### CURVE RESISTANCE.

Curve resistance is usually estimated at about one-half of a pound per ton of train per degree of curve. That is, a 4 deg. curve will offer a resistance of ⁴/₂ lbs. for each ton of train on the curve.

### SOLUTION OF PROBLEMS.

Having stated the fundamental formulas, it remains to indicate their use in solving the problems mentioned in the beginning of this paper.

In advance, one formula for train resistance is adopted and diagrammed or tabulated so that the resistance for any speed may be taken at once from the diagram or table. It will perhaps be best if several diagrams or tables are made for various percentages of loading on the train, the several curves for partial loading lying between the curves of loaded and empty trains.

Next, for the particular locomotive to be discussed, a diagram or table of tractive effort should be made, using the boiler tractive effort formula for all speeds above that for which the boiler tractive effort equals the cylinder tractive effort, using, say, 80 per cent. of boiler pressure as mean effective pressure in the cylinder formula, except that for speeds below five miles an hour 85 per cent. of boiler pressure may probably be safely used. Should the tractive effort of adhesion be less than the cylinder tractive effort that quantity should be used for the lower speeds.

Problem 1. To find the load a given locomotive can haul on a given grade at a given constant velocity. The sum of the resistances must equal the tractive effort; therefore, the tractive effort at the assumed speed should be placed equal to the train resistance and grade resistance, indicated by the weight times the resistance in pounds per ton, and the weight obtained thus:

$$T = W\ (R_T + 20\ r)$$

$$W = \frac{T}{R_T + 20\ r}$$

If r is the ruling grade of the road, T should be taken for the minimum allowable speed; which is placed by different experimenters at from five miles per hour to 10 miles per hour. It should be that speed which is just enough to make stalling from small accidents of firing, or track condition, unlikely. When this speed is used the rating for the locomotive over the division is obtained.

Problem 2. Assuming this load, let it be required to determine the distance on some grade less than the ruling grade in which, if the locomotive exerts its full power, the velocity may be increased by one mile per hour. Again, the net tractive effort must equal the sum of the resistances, including that due to acceleration. The P of equation (E) becomes $T - W\ (R_T + 20\ r)$. T and $R_T$ should be values either for $S_1$ or $(S_1 + ½)$ or $(S_1 + 1)$. It will be more nearly exact to consider T and $R_T$ the tractive effort and resistance for $(S_1 + ½)$. Then (E) becomes

$$l = 70\ \frac{W}{T - W\ (R_T + 20\ r)}\ (2\ S_1 + 1)$$

$$l = \frac{70\ (2\ S_1 + 1)}{\frac{T}{W} - R_T + 20\ r} \qquad (I)$$

If it is desired to find the space required to increase the velocity from $S_1$ to $S_2$ miles per hour, equation (I) is solved with successive values of S and corresponding values of T and $R_T$ until the value of $S_2$ is reached; the values of l thus found are added for the required result.

If it is desired to know what average speed may be made up such a grade of length L, equation (I) is solved with successive values of S and corresponding values of T and R until the sum of the several values of l equals the length L; then for an approximate result average the initial and final speeds. For a more exact result each S or each $(S + ½)$ is multiplied by the corresponding l, the products summed, and the sum divided by L. The sum of the l's will probably not just equal L, but extreme precision is useless in such a problem, since the assumed conditions are rarely those obtaining; the whole train does not enter the grade at once, may never be on the grade, and does not leave it at once.

Both of these problems may be approximately solved by using for T and $R_T$ their values for the mean velocity, known in the first and estimated in the second, and substituting the resulting P in equations (B) and (D).

Problem 4. The procedure is as in the last problem, omitting the averaging.

Problem 5. A locomotive and train approaches a grade steeper than the ruling grade for which it is loaded at a speed of $S_1$ miles an hour, and may leave it at a speed of $S_2$ (less than $S_1$) miles an hour. How long may the grade be?

P of equation (B) is now essentially a negative or retarding force, and the parenthesis $(V_2^2 - V_1^2)$ becomes for $V_2 = S_2 - 1$, $-(2\ S_1 - 1)$ therefore (E) becomes

$$l = 70\ \frac{W}{P}\ (2\ S_1 - 1)$$

and as before P is the difference between T for speed, $S_1$ or $S_1 - ½$, $R_T$ for the same speed and $R_2$, or

$$l = 70\ \frac{W}{T - W\ (R_T + 20\ r)}\ (2\ S_1 - 1)$$

$$= \frac{70\ (2\ S_1 - 1)}{\frac{T}{W} - (R_T + 20\ r)} \qquad (K)$$

Solving with successive values of S to $S_2$ and corresponding values for T and $R_T$, and summing the results, the possible length of grade is obtained. Again, an approximate solution may be had by substitution in (B), using for P a value obtained by taking T and $R_T$ at their values for the mean velocity on the grade, thus:

$$l = \frac{70\ W\ (S_2^2 - S_1^2)}{T - W\ (R_T + 20\ r)}$$

$$= \frac{70\ (S_2^2 - S_1^2)}{\frac{T}{W} - (R_T + 20\ r)} \qquad (L)$$

If both numerator and denominator of (K) and (L) be divided by 20, there results

$$l = \frac{3.5\ (2\ S_1 - 1)}{\frac{1}{20}\left(\frac{T}{W} - R_T\right) - r} \qquad (K')$$

$$l = \frac{3.5\ (S_2^2 - S_1^2)}{\frac{1}{20}\left(\frac{T}{W} - R_T\right) - r} \qquad (L')$$

But from the equations given under Problem 1

$$T = W\ (R_T + 20\ r) \text{ and}$$

$$r = \frac{1}{20}\left(\frac{T}{W} - R_T\right)$$

is the grade on which with tractive effort T and train resistance $R_T$, the locomotive can just draw the train at the constant velocity corresponding to T and $R_T$, and this quantity is seen to be the first term of the denominator in both (K') and (L'). If, therefore, r' be the grade on which the locomotive can just draw the weight W at the mean velocity of $(S_1 + ½)$ or $\frac{S_1 + S_2}{2}$, then (K') and (L') become

$$l = \frac{3.5\ (2\ S_1 - 1)}{r' - r} \qquad (M)$$

$$= \frac{3.5\ (S_2^2 - S_1^2)}{r' - r} \qquad (N)$$

The quantity r' may be tabulated in advance for the given locomotive when the problem of determining l for any grade on the road will be a very simple matter. r' is known as the virtual grade.

Equation (I) may be similarly treated and will then become

$$l = \frac{3.5\ (2\ S_1 + 1)}{-r} \qquad (P)$$

Problem 6. This problem is determined by successive solutions of the preceding problems. Assuming the locomotive loaded for

minimum speed on the ruling grade of the division, the average speed that can be made on the several grades is determined taking care that a maximum speed of, say, 30 miles an hour, is never exceeded, and introducing all probable stops, the average speed over the division is then readily determined. This will be in the nature of things an estimate and should be checked by trial on the road.

Problem 7. Problem 7 is quite complex. The method of investigation may be stated somewhat as follows. Determine the load to be hauled on the ruling grade at the minimum speed; from the maximum tractive effort required determine the weight on drivers, and from the allowable unit weight the number of drivers (note that the result is rational and practicable); determine a desirable average schedule time, and with this and some grade on the division assumed at average speed to require the full capacity of the locomotive, and the determined load, estimate the total resistance and the necessary power to overcome this at the assumed speed; with this assumed power, a profile of the division, and the determined load, find the speeds at which the various grades can be worked, compare the resulting average with that deemed desirable and modify the power as may be necessary; determine the heating surface, and approximate dimensions of boiler by comparison with existing locomotives or *de novo;* see that the results are practicable; state the requirements to be a locomotive with the determined weight on drivers and the determined cylinder horsepower, to be developed most economically at the determined average speed, to be capable of such a maximum speed, and with such a maximum cylinder tractive effort as has been determined, and leave the proportioning to the locomotive designer, checking the design in these particulars when it shall be submitted.

Problem 3. The time required to gain the velocity v feet per second from rest, if gained in the distance l feet is

$$t = l \div \frac{v}{2}$$

with v expressed in miles per hour S, since

$$v = \frac{5280}{3600} S$$

$$t = \frac{15}{11} \cdot \frac{l}{S}$$

and if the speed is to be increased from $S$ to $S_2$ miles per hour in the distance l feet, the time required is

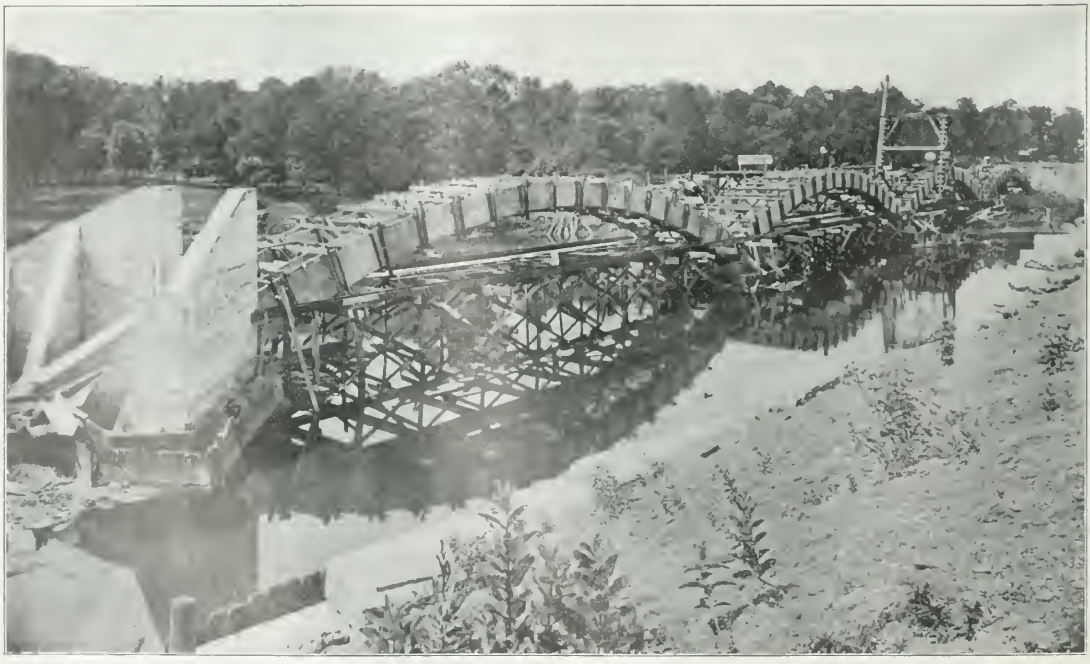
$$t \text{ seconds} = \frac{15}{11} \cdot \frac{l}{S_1 + S_2} \qquad (R)$$

Hence, having found the distance required for a given acceleration or retardation, substitute it for l in equation (R) and solve for the time.

## Strauss Ribbed Concrete-Steel Bridge for the Elgin-Belvidere Electric Railroad.

A reinforced concrete bridge of novel design has just been built near Belvidere, Ill., from the plans of Mr. J. B. Strauss, of Chicago. It is a ribbed concrete-steel structure and embodies fea-

Derrick Handling Sectional Forms; Steel Mould in Foreground—Strauss Ribbed Concrete-Steel Bridge.

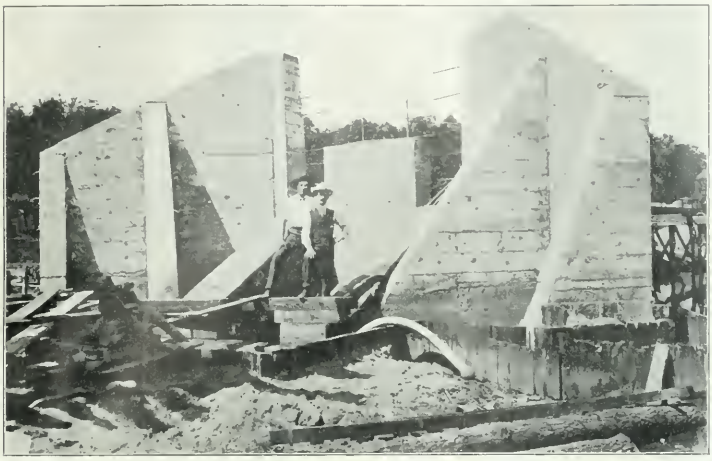


North Elevation of Strauss Ribbed Concrete-Steel Bridge near Belvidere, Ill.; All Spans Erected.

tures which have considerably increased the economy of this type of bridge, the first design of which by Mr. Strauss was built in 1905. For the following description of this bridge, which is a single-track structure on the Elgin-Belvidere Electric Railroad, and spans the Kishwaukee river at a point about 2½ miles east of Belvidere, we are indebted to Mr. Strauss.

There are four arches of 81 ft. clear opening, the piers being spaced 87 ft. 6 in. centers. The total length of the bridge is 350 ft. Each arch has a circular intrados with a radius of 83.36 ft. and a rise of 10 ft. 6 in. At low stages of the river the water is about 3 ft. below the springing line, and in extreme stages it rises to within 5 ft. of the intrados of the arch at the crown.

Each span has two arch ribs 8 ft. 10 in. c. to c. The ribs are 2 ft. 6 in. wide throughout, but vary in depth from 3 in. at the crown to 4 ft. 6½ in. at the haunches. Each arch rib carries a



Back View of East Abutments-Strauss Ribbed Concrete-Steel Bridge.

12 in. spandrel wall centrally disposed above the rib and built up to a horizontal plane through the extrados of the arch at the crown. For lateral stiffness the arch ribs are connected by eight 21-in. diaphragms in each span spaced at even intervals along the arch, and on top of these diaphragms 12 in. cross walls are built flush on top with the spandrel walls. On these spandrel and cross walls the floor slabs are carried. These slabs are 14 ft. wide and 6 in. thick, and at the sides there are two 8 in. curbs, whose purpose is to confine the rock ballast of the roadbed. In the floor slab drain holes are provided at intervals as indicated. At each of the piers a pilaster is built to within 3 in. of the ledge of the floor slab, and means provided on this pilaster for the support of the trolley poles. At the abutments are seats for the connection of the trestle approaches.

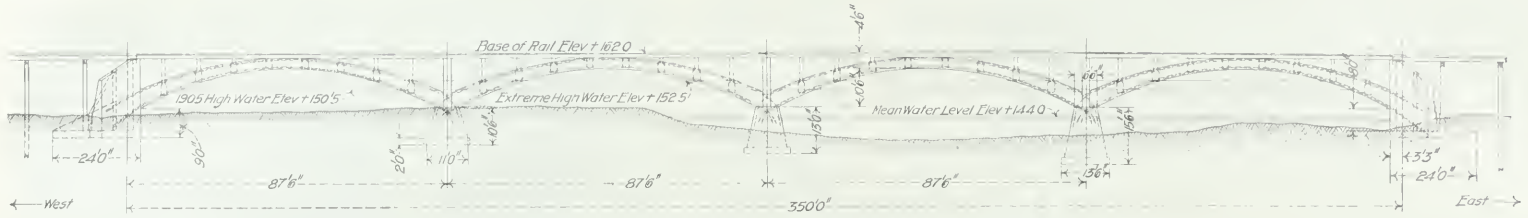
As far as described, the design follows the lines of the Strauss ribbed bridge, previously referred to, the fundamental feature of which is a series of longitudinal ribs and transverse cross braces. It was in the erection of the bridge that radically new methods were employed, which had for their purpose the elimination of all centering and falsework. In carrying out this plan each arch ring was divided into 17 trough-shaped reinforced concrete sectional forms, 2 ft. 6 in. wide outside and 4 ft. 11 7/16 in. bottom length. The sectional forms at the crown were 3 ft. deep and at the haunches 4 ft. 6½ in., and the intermediate sectional forms graduated from one to the other. The walls of these sectional forms were 3 in. thick and the bottom 4 in. thick, making the core or rib proper 2 ft. x 2 ft. 8 in. at the crown and 2 ft. x 4 ft. 2½ in. at the haunch. The inside corners were filled as shown in the illustrations. The reinforcement of each sectional form consisted of ⅜-in. plain round steel bars, placed 8 in. c. to c. in the direction of the arch, and 12 in. in the opposite direction. The mixture of concrete used was 1:3, very wet, to thoroughly fill the steel moulds in which the sectional forms were cast. The weight of these sectional forms varied from 1,500 to 2,200 lbs. The forms were cast in a series of steel moulds, eight—all alike—being used for the rib forms and two for the diaphragm forms. The steel moulds were built up of 16-lb. sheet steel stiffened by 3-in. channels and held in alinement by angle irons so connected up that the moulds could be readily knocked down and reassembled.

There were 136 rib forms and 32 diaphragm forms to cast. Since each rib was symmetrical about the center only nine different kinds of sectional forms were required for the ribs and one for the diaphragm. These were all cast in the 10 steel moulds, variation in the depth of the rib forms being effected by inserting loose wooden strips in the correct position between the inner and outer side pieces of the mould. The sectional forms were cast with the mould standing vertically, so that one voussoir face was against the working platform on which the mould stood while the other was flush with the top of the mould.

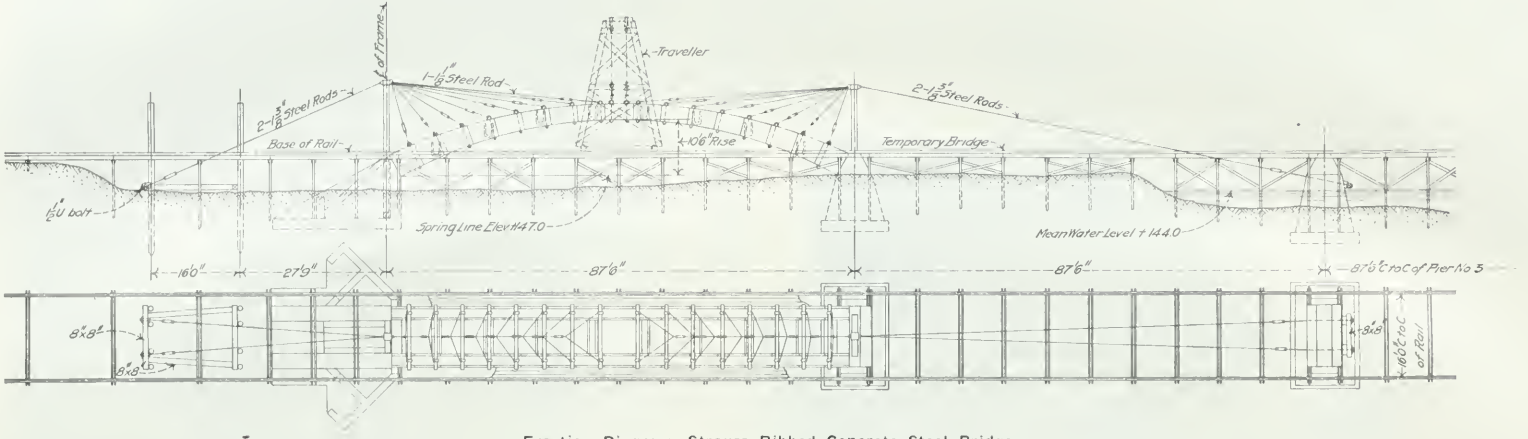
It will be noticed that each sectional form has a hole in each side at about its center of gravity. These holes were for handling. Several of the sectional forms also have two rectangular openings in one wall. These were provided for the diaphragm connections, and all these openings were made by fastening wooden blocks to the mould before the concrete was filled in. The sectional forms hardened very rapidly and it was possible to remove the steel mould 24 hours after the concreting was done. After all the sectional forms had been made they were numbered and stored at the site until ready to be placed in the structure.

Meantime a light temporary bridge was built by hand-driving two rows of piles on each side of the bridge, capping these with 2 in. x 10 in. transverse planks and bracing them in both directions by 1 in. boards. On top of the piles 6 in. x 10 in. stringers were laid and light rails were spiked directly thereto. On this temporary bridge a light traveler was mounted and fitted with two triplex blocks, each provided with a balance beam made up of two 8-in. channels. In placing the sectional forms in position, they were first moved to a platform on the temporary bridge by means of a guy derrick, then assembled in pairs with a lifting frame of two sets of 4 in. x 6 in. cross timbers, one near each end. These were connected to the forms by means of long bolts passing

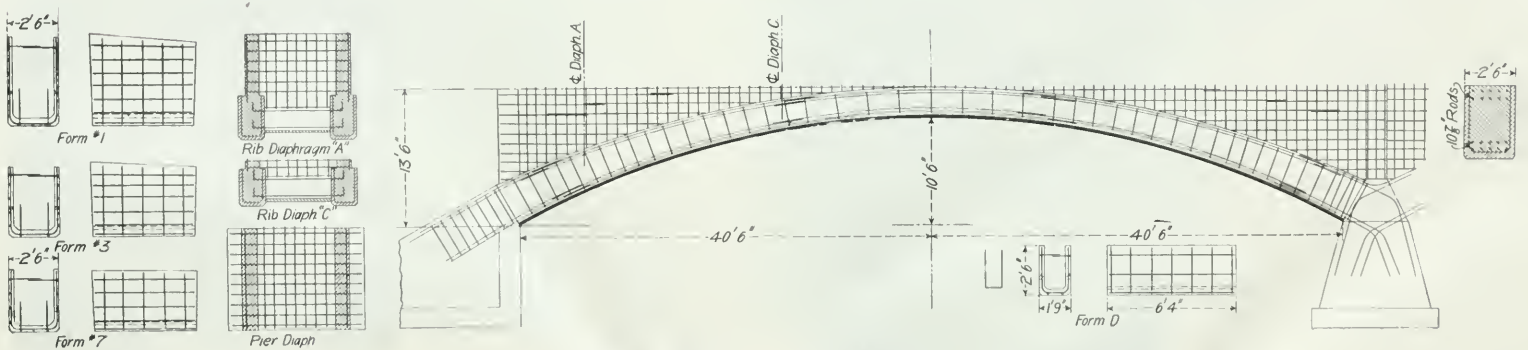
General View of Strauss Reinforced Concrete Bridge at Belvidere, Ill.




General Elevation, Strauss Ribbed Concrete Steel Bridge near Belvidere, Ill.




Erection Diagram, Strauss Ribbed Concrete Steel Bridge.




Details of Reinforcement, Strauss Bridge.

through holes in the bottom of the forms, and at the top were fitted with U bolts, corresponding to the hooks of the balance beams. Two of the accompanying views clearly show how the derrick and traveler handled these sectional forms, one of them also showing one of the steel moulds. Two ribs throughout were erected simultaneously, and where the rib forms were associated with diaphragm forms they were all placed as a unit.

To support the sectional forms in position, two A-frames were built. One of these was set at the abutment and anchored back to the piles of the trestle approach. The other was set on pier No. 1 and anchored back to pier No. 2. The anchors consisted of two 1⅜-in. round steel rods for each A-frame, the rods being in 16-ft. lengths connected by sleeve nuts. Turnbuckles were also provided for adjustment. From the top of these A-frames radiated a series of eight 1¼-in. round steel rods, each provided with a turnbuckle, and each terminating in two shorter 1 in. rods diverging to the ribs, where they were connected to the U bolts on the lifting frame carrying the assembled sectional forms. In addition to the 4-in. x 6-in. timbers above referred to, two light wooden frames on each pair of forms were used to brace the ribs, and while the lifting frames were removed as soon as the span was completed, the brace frames were left in place until the concrete had been placed in the ribs.

The erection was begun simultaneously from each haunch, the first sectional form being supported on the skewback at one end, and at the other end attached to the first set of A-frame rods as just explained. The second sectional form was then brought into position and supported at one end on the first form, the other end being supported on the second set of A-frame rods. The connection between the sectional forms was made by means of steel dowels placed in gas pipes located in the bottom corners of the forms, and in some cases by means of wooden blocks fitted to the inside of the forms. In this manner the sectional forms were all placed in position and supported. The keystone required no support other than that supplied by the two adjacent sectional forms, and when this keystone had been placed the A-frame rods were slackened and the two halves allowed to close against it. The entire series of sectional forms forming the arch then became self-supporting and the A-frames with their anchors and rods were removed and used for the erection of the next arch in a similar manner. The assumption used in calculating the A-frame rods was that the sectional forms were supported at two points while being placed, and this condition was actually established as explained above. The suspension rods were so adjusted that the joints between the various sectional forms were left open slightly at the top.

To insure the proper fitting of the keystone, the faces of the skew-backs on the piers were dressed before erection was started so as to make the angle between the face of the skew-back and the horizontal plane through the springing line slightly less than that calculated. In addition, the lower edge of the first sectional form was rounded so as to keep the pressure from coming too close to the edge, and a strip of sheet lead ⅛ in. thick was placed in the joint. By means of the turnbuckles on the anchor rods it was possible to raise or lower half of the arch as a unit, the rotation taking place about a horizontal axis near the lower edge of the first sectional form, and the effect was practically the same as if a hinge had been inserted in the joint at the skewback. In this way the opening in the center for the keystone was adjustable, and there was no trouble whatever in fitting the keystone in place. After the removal of the A-frames and supporting rods all the joints were found tightly closed and the alinement was perfect.

After the first arch ring had been completed in this manner it was left without filling in the concrete until all the remaining arches had been completed. This was necessary, as the intermediate piers would not be stable under the unbalanced horizontal thrust caused by placing the concrete in one span before the skeleton arch of the adjoining span was erected. When the four arches were in place the reinforcement was put in position in the hollow ribs. These ribs, together with the diaphragms, were then concreted by first putting in a 12-in. layer of concrete and then following up with the remainder. The concrete in the arch ring and the diaphragms was made continuous by means of the openings through the inner walls of the sectional forms, and the entire construction thus rendered monolithic. After the arch ring had been completed in this manner the spandrel walls and floor were built by means of ordinary wooden forms.

The erection of the arch rings was successfully completed in a very short time notwithstanding the fact that only unskilled labor was employed. It took an average of three days to erect one span and take down and reset the A-frames with their anchorages. The last arch ring was erected in a day and a half, and the largest number of sectional forms placed per day was 12 pairs. The entire superstructure, including the arch rings, was completed in 30 days, which included three or four days delay caused by labor troubles.

The substructure presents no features of special interest. The three intermediate piers were built of solid concrete, while the abutments were provided with buttressed wing walls, which together with the walls and base slab were all of reinforced concrete. With the exception of pier No. 3 and abutment No. 2 the substructure was founded on gravel. At pier No. 3 quicksand was encountered, which caused a great deal of trouble and involved a delay of at least 30 days in the completion of the substructure. Abutment No. 2 likewise gave some trouble on this account. A double-walled cofferdam was finally built around this pier and abutment and piling driven. The cofferdam was then sealed by depositing the concrete under water, after which the construction proceeded in the usual way. The mixture of concrete for the piers and abutments was 1:3:5 and for the superstructure 1:2:4.

The bridge was built for a live load consisting of a train of 40 ton interurban electric cars, and for the following unit stresses:

| | Without temperature variations. | With temperature variations, of + or — 40° F. |
|---|---|---|
| Concrete: Compression | 500 lbs. per sq. in. | 650 lbs. per sq. in. |
| Tension | 50 " " | 75 " " |
| Steel | 10,000 " " | 13,000 " " |

It will be noticed that the tension in the concrete is kept below the limit where there is any danger of cracking. The stresses were figured for the arch fully loaded and half loaded and were combined with the temperature stresses to produce the maximum. Only the concrete and steel in the core was considered effective, but since the sectional forms actually carry a considerable part of the dead load the factor of safety of the bridge is higher than ordinarily obtains in reinforced concrete construction. The reinforcement in the arch rings consisted of ten ⅞-in. plain round rods in both the extrados and intrados of each arch ring, with shear rods as shown. The ⅞ in. rods were about 30 ft. long and were spliced by overlapping 3 ft. These rods were also continued into the foundation. The reinforcement in the spandrel walls consisted of ⅝-in. round rods spaced 12 in. centers, horizontally and vertically. The reinforcement in the floor consisted of ½-in. rods, 5½-in. centers, transversely near the bottom of the slab between the spandrel walls. Every other rod was bent so as to be near the top in the outer part of the slab and continued up into the curbs at the sides. There were also 12 ⅜-in. round rods placed longitudinally throughout the floor and wired to the transverse rods.

The deflections of the arch rings were observed at the following times: (1) Immediately after the erection of the four arch rings and before any concrete had been placed in them; (2) after the concrete had been filled in the arch rings to form the solid ribs; (3) after all the concrete had been placed in the spandrel walls and floor of the superstructure. The results are indicated in the following table:

*Belvidere Bridge.*

Table of elevations and deflections observed at intradas of arch ribs at crown. All elevations are 157+ but only decimals of feet are given. Elevation at crown as per design, 157.46. Average actual elevation 157.47.

| | Elevations, in ft. | | | Deflections in ft. | | |
|---|---|---|---|---|---|---|
| | Before any concrete was placed. | After concrete was placed in ribs and diaphragms. | After concrete was placed in walls and floor. | Caused by load of concrete in ribs and diaphragms. | Caused by load of concrete in walls and floor. | Total deflection caused by dead load of structure. |
| Span No. 1: | | | | | | |
| North rib | .43 | .39 | .34 | .04 | .02 | .06 |
| South rib | .38 | .37 | .34 | .01 | .03 | .04 |
| Span No. 2: | | | | | | |
| North rib | .65 | .56 | .54 | .09 | .02 | .11 |
| South rib | .49 | .41 | .39 | .08 | .02 | .10 |
| Span No. 3: | | | | | | |
| North rib | .63 | .58 | .55 | .05 | .03 | .08 |
| South rib | .60 | .56 | .53 | .04 | .03 | .07 |
| Span No. 4: | | | | | | |
| North rib | .54 | .53 | .49 | .01 | .04 | .05 |
| South rib | .57 | .56 | .52 | .01 | .04 | .05 |
| Average | .54 | .50 | .47 | .04 | .03 | .07 |

It will be noticed that the deflection caused by the filling of the concrete in the ribs is somewhat variable, which is probably due to the fact that the joints between the sectional forms may not all have been closed up completely. After the ribs had been completed the deflection caused by the additional weight of concrete in the spandrel walls and floor is very regular. The total deflection in no case exceeds the normal, and it is interesting to notice that the average elevation of the eight ribs at the intrados of the crown, after the completion of the structure, deviated only $^1/_{100}$ of a foot from what it was figured in the office

This design is the first practical application of this entirely new system of concrete bridge construction, and though it will be evident that the method is very unusual and that in working it out many new and untried conditions had to be met, yet the success of the system has been most pronounced. The great advantage of the construction is the elimination of centering, which is always a large portion of the total cost of a concrete bridge, and in deep and swift rivers makes construction not only extremely expensive but dangerous and risky. While for the sake of expediency in this case a traveler and temporary track were used for erecting the concrete-steel forms, the plan which will be followed hereafter will be the use of a cable way. In this way concrete bridges can be thrown across streams no matter what their nature, and after the foundations have been built there is no further danger or delay. It will also be evident that in this manner concrete bridges can be built across canyons and gorges of unlimited depth,

and over railroad tracks or highways without interfering with traffic.

The outfit required to construct these bridges involves a larger first cost, but after this outfit has once been acquired it enables the construction and erection of the sectional forms at very little cost and at remarkable speed. The steel moulds used at Belvidere will answer for a series of arches ranging in length from 25 ft. to 100 ft., and these forms can be used over and over again. Where there are a series of bridges to build at one time, as for instance on a railroad line, this feature attains great importance in reducing cost. Ribbed bridge construction in itself is undoubtedly the most economical as regards the quantities of material, and with the increased economy of erection made possible by this improved method of erection, the total saving as compared with other forms of concrete steel construction is, for the same factor of safety, about 20 per cent. It will be noticed that this method of construction is also applicable to buildings.

The Belvidere bridge was designed and built by the Strauss Bascule & Concrete Bridge Co., Chicago, which owns the patents of Mr. Strauss. The work was executed under the immediate supervision of Mr. K. Hojgaard, Engineer for the bridge company. The Elgin-Belvidere Railroad is under construction by the Arnold Company, Chicago, and this design of bridge was recommended to the company in preference to a steel structure, both for reasons of economy and permanence, by Mr. B. J. Arnold, President of the Arnold Company. Mr. George Weston was Engineer for the Arnold Company on the work.

## How Best to Get Cars Through Large Terminals.*

System is the underlying principle of success in handling any large proposition, such as what we have to contend with at the head of the Lakes, and it must prevail, else failure or partial success will be the result. All who have been in the railroad service for any length of time will remember how insignificant car work was formerly considered. Car checkers and clerks were the cheapest men on the pay roll. The boys, the beginners, all were started with car work. Many times, during the rush of business, car reports were allowed to run for a week and I have known instances where car records were not touched for months during the busy season. These conditions existed during the time when handling the present volume of business was an unthought of possibility, and all railroads (except during the fall rush) had plenty of cars. Under the old mileage rules, cars were settled for on the basis of miles traveled. Foreign cars were settled for with lines interested, on the basis of miles traveled; therefore, if they remained on track or siding an unusual length of time there was no direct money loss to any one, providing cars had not been traveling loaded or empty through mistake or otherwise, the most serious complaint resulting in a mild reprimand from the superintendent.

Owing to the immense increase of the world's commerce, the most pronounced being that of our own country, every car building establishment in the United States has been running more than full time for the past few years, and even by so doing are unable to fill orders with any degree of promptness. This, with the increase resulting from many railroad companies building their own cars, should eventually overreach the everlasting increased demand for cars. I venture to say that if a dozen or more railroad officials were asked to-day where all the railroad equipment went to and their views on causes of shortage, you would have as many different opinions.

The handling and importance of all matters pertaining to cars has changed more completely in the last few years than any other branch of railroad service. Reports must be correct; must be made on time, often wired; yard and car clerks should no longer be cheap or inexperienced men, but should be the best, and car work should be kept up-to-date, regardless of how much help it takes. The yard office cannot be in possession of an over-supply of data. A sufficient number of yard clerks should be employed to make a daily check of the yards and other districts assigned to each individual yard clerk, so that when a car gets out of line (which is the case in all large yards where any number of switch crews are employed), he will immediately detect it and give such orders to yardmaster as will insure lining the car up for its proper destination. In this way it will not suffer to exceed a 24 hour delay at the outside. Otherwise, if the yard is not carefuly checked daily, such cars might lie around four or five days and not be looked up until complaint is filed by either consignee or shipper, which, of course, is embarrassing to traffic officials.

It might be well to mention demurrage in connection with delay to cars. Demurrage was never installed for money-making purposes, neither was it intended to work a hardship on the shipping public, and if handled judiciously is a direct benefit to shippers and railroad companies, from the fact that it expedites the loading and unloading of cars, making it possible for all to handle more tonnage. The former most bitter opponents of demurrage are now listed as champions and realize from the monthly reports at the head of the Lakes, that such a volume of business could not be handled without close checking and prompt movement.

As the delay to cars in large terminals may begin from the time of arrival, I will attempt to make my start from there also. Upon arrival of train at the terminal, way-bills covering loaded cars and slip bills covering empty cars should be turned over directly to the agent or yardmaster. If disposition of loads can be given, switch lists should be made to cover and loads switched accordingly. Such loads as cannot be disposed of at the time, or are necessarily delayed for inspection, weighing or other reasons, should be switched to tracks reserved for that purpose, to be disposed of from there later with all possible dispatch. If foreign cars are received in train for loading or other purposes, I would suggest the plan of marking such cars on black body of the door with red lumber crayon—which cannot be erased by rain or weather—showing date of arrival, road to which it belongs and foreign routing, via which line it may be handled. This serves a double purpose, that of giving switchmen information as to where he can apply it on any orders he may have, and also giving shipper necessary ronting information for his loading. However, the card system is preferred and is more generally used. The above is for cars arriving.

The following system is suggested for cars forwarded or rather cars loaded at industries to be forwarded, or cars loaded for local or town delivery. Any cars loaded at industries on initial or connecting lines should not be handled or switched until switch bill is furnished by shipper and way-billing furnished to cover. In case this is not practicable, telephone instructions should be given to some designated central office and from there switch bill made to cover and information transmitted to switch foremen, as soon as possible as to how to handle, but in no case to allow switchmen to move cars until furnished, and the one in charge should have positive assurance that billing will follow. This will prevent cars being delayed for billing and saves additional switching. Loaded cars taken from industries or sidings should be delivered to connecting line, other local indnstries or switched into train order, the switchman having in his possession the switch list. Such cars as are owned by local roads would naturally go to them, unless otherwise specified. The foreign cars are all carded or chalked to show road they belong to. Work of putting into train order or placing at industries is of comparatively little note, but it is very important that holdouts be followed up closely and vigorously.

At the annual meeting at Minneapolis last year of the American Association of Local Freight Agents' Associations, a committee was appointed for the purpose of securing data and particulars of the switching systems in use throughout the country. The committee have classified various propositions as follows: Local orders or switch way-bills, the Indianapolis plan, the Burlington plan, the Keystone switch order system and the Southeastern plan. This committee was also instructed to give consideration to the question of switching charges, whether they should be made at certain rate per car or by the hundredweight, and reported that the preponderance of opinion as well as practice seems to favor a flat rate per car. While the report of this committee is of more interest to railroad auditors, it should also be interesting to railroads and the public, as it outlines the details of switching charges, as to how handled, etc.

In the switching and handling of cars at any terminal, the earnest co-operation of the public is necessary. They can assist the railroads as materially as the railroads can them, by giving disposition promptly, furnishing switch billing, etc.

*Presented at the June meeting of the Northern Railway Club by W. H. Smith, Asst. Genl. Agt., Northern Pacific Ry.

## The South Canadian River Bridge of the K. C. M. & O. Ry.

The South Canadian river, in the vicinity of the crossing of the Kansas City, Mexico & Orient Ry., in Dewey County, Oklahoma, drains about 1,050 sq. m. and varies in width from 2,000 to 4,000 ft. The river bottom is mostly quicksand, from 12 to 60 ft. deep above the rock, which is a hard red sandstone. Within minor limits, the bridge location was selected at the point where the rock occurs closest to the surface. After a study of local conditions with respect to the elevation of high water, depth of fonndations and the nature of the stream, 2,000 ft. was decided on as the necessary width of opening at the point of crossing, the north half of the bridge to be of steel on concrete piers, the south half to be of pile trestle, to be replaced later with a permanent structure.

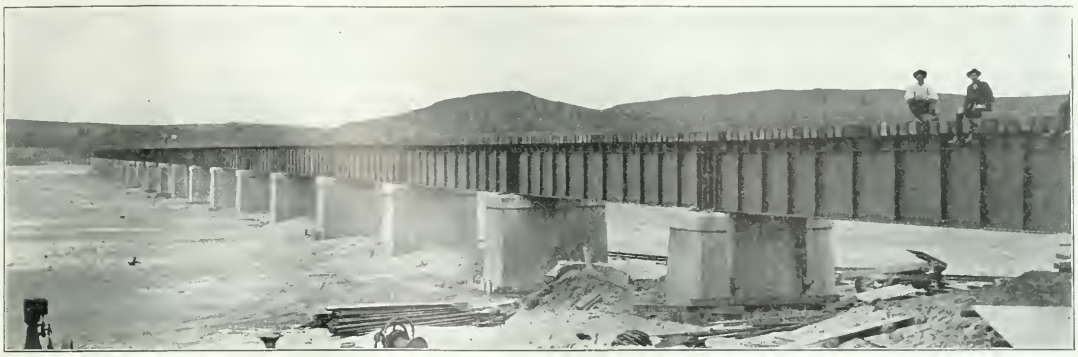
The most economical class of structure for the steel portion of the bridge was found to be 50 ft. deck plate girders, and as this construction conformed to the necessary requirements in other respects, that type was adopted. The grade line was established to permit of replacing the pile trestle portion of the bridge with a steel structure of 70 and 85 ft. deck plate girders on cylinder piers. The whole structure was built by company forces and the construction of the piers, which are 1: 3: 5 concrete except the bridge seats.

which are 1: 2: 4, was carried on as follows: The bases were put down in open cofferdams, the sheet piling for which was jetted to the rock. The sand was excavated by means of a centrifugal pump, and the bracing between the walls of the cofferdam placed in position as the excavation proceeded. After the cofferdam had been pumped dry, all leaks were caulked and the bottom of the sheet piles grouted with neat cement. In the lowest corner of the foundation a recess was formed to gather water from leakages, which was kept dry by means of a "Pulsometer" pump.

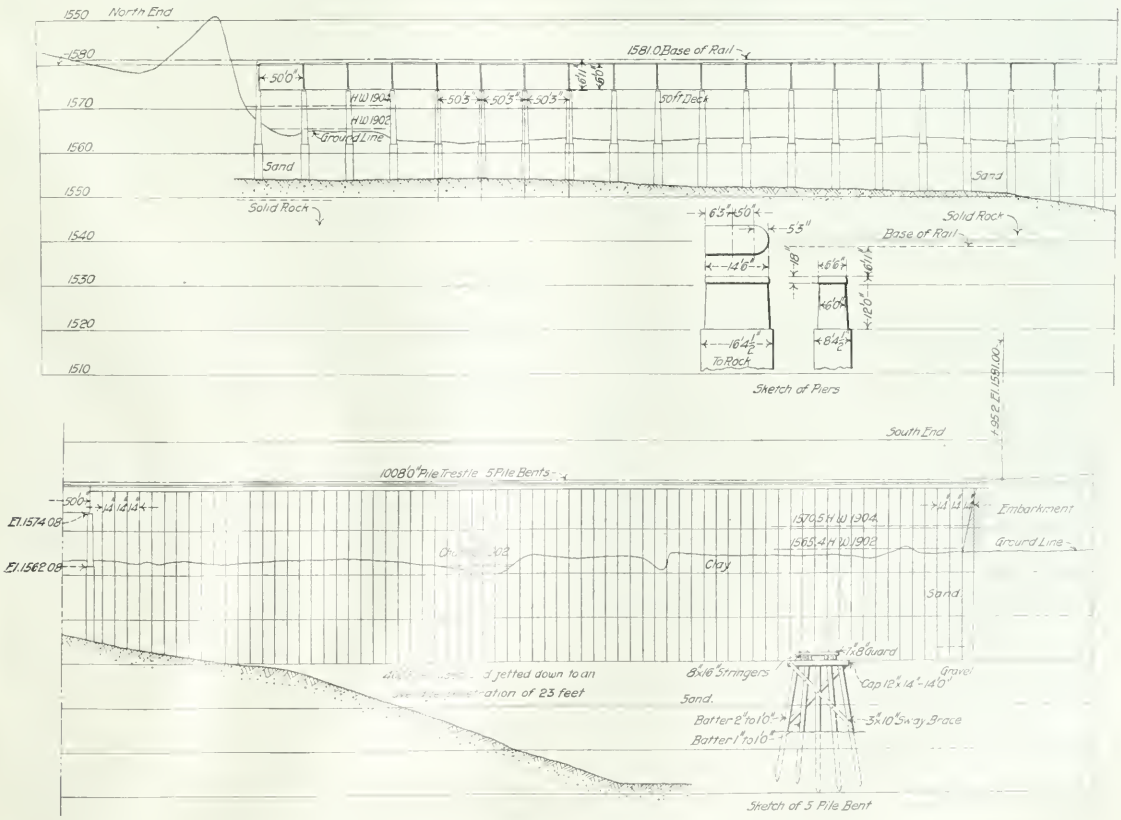
The concrete mixer and all other machinery was, as far as possible, located on the bank, above danger of damage by high water. A temporary track was laid, extending from the main line at the north end along the side of the embankment approach and out into the bed of the stream. The mixer and concrete materials were placed on the embankment between the temporary track and the main line and the concrete carried to the cofferdams in dump boxes set upon push cars. The chute from the mixer was placed to deposit directly into the dump boxes.

While the concrete was being deposited at one pier, the cofferdam for the first pier ahead was being excavated and the sheet piling of the second pier ahead was being driven. As the base of one pier was completed, the temporary track was extended to the next pier and supported on bents built of ties and jetted to the rock. In this manner work was carried on continuously on three piers. The grade of the temporary track was such that loaded cars were carried by gravity to the sites of the piers and were returned by teams.

After the completion of the bases, the forms for the shafts were set in place and the depositing of the concrete continued in the same manner as had been followed in the construction of the bases, with



South Canadian River Bridge of the K. C. M. & O. Ry.




Crossing of the South Canadian River, Kansas City, Mexico & Orient.

the exception that a derrick was placed at the pier and the concrete boxes lifted to the top of the form and dumped.

The cofferdams were originally designed with an inside form, to permit of removing the sheet piling after the completion of the base. This plan was found to be impracticable on account of the difficulty of preventing leaks and removing the sheet piling and was abandoned after the construction of the first two bases.

The cost of the concrete work, including cost of materials, labor, freight and all other expenses, was $8.80 per cubic yard.

The girders had been previously stacked in a convenient position and were set in place on the piers by means of a derrick car with a 40 ft. boom.

Work on the bridge was begun in October, 1905, and completed in May, 1906. We are indebted to Mr. M. P. Paret, Chief Engineer of the K. C., M. & O., for the foregoing information.

## The Canal and the Railroad from 1861 to 1865.*

In the industrial development of the country from 1861 to 1865 no phase is more remarkable than the growth and prosperity of the canals and railroads. During four years of war there was a steady increase in traffic, unprecedented activity, and a surprisingly widespread public interest in transportation questions. At the close of the year 1861 the *American Railroad Journal* declared, "The year has on the whole been a very favorable one for the Northern railroads. Their earnings for the present season greatly exceeded those of 1860. Their traffics have immensely increased to supply the foreign demand for breadstuffs. It is consequently a somewhat remarkable fact that in a period of civil war the value of railroad property should have improved while that of all other kinds has greatly deteriorated." In the middle of the war, reviewing the year 1863, the same journal said, "The railroad system has greatly flourished the past year. The companies have got out of debt or largely diminished their indebtedness, their earnings are increasing, their dividends have become regular and inviting. The past year has been, therefore, the most prosperous ever known to American railroads."

Concrete illustrations of this growth are to be seen in the rapid increase in freight cars and in tonnage. The Pennsylvania Railroad, the Pittsburg, Fort Wayne & Chicago, the Erie, the New York Central, the Cleveland & Toledo, the Michigan Southern, the Chicago, Burlington & Quincy, the Illinois Central, and the Cleveland, Columbus & Cincinnati doubled their number of freight cars; those of the Central of New Jersey were more than trebled. The growth in freight carried was proportionate in almost every case. The movement of the enormous harvests was one cause of this unusual activity, especially to provide for exportation to Great Britain, where the harvests were poor in each of the successive years, 1860, 1861 and 1862. The stock market reflected this prosperity. Practically the first substantial sign of recovery from the crisis of 1861 was the heavy investment in railroad stocks in the summer of 1862, and from that time on, till the announcement in the fall of 1863 that the harvests in Great Britain were at last good, and that, therefore, there would be less activity in the movement of grain to the seaboard, these were the most prominent stocks on the Stock Exchange.

Of the various roads, those in New England, almost shut off from grain movement and army transport service, showed the least advance over their previous flourishing condition; those in Pennsylvania prospered with the growing output of iron, coal and petroleum which they carried; those in the West and Northwest, built in the previous decade far in advance of immediate needs, were now for the first time used to their utmost capacity in carrying the crops, which, but for them, could not easily have reached a market after the closing of the Mississippi; the North and South lines, such as the Illinois Central and the Cleveland, Columbus & Cincinnati, which had the previous record of never making money, throve on army business. The most prominent, if not the most important lines, were the three East and West trunk lines, the Pennsylvania, the Erie, and the New York Central, which were continued westward by the Pittsburg, Fort Wayne & Chicago, the Michigan Central, and the five lines later consolidated into the Lake Shore & Michigan Southern. Farther north the Grand Trunk reached the lakes in Canada, while to the south was the Baltimore & Ohio, largely within the war zone.

The various meat products sent eastward from Chicago commonly went over the railroads, especially the Pittsburg, Fort Wayne & Chicago, but in the middle of the war 99 per cent. of the wheat, 95 per cent. of the corn and 81 per cent. of the flour from Chicago took the lake route to Buffalo and other eastern lake ports, to be forwarded thence by rail and canal to New York and Boston. In 1862, 2,500 more vessels entered and cleared the port of Buffalo than in any previous year. Although the Erie and the New York Central had their own boats plying the lakes and supplying their steam lines at Buffalo and other lake terminal points, the Erie Canal took twice as much of this lake traffic as the two great railroads together. Never had the New York waterway performed such services. The boats on its waters rose from 3,000 in 1860 to 6,000 in 1863. The resulting activity in boat building was very great. Not since 1847, the year of heavy exportations of grain to famine-stricken Ireland, were so many vessels built on these canals of the Empire State as in 1862. In this year vessel building in every lake port also was greater than in any previous year. The commerce of the western rivers, where government transport service filled the gap made by the disappearance of the old southern trade, was comparable to that of the lakes. In the last part of the war more vessels were built on these rivers than for many years.

American transportation on the ocean had not so brilliant a record. Of the three American transatlantic lines started before the war, the Collins Line failed in 1858, the Bremen Line was withdrawn in 1858, and the Havre Line was taken into the government service. Flushed with pride over the success of their steam transportation on land, it was humiliating to Americans to see eleven foreign lines with 54 steamers entering their leading port, carrying the foreign mails, and meeting no American competition. The actual conditions of transportation on the ocean must be set over against those on the land in order to enable us to appreciate another phase of the general subject—the agitation for increased transportation facilities. Nothing is more characteristic of the period, aside from interest in war and politics, than the efforts of rival cities to gain commercial supremacy, to build additional means of transportation both on land and sea, and especially to improve connections with the West.

Of these cities, New York with the Hudson River Railroad, the New York Central, the Erie, the 11 transatlantic steamship lines, meeting on the best harbor of the continent, was easily the leader. Neither Philadelphia nor Boston had a line of steamers to Europe. The former had one trunk line leading to the West, but Boston was dependent on roads terminating in other cities. On the north Boston had a rival, small but growing—Portland, the terminus of the Grand Trunk. On the south, Philadelphia was opposed by Baltimore with the Baltimore & Ohio Railroad, but this border city was too harassed by war to be formidable while hostilities lasted. Every commercial city was the rival of every other, working for its own aggrandizement and the depreciation of all the rest.

New York's water communications with the West were quite as important as those by rail, and the attempts to improve them, while not so effective as the changes on the railroads, attracted much more attention both in the city and in the nation at large. The movement began in Chicago and the West in 1861, because there did not seem to be facilities to carry the crops of the year to market. The important route by the Mississippi River was closed, and consequently freight rates on other available lines became very high. The westerners insisted that these east and west lines, with their suddenly acquired monopoly, should be checked, and they called on the national government to open the Mississippi to the Northeast by enlarging the Illinois and Michigan Canal from the Great Lakes to the Illinois river.

At the same time the state of New York was aroused at the inadequacy of her accommodations for the western traffic, although after 27 years' work and an expenditure of $40,000,000 the state was just bringing to conclusion a great enlargement of the Erie Canal. If the increasing western crops were to be handled, the canal would have to be further enlarged. Again, the Trent affair brought into the discussion the military argument. However, the state was unwilling to tax itself a second time for the purpose. If the work was to be done, Congress might furnish money; but Congress held back. New York was plainly blocking Chicago, and Chicago was blocking New York.

Few anticipated the next step. Chicago business men held a mass meeting, and within less than six months transferred their local scheme into an almost national demand, with the hearty support not only of New York but also of many other parts of the Union. It was a fine illustration of the power of the western market over all sections. To bring New York to terms, Chicago held up to the public mind the rival route seaward of Canada and the St. Lawrence, setting forth the advantages of a route by way of Lake Michigan, Georgian Bay, a short canal connecting with the Ottawa river, and thence to the St. Lawrence and Europe, with a considerable saving of distance over the Erie Canal route.

Canada was in earnest; New York and New England were aroused. At the psychological moment in 1863, at a call signed by 14 United States Senators and 80 Representatives, a great ship canal convention assembled in Chicago; representatives from every section were present, strong eastern delegations coming from Portland, Boston and New York.

The final resolution by a mass vote was that the national government should be asked to improve both the Illinois and New York canals for military and commercial reasons. No action, however, was secured from Congress, for the opposition was very strong, particularly from Philadelphia, Pittsburg, Cincinnati and Milwaukee. Where railroads had not already superseded them, as, for example,

*From a paper by Emerson D. Fite, in the *Yale Review* for August, 1906.

in New York, nothing but state taxation of the land routes could keep the water routes alive. The relief must be immediate, while to complete the proposed improvements would require a long time. Chicago and New York, they declared, were using the cloak of military necessity to conceal their local and selfish designs, which it would be unwise for the general government to gratify, because so many other communities were clamorous for their special claims.

Despite this extended public discussion, little was practically accomplished for canals. No new ones were dug and no important improvements made. In railroad building, however, much was accomplished for New York and for all her rivals. The railroad interests were spurred to the greatest activity in their endeavor to hold their own against the popular canal agitation. Their most effectual response to the canal measures was the construction, by foreign capital, of a new trunk line to the West, the Atlantic & Great Western, built from Salamanca, New York, on the Erie Railroad, which furnished direct connection with New York City, to Dayton, Ohio, whence there were direct connections with Cincinnati over the Cincinnati, Hamilton & Dayton, and on to St. Louis over the Ohio & Mississippi. This was the greatest railroad achievement of the war. In May, 1865, when the first trains arrived in Cincinnati, shipments from New York, which had formerly taken 30 or 40 days, began to come through in less than a week. Merchants were delighted beyond expression. The daily press, realizing beforehand the significance of the road, faithfully chronicled the progress of the work as it advanced over the three states of New York, Pennsylvania and Ohio. A special excursion from New York, a banquet, speeches and fireworks celebrated the completion of the road to Cleveland, which had particular reasons to rejoice, for, besides through cars without change to New York, this city boasted that the Chicago and New York lake traffic, which now went by way of Buffalo, would be diverted to her to go eastward by the new road. There were similar celebrations in St. Louis and Cincinnati.

Philadelphia secured three new routes to the West. Since 1836 there had been a demand for a railroad northwest from Philadelphia to meet the lake route at Erie, but little was done till 1861, and during the excitement of the Presidential campaign of 1864 the road was completed. Erie with the new road, like Cleveland with the Atlantic & Great Western, would now contend with Buffalo for the honor of being the connecting link between the East and the West, and Philadelphia would wrest from New York some of that city's commercial prestige as the depot for western products. Governor Curtin, of Pennsylvania, left off making campaign speeches to join in a great excursion in honor of the event. Time was soon to prove how hollow were the hopes for the new line and how much more substantial were the results of connections secured in the West with Cincinnati and Chicago. In 1864 a new line was completed from Steubenville, Ohio, to Pittsburg, giving Philadelphia direct communications via Pittsburg with Columbus and Cincinnati, and with Chicago via existing lines from Columbus to Richmond, Ind., from which point a new road just completed led to Chicago. Thus in three ways Philadelphia met the competition of New York's new line, the Atlantic & Great Western.

New York on the north had another rival. Boston, the metropolis of New England, shut up in a corner away from the rest of the country, conscious that she had been comparatively indifferent in the past to the trade of the West, and that she was consequently losing her hold there, was aroused. Massachusetts had spent only $5,000,000 on western connections, and individuals of the state, together with the city of Albany, $11,000,000 more, while New York state had spent $65,000,000 for the same purpose, Pennsylvania and Philadelphia $40,000,000, Maryland and Baltimore $12,000,000, individuals in these states and cities $117,000,000, and Canada $75,000,000. Boston saw that she must exert herself to meet the occasion.

It was vexatious to Boston merchants to be dependent to so great an extent for their western trade upon a single line which was liable to be overcrowded, and which, without a rival save indirect routes through Canada, was able to extort high freight rates. All interests demanded a new western road, but while it was commonly agreed that it was impracticable to construct one through to the West, and that some existing trunk line should be tapped to divert traffic, there was no unanimity as to the manner in which this project should be realized. Negotiations to draw the terminus of the Grand Trunk from Portland to Boston were repeated each year, with no success, however, other than exciting much ill-will between the two cities.

South of the Grand Trunk were the New York Central and the Erie Canal, which might be tapped at Albany by a second line. As early as the completion of the Erie Canal in 1825, Boston men planned the Hoosac Tunnel and agitated for it. In 1848 the Troy & Greenfield Railroad was chartered and given seven years to build its road and the tunnel. There was delay in raising money and state aid was secured in 1854. In 1855 the tunnel was begun, but, although the company availed themselves of state aid again in 1860, little was done, and in 1861 they abandoned their task. In 1863 the state took up the unfinished work, and pushed it vigorously throughout the remainder of the war with Boston's hearty support. This was one of the most substantial public works of the period, rivaling the Atlantic & Great Western Railroad in general interest, and comparable to the great contemporary undertaking of tunneling Mt. Cenis in Italy.

Farther south than the New York Central was one of the eastern termini of the Erie Railroad at Newburg, N. Y., opposite Fishkill, to which point Boston capitalists in 1863 secured a charter for a road, designing to use some small existing roads, and to build the necessary connecting links. This line was to be called the Boston, Hartford & Erie, and all predicted for it a great future because it would bring direct connections, without change of cars, with Cincinnati and St. Louis; and further because it would have the advantage of delivering its freight by the side of the ships themselves, whereas the Boston & Worcester delivered its grain at its terminus on the Charles river, whence cartage was necessary across the city to the ocean. Despite all the agitation, however, the road was not completed till 1881.

In addition to trunk lines, another facility was needed before Boston could hope to become a great railroad terminus. Boston, in common with Philadelphia and in strange contrast to New York, had no regular steamship lines to Europe. If the competition with New York for western grain was to become serious, this lack must be supplied. It would avail little to build roads to bring more grain, if there were no swift steamers to carry it to its destination. Throughout the war both Boston and Philadelphia strongly and continuously agitated in favor of new transatlantic steamship companies. In Boston nothing was accomplished, but in Philadelphia in 1865, in imitation of the progressive Baltimore & Ohio Railroad at Baltimore, which had just inaugurated a steamship line of its own to Liverpool, the Pennsylvania Railroad in conjunction with the city of Philadelphia matured plans for a similar line.

Pittsburg, Cincinnati, St. Louis and Chicago were active equally with the seaboard cities in struggling for more trade. Pittsburg shared with Philadelphia in the benefits of the new connections with Columbus, Cincinnati and Chicago, already mentioned. She endeavored without success to reach the Baltimore & Ohio, but her strongest desire was to reach the newly opened oil fields in northwestern Pennsylvania. The Allegheny river was one avenue of approach to these. Another and more important one was the Erie & Pittsburg Railroad, projected before the petroleum discoveries but not completed till 1864. These two routes brought most of the crude oil to Pittsburg, and made her the great oil center. But there were rival routes, namely, two branches of the new Atlantic & Great Western, and a branch of the new Philadelphia & Erie, which transported some oil to New York and Philadelphia. Pipe lines were not invented till the very end of the war, and for the greater part of our period the oil had to be hauled to the steam cars in wagons over difficult country roads.

Cincinnati and St. Louis rejoiced in the completion of the Atlantic & Great Western, but aside from this east and west line the interests of the two cities in increased transportation lay in different directions; Cincinnati turned to the south, St. Louis to the west. The prize in the west for St. Louis was the large overland transportation business of the Missouri river towns with New Mexico, Pike's Peak and the Colorado gold mines, Utah, Nevada, and points on the plains. In 1860 it was estimated that from Kansas City, Leavenworth, Atchison, St. Joseph, Nebraska City and Omaha, approximately 7,000 prairie schooners were engaged in this trade, carrying over 36,000,000 lbs. of freight. During the war the trade increased. In 1865 21,000,000 lbs. of freight were despatched from Atchison alone, compared with 6,000,000 lbs. in 1860. The problem was to win this great market for St. Louis, and to keep it away from Chicago. The Pacific Railroad of Missouri was the solution. This road, planned as early as 1850 but completed only in 1865 after active work in the last part of the war, was the shortest route between these two cities, and, as it was enabled to reach farther and farther west over Kansas by the gradual completion of the Kansas branch of the Union Pacific, its value to St. Louis increased. It was prepared also to join the Atchison, Topeka & Santa Fe, whenever that much discussed road, now richly endowed by large land grants from Congress, should begin to traverse directly the old southwestern route.

Chicago's efforts to increase her trade were many and diverse. She worked toward the overland Kansas trade and the Kansas branch of the Union Pacific by gaining control of the Hannibal & St. Joseph Railroad. Her hold on the Nebraska branch of Union Pacific she made stronger by the consolidation of the Chicago & North-Western with the Galena & Chicago Union, thus securing a continuous line extending through Iowa 204 miles west of the Mississippi river, beyond which the construction of 130 miles of track would give through connections with Omaha, the Nebraska terminus of the Pacific road. She matured plans for new connections with St. Paul and the Northwest, she laid a new route to Madison, Wis., and, as she thought, gained complete control of the traffic from the iron and copper mines of northern Michigan by extensions of the Chicago & North-Western. Her three trunk lines to the East

she added to by building the Chicago & Great Eastern already mentioned, and at the very end of the war definite plans were laid for the extension to Chicago of the Grand Trunk from Port Huron, opposite Sarnia, Ontario.

The Pacific Railroad, to which the West, and, in fact, the whole country were turning, was the realization of public discussion as old as the discovery of gold in California. In 1853 Congress ordered the survey of northern, central and southern routes to the Pacific. By an act of 1862, amended slightly in 1864, the national government incorporated a company to build a road from the wilds of western Nebraska to the western border of Nevada, with a western branch leading to Sacramento; and in the east two branches, one leading through Nebraska to Omaha, the other through Kansas to Kansas City. The route was located by the existence of frontier settlements in Nebraska and Kansas, and by the thin strip of settlements extending across the continent through Colorado, Utah and Nevada. The government pledged itself to subsidize the line with 35,000,000 acres of public land and $50,000,000 in United States bonds. The incorporators in 1862 easily secured the necessary public subscriptions of $2,000,000, and at once many arguments in favor of the work were widely advanced. California must be drawn more closely to the Union, her trade retained and her secession made impossible; the nation's influence in the Pacific and its share in the commerce of the East must be advanced; the movements of the French and English in Mexico and Central America for short Isthmian railroads and canals must be checkmated. Western mining and agriculture must be fostered; great public works like this one and the Hoosac Tunnel must be pushed for the sake of their encouraging influence on the public mind. Only a few miles of track were completed while the war lasted, but that little aroused great interest. The laying of the first rails in Kansas, Nebraska and California was the occasion of much ceremony and public enthusiasm. After the war it was asserted that no public work since the Erie Canal had so held the public mind. The Northern Pacific, to which attention was directed by the discovery of gold in Idaho in 1863, was chartered in 1864, the government guaranteeing a subsidy in land of 47,000,000 acres, but no bonds.

The most characteristic and important feature of transportation during the war, the one that accomplished most toward solving practical transportation problems, yet remains to be discussed—the gradual improvement of the facilities of the existing roads. The consolidation of small roads into larger ones was widespread. Boston's most effective stroke in achieving a new western route was her consolidation of the seven lines leading from that city to Ogdensburg, N. Y., in the hope that thereby she might tap the Grand Trunk across the St. Lawrence at that point; and her most earnest endeavor each year of the war toward bettering herself was to unite the Boston & Worcester with the Western Railroad, which continued the route to Albany. These two roads, composing her only direct route to the West, could not perform their best services while continually quarreling with one another over profits. But, despite the fact that their union was so important and public sentiment in favor of the union so strong, the consolidation was not effected till 1867. The Erie gained control of certain small lines in northwestern New York and changed its western terminus from Dunkirk to Buffalo. The Pennsylvania took over the Philadelphia & Erie, the Oil Creek Road, both leading to the oil fields, the Pittsburg, Fort Wayne & Chicago, and the Cleveland & Pittsburg. The four lines forming the Lake Shore route from Buffalo to Toledo, partly under the extending influence of the New York Central, united and eventually included in the agreement the Cleveland, Columbus and Cincinnati. In Canada the Grand Trunk and the Great Western were united. Examples could be multiplied, but sufficient have been given to show the universality of the tendency of small railroads to merge into large corporations. The phenomenon was not new, but nevertheless was now especially marked. Heavy traffic and the appreciation of gold could hardly have acted otherwise. It was in every way desirable to do away with the losses of competition between rival cities and between rival railroads, and in the presence of high prices to hold in check the expenses of management. Akin to this movement and as extensive was the reorganization of many roads and their establishment on firm financial ground, notably the old New York and Erie, the Pittsburg, Fort Wayne & Chicago, and the Chicago & North-Western.

An obstacle to all traffic was the different gages on the railroads in different parts of the country. On the New York and New England roads the rails were 4 ft. 8½ in. apart; in Ohio, the West, and south of Philadelphia, 4 ft. 8½ in. and 4 ft. 10 in.;* in Canada and in some parts of Maine, 5 ft. 6 in., and in some special cases in the West 6 ft. In no direction could cars run long distances without changes and delays. The Hudson River & New York Central cars passed from New York to Buffalo without change, but could not run to Chicago over the Lake Shore route without changes on the five lines west from Buffalo; they could not go through Canada and strike the Michigan Central without similar changes, and if they proceeded over the Ohio roads to Cincinnati there was a change; the Pennsylvania could not send its cars west from Pittsburg without changes; there were changes between New York and Washington; Grand Trunk trains, suited to the Canadian gage, could not reach Boston from Portland, nor Chicago from Detroit, without the delay. In the opening of the war, when government officials made requisitions on the roads for cars, the response could not be immediate, and after the cars were once delivered there was the delay of fitting them to the southern tracks. In many cases there was no possible adjustment and the contents of trains had to be transferred to other cars. But although no standard gage was adopted, there was progress in doing away with the evil. The Atlantic & Great Western established a uniform broad gage from New York to St. Louis, an unusually long distance for one gage. The completion of the new road between Steubenville and Pittsburg made another uniform gage between two such distant points as Philadelphia and Cincinnati. The gage of the Oil Creek Road was made similar to that of the Pennsylvania. The Atlantic & Great Western entered Cleveland from Leavittsburgh by a third rail on the Cleveland & Mahoning; and Cincinnati in the same way over the Cincinnati, Hamilton & Dayton. Some roads, like the Pennsylvania for a part of its western traffic, availed themselves of a new patent wheel, extra wide, designed to accommodate different gages, while others, like the New York Central in its eagerness to reach Cincinnati, built cars of an adjustable axle, cars of a "compromise gage." The Star Freight Line between Buffalo and Chicago also used this latter expedient. There were few roads which did not have to deal in some way with this universal evil. It is not, then, surprising that the railroad traffic on the Lake Shore route between Chicago and Buffalo was so much lighter than that on the Pittsburg, Fort Wayne & Chicago, and on the lake steamers. Private and state initiative in railroad building was a good thing, but national supervision would never have allowed anything but a uniform gage.

Another obstacle quite as vexing as the existence of different gages was the absence of bridges over the wide rivers; "the chief miseries of traveling are changing cars and crossing ferries," said the *New York Tribune* of Aug. 11, 1861. But desirable as were improvements in this direction, and anxious as the railroads were to make them, there was strong opposition from the established ferry companies and from rival commercial cities. Troy endeavored to divert to her own bridge, away from the Albany ferry, all New York Central lines, and with injunction fought the forthcoming bridge at Albany in the courts, uselessly, however, for the great iron structure at the latter point was begun in 1864 and finished in 1866. It was a revolution in American railroading, attracting universal interest. The ferry companies successfully blocked all Mississippi river bridge projects at St. Louis, although there was an old charter for such a bridge, and the whole city united in fighting a new bridge over the river farther north which would be to the advantage of Chicago. Chicago won and the bridge, the second over the Mississippi, was built in 1864 by the Chicago & North-Western Railroad at Clinton, Iowa. A suspension bridge over the Ohio at Cincinnati was begun in 1864. The same river was bridged at Steubenville, thus connecting Pittsburg and Philadelphia with Columbus. A new bridge was erected over the Monongahela at Pittsburg. The ferry at Havre de Grace, Md., over the Susquehanna on the main route from Philadelphia to Washington was displaced.

In laying double tracks little progress was made before 1861, but during the war some of the leading lines advanced in this respect. The Hudson River completed double tracks from New York to Albany; the New York Central from Albany to Buffalo. The same was accomplished between New York and Washington. The building of new grain elevators was extensive. St. Louis had none at all, and to judge from the public discussion in her newspapers one would conclude that to erect a grain elevator was the most important step which that city could take in fighting the overshadowing and ever-growing predominance of Chicago. Without suitable storage facilities the one city could not hope to attract grain trade away from the other, equipped with a score of elevators. Detroit and Erie likewise got their first elevators. New York, which stored little grain but shipped vast amounts to Europe, in 1861, when the great grain exportations began, got her first floating elevators to lift the grain from lighters and canal boats to the steamers. Previously this work had been done, as in Boston, Philadelphia and Baltimore, by hand pulleys, an immemorial custom. The Irish laborers, by a stubborn strike and threats, most strenuously resisted the change, but the companies persisted. In the first year of the war two of the monster labor-saving machines were set up, five in 1862, the year of the strike, seven of them throwing 2,000 laborers out of work. Each year thereafter more were erected, as also in the other great cities of the seaboard, but, in spite of this fact, at the close of the war some of the grain was still handled in the old way in all these cities. Chicago and Buffalo were the great centers of grain elevators. Nothing better illustrates the growth of lake commerce in grain than the erection in Buffalo of nine new elevators during the war, doubling the capacity of the elevators of that city in four years.

*Also, 3 ft. 6 in.—Editor.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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Interstate Commerce Commissioner Cockrell says that the Commission will aim to secure:

> "(1) A uniform system of accounting by the railroads; (2) a uniform system of classification of freight throughout the United States; (3) a uniform schedule of rates, fares and charges; (4) the performance by the roads of the entire transportation service from the place where freight is received to the point of destination."

The first, third and fourth of these objects are in most of their features new, and their accomplishment is a more or less legitimate object of endeavor by the Commission and of discussion by anybody; but the second problem, which means, we suppose, subject to a reasonable number of exceptions, to put each commodity in the same class everywhere, is fifteen or twenty years old. Has the revision of the law in any respect changed the conditions surrounding it? We cannot see that it has. If the Commission were empowered to establish rates by wholesale, without waiting for a complaint, as may be done by the Texas Commission, for example, a rigid classification, to apply everywhere, would be easy. Moreover, we may say, in passing, that a rigid classification, enforced by fiat by an arbitrary and all-powerful Governmental agency would be free from some of the drawbacks that have made it impossible for the railroads to agree on a classification. The inability of the railroads to agree has been due, not alone to the unreasonableness and injustice of the changes that would have to be made in one territory to make its freight classes agree with those of another territory, but largely also to the impossibility of clearly explaining to shippers many changes that would be practicable and possibly beneficial. A railroad must not only give fair rates, but must do its best to convince the customer of their fairness. A Government board would be largely relieved of this duty—or, at least, the board would be so distant and lofty, as related to many aggrieved shippers, that complaint would be difficult and the turning of a deaf ear by the Commission would be easy. But the new law does not give any such sweeping power as a change of classifications would necessitate. Changing a classification is prescribing rates; and the Commission can prescribe rates only after a regular complaint and full hearing. To unify the classifications between New York and San Francisco it would be necessary to change the class of, say, from ten to a hundred important commodities; and each change would cause loss either to a railroad or to a shipper. Even if a reduction forced on a carrier were uncomplainingly submitted to by him, the change would in many cases give rise to complaints from shippers of other and competing commodities not reduced. Thus the Government would be forced into the same position that the railroads are in now, forced often to hear a complaint of excessive rates which has more or less basis of reason but which cannot be adjusted because a reduction would cause a lot of other rates to tumble down at the same time. A change in classification being, therefore, such an intricate operation, who is going to make the complaint, or bunch of complaints, that would be necessary to warrant the Commission in taking the subject up for consideration? There would be complaints a-plenty after the change had been made; but beforehand each complaint—assuming that there were one or more aggrieved shippers to make complaints—would have to be dealt with on its merits; merits which would be different from, and probably would conflict with, the merits of other complaints. In short, the demand for uniform classification is, in substance, little more than a demand for a simplification of clerical details, while the rate-regulating machinery which Congress has put into the hands of the Interstate Commerce Commission is designed to deal with demands of an entirely different nature—demands for radical change in the substance of things. The classification is little more than a mechanism for applying rates; the making of rates is a radically different operation.

At last one of the party (Democratic) conventions in Connecticut has adopted a platform that criticizes, all too briefly, the state railroad commission, yet the Hartford *Courant* expresses some wonder that the particular commission should have been singled out for censure. Its party opponents ought to be able to dispel the wonder of the *Courant* very quickly. The creative statute of the state of Connecticut provides for a railroad commission of three members at an annual salary each of $3,000 a year—paid by the railroad corporations—and free transportation on railroads and

street railways for themselves and all persons in their official employment. One of the three members must be a lawyer; another a civil engineer, and the third a "practical business man." The commission now consists of a civil engineer about 72 years old who, since he was appointed to the commission in 1887, has given up, we understand, active practice of his profession during a long period of high and rapid development in railroad engineering. Both the other two commissioners have been chairmen of the state committees of their political party in Connecticut—one of them reaching the inverted dignity of a "boss"—both have had long and active records in the legislative lobby and neither of them, before appointment, had any training in railroad matters. The commission has been vested with ample statutory powers even larger than those of the efficient commission of Massachusetts. But it has exercised those powers only in the most negative fashion; it has never had initiative or a policy; it left to the action of a private citizen the printing of the street railway returns after the returns had been ordered by the legislature; on general railroad and railway legislation it has exerted practically no influence either formative or advisory; and, as we have in past years pointed out, its compilations of figures and summaries have contained blunders that would be farcical in a Connecticut common school. Under the statutes of the state the commission could easily enough have checked trolley inflation in Connecticut, yet it has allowed that inflation to reach about $100,000 per mile of capitalization—stock bonds and floating debt—or about double the amount in Massachusetts. By tradition and custom the commission was for many years partisan, with two members representing the dominant political party, but last year it was made absolutely partisan. Partisanship, incompetence, indifference and sinecureism are hard words to apply to an old board of railroad commissioners in an eastern state; but in Connecticut they have been richly earned and challenge the platform criticism of both political parties rather than of one; and, unfortunately, the Connecticut commission represents a type too common in the country at large with demagogism often added to the other traits of negation.

It was definitely announced this week that negotiations were in progress between Messrs. Kuhn, Loeb & Co. and the Union Pacific Railroad Co. for the sale to the Union Pacific of the 400,000 shares of Baltimore & Ohio, which the Pennsylvania recently disposed of. At the time of the Pennsylvania sale a few weeks ago we called attention to Mr. Cassatt's statement, in which he said that the Pennsylvania originally took the Baltimore & Ohio stock because the road was making trouble, but that he was convinced that it was now going to be good. The Union Pacific wants the stock for quite a different purpose from this. With its main lines terminating at Omaha and at Kansas City, it has had no eastern connection of its own, although it has worked in harmony with the Chicago & North-Western and with the Vanderbilt lines for many years. Suppose, however, that the Chicago & North-Western intends to use the large issue of stock to be asked this fall, for purposes unstated, to push through to the coast. The North-Western would then become a rival instead of a friend, and it may conceivably have been forced home to the Harriman interests that their eastern territory and eastern connections are in jeopardy. More important, however, than the Chicago & North-Western extension funds are the moves which the Goulds are making to have a transcontinental line of their own, the first true transcontinental line between the Canadian Pacific and the National Tehuantepec road, the former crossing the continent with a span of 2,904 miles, the latter with a span of 193 miles. The Goulds are rapidly pushing the Western Pacific connection between the Pacific coast and the terminus of the Rio Grande Western. They have their Pittsburg entrance and their Western Maryland and West Virginia Central & Pittsburg, and lack not much over 100 miles of having an absolute transcontinental line under one flag. It is true that the prospects for their filling this gap through the extremely mountainous country lying between the Wheeling & Lake Erie and the West Virginia Central & Pittsburg are not especially immediate; competition is intense and the finances are in pretty bad shape, but the possibility is there, and the link will doubtless be built some day. Through the medium afforded by its holdings in the Chicago & Alton it may be fairly said that the Union Pacific, on the consummation of its Baltimore & Ohio purchase, will come measurably near to having a transcontinental line. From present advices it looks as if it would own something more than a fifth of the entire Baltimore & Ohio stock outstanding; not a large proportion, it is true, and yet enough to give it a considerable voice in the management of the company, especially in consideration of the fact that the Baltimore & Ohio has fully as much to gain as the Union Pacific has by through traffic arrangements.

## FOREIGN CAR WHEEL PRACTICE.

The present unusual demand for freight equipment is not confined to the United States, heavy orders having recently been placed by Italy, Belgium and other European governments. The requirements include all classes of cars of the usual foreign type; steel underframe with wooden floors and superstructure, the capacity varying from fifteen to twenty metric tons carried on four steel-tired wheels. The delivery of the cars is limited, in most instances, by the ability of the contractor to secure these wheels. A few builders make their own, but the majority purchase them along with the axles, from some German or Belgian steel manufacturer. Many of these steel makers are in turn dependent upon the tire makers, and some even purchase the centers as well, assembling and mounting the parts only. The process of manufacture is unavoidably slow and expensive, at best.

Why do our neighbors continue the use of these wheels, when a chilled iron wheel is not only less expensive but much easier to produce? The chilled cast-iron wheel came into use in the United States at a most opportune time, the first expansion period both of the country and of the railroads, and has proved to be at once cheap and efficient. Chilled wheels are so easy to make that their use has enabled the railroads to obtain large numbers of cars on short notice, while their low valuation has reduced the investment. The eight wheels under an American 40-ton freight car represent an investment equal to less than that necessary for two wheels of the European type used under a 20-ton car. This means for us a smaller investment in rolling stock per ton carried, and either reduced freight rates or increased earnings, or both. The wheels can be made in almost any foundry, and the annual production runs into the millions. Any manufacturer can control his output absolutely, and is not dependent upon some steel combination for tires, centers, etc. Give him the raw material and he will deliver the wheel. When the history of the development and economies of American railroads is written, the chilled iron wheel should be given an honored place, its low initial cost, ease of manufacture, efficiency and high scrap value has rolled up many a dividend which would not have been possible after the investment required by the use of steel tired wheels. Now that our equipment is becoming permanent and of higher capacity, the chilled wheel may possibly be relegated to secondary services, but let us not forget its past record.

There are several reasons why this wheel has never been used abroad, not the least being an old prejudice against the use of a casting where its failure might produce a wreck. There exists in most countries a law forbidding the use of cast iron for wheels. No one is interested in agitating the repeal of these laws, for the officials now serving found the steel tired wheel in satisfactory use when they came into office, and why should they run the risk of losing position and reputation by adopting something else? If the change proved a success they would reap no benefit, whereas one wreck traced to a wheel failure would carry with it the resignation and reputation of the sanctioning official. Moreover, since many foreign roads are owned by governments, which fix freight rates by law, the matter of reduced investment is not important. The shipper is accustomed to high freight rates, and is not influential enough to persuade the government to change its practice and give him the benefit. Then again, the European standard car wheel diameter is much larger than ours, averaging about one meter. Would the chilled iron wheel prove as efficient at this diameter as it has at 33 inches?* It would be difficult, if not impossible, to reduce the diameter under the existing four-wheel equipment without serious expense, so until the double truck, permitting the use of a smaller wheel, is adopted, there is little chance of its introduction. It is true that Austria and Hungary use the chilled wheel to some extent, but cars so equipped are not accepted for interchange by other countries. Chilled wheels have also been used successfully in Spain on narrow gage roads not subject to the same laws as those of standard gage.

Some time this fall representatives of the different countries which interchange cars will meet at Berne to discuss and adopt standards. Could they be persuaded to sanction interchange of freight cars equipped with the chilled wheel it would undoubtedly lead to a more general use of this wheel in Europe, but until

some move of this sort is made the governments will have to be content with slow equipment deliveries as well as heavy initial expense and investment.

## REFRIGERATOR CARS FOR THE HARRIMAN LINES.

Announcement is made in our news columns this week that the Harriman lines have ordered 6,000 refrigerator cars from the American Car & Foundry Company. At $1,200, which is about what these cars will cost, this is a $7,200,000 contract, and noteworthy for that reason if for no other. But the wholesale purchase of refrigerator cars by a company which has hitherto relied on the Armours raises interesting questions of policy, covering an area much greater than that served by the lines extending from the Pacific coast to New Orleans and Omaha. The new law provides, subject, of course, to judicial interpretation, that railroad companies are under obligation to supply their customers with refrigerator cars when necessary. Heretofore the Armour interests, through their peculiar double possession of a highly desirable kind of tonnage and of refrigerating equipment, have been able to drive hard bargains. It was always obvious that if the roads in a certain large territory should get together and refuse Armour equipment, they could regulate the situation, but the cost was great, competition was keen, and there remained the fact, constantly recurring in testimony, that most railroads had light seasons and heavy seasons for the use of refrigerating equipment, so there was real economy in being able to obtain this equipment for a season as long or as short as the case might be, and then dispense with it. It was cheaper to pay three-fourths of a cent a mile for refrigerators at the height of the season than to maintain the cars and pay the interest charges on them the year around, especially in view of the fact that any company which manifested hostility to this arrangement would receive no Armour beef shipments. This was very well if cars could be gotten, even if the rates had to be hammered down to the minimum. But it happened most frequently, especially in the case of smaller roads, that the supply of refrigerator cars was not equal to the demand, while the icing charges remained a constant source of dissatisfaction to the shipper. All this matter is of so recent record, however, that it need not be further discussed.

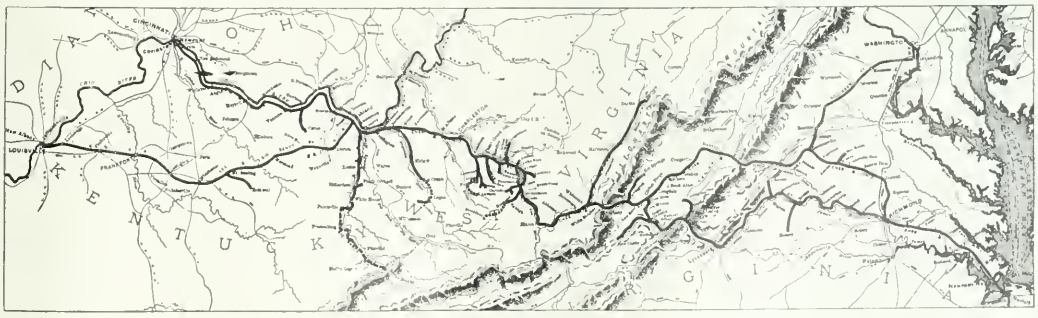
The new Harriman order is apparently equal to nearly fifty per cent. of the total number of Armour cars. The road has therefore declared its independence with a vengeance, along with the Atchison, which has used its own refrigerator equipment, apparently with entire success, for a number of years. Whether or not these precedents can be generally followed is another matter. The orange, lemon and vegetable business in Southern California amounts to some 25,000 or 30,000 carloads annually, and there is a two-season demand for equipment, deciduous fruit moving in the summer months and citrus fruit in the winter. Thus the Southern Pacific has an unusually long demand for refrigerator cars, but must, nevertheless, be exposed to dull seasons in between, although beef traffic on the Southern Pacific and Union Pacific alike can doubtless furnish a use for some of the cars. But in Georgia, in Michigan, and other localities where the season is short but the demand urgent, conditions are quite different. Whether the Harriman lines propose to rent out their equipment between seasons, we do not know; there would surely be nothing impossible in the formation of some such arrangement, without the traffic strings tied to it which gave the Armours their dictatorial power. In any case, the new increase in the total amount of refrigerator rolling stock in the country, and the independence of the central and southern group of lines to the coast, should temporarily at least make the supply fully equal to the demand if not in excess of it, and thereby lessen the difficulties of the smaller roads.

What the final outcome will be, whether the Armour equipment will be sold, or part of it sold, can only be a matter of conjecture. It is evident that there is a real need for a flexible system of refrigerator car distribution, and the private car companies can render a great service to the railroad companies, under the supervision of the new law, with the old flagrant abuses checked, and enough competition to shift the balance of demand.

On a branch railroad of one of the largest systems of the country having a regular passenger rate per mile there is a small station erected by a private citizen but on land owned by the railroad corporation. The station is not marked on the local time-table of the branch line either as a "flag" station or by any other title whatsoever; but by "custom," especially during the heavier summer passenger traffic, local trains stop either when passengers appear on the station platform or on notification to the conductor when passengers wish to alight. Not long ago at the terminal station a party of three persons asked for tickets to the *quasi* "private" station. With no tickets supplied to the station in question the ticket agent attempted to charge to the next station several miles beyond for which the tickets were on regular sale. Payment was refused and the matter was finally compromised conversely by sale of tickets to the station next *before* the party's destination. Nor did the case end here: The conductor, though duly notified, carried the party three-quarters of a mile beyond their station before remembering to stop the train and an important appointment—it might have involved a large pecuniary sacrifice—was missed. We cite this whole case, with its actual facts coming to our attention, as a sample of the small but sometimes costly complexities which railroad corporations face in the operation of rural lines with their little and what we may dub "hybrid" stations. Here in this petty instance were raised questions of official instruction, of the legal status of a hybrid station privately erected on corporation land, of the proper adjustment of fare, and of responsibility, in such a peculiar case, of the corporation for the act of a forgetful conductor—all large matters of legal principle and procedure. The practical aspect of such a matter is the perilous unwisdom of the irregular railroad station unclassified and ranking below the "flag" station; and, secondly, as regards at least formal title to all stations, the importance of unmixed and responsible corporative ownership. The thousands of flag stations in the country, with their incubus on conductors in the gloom of fog and darkness, are enough without ramifying into a lower scale with higher risks.

### Chesapeake & Ohio.

The Chesapeake & Ohio has had a year of large and steady growth. Gross earnings, which a year ago showed what was then held to be the important increase of $1,400,000 over the 1904 twelve month, have during the past year made a further gain of over $3,800,000, and net earnings, following an increase of $959,000 in 1905, last year made another gain of over $2,000,000. After deduc-




Chesapeake & Ohio.

tions from income for extraordinary expenditures and on account of principal of equipment trusts $580,000 larger than in 1905, and the one per cent. annual dividend requirement of $627,907, there was a profit and loss balance remaining for the year of $1,426,577 against $291,258 in the preceding year.

Most of the increase in gross earnings came from freight traffic. Earnings from freight were $3,356,336 larger than in 1905, a gain of 20.9 per cent. Passenger earnings were $348,411, or 8.9 per cent. larger than in the preceding year. These gains were made on an average operated mileage of 1,794 miles, 121 miles more than in

1905. Considering the gain in freight traffic from a tonnage standpoint, coal and coke showed an increase of 1,775,028 tons, or 21.9 per cent, and other freight of 128,706 tons, or 24.8 per cent. The total tonnage carried and total number of ton miles each increased 23 per cent., while there was an increase of only 16.8 per cent. in the freight train mileage including mileage made by light trains. The number of tons one mile per mile of road was 2,575,392, against 2,244,776 in 1905, an increase of 14.7 per cent. Freight earnings increased $1,223 per mile of road.

In the 1905 year, operating expenses showed increases in maintenance of equipment and conducting transportation, and decreases in maintenance of way and general expenses. This year, with the great increase in business, there were increases in every department of current expense. Instead of a decrease of $118,800 in maintenance of way, as in 1905, there was an increase of $460,700. Maintenance of equipment increased $391,600 against $419,000 in 1905. Conducting transportation, which showed an increase in 1905 of $257,000, increased $947,000, and general expenses again a decrease of $88,600 in 1905 increased $49,400. As a whole operating expenses were $1,848,489 larger than in 1905 when the total increase over 1904 was $467,776.

On maintenance of way and structures there was an expense of $1,477 per mile of road against $1,308 in 1905. Maintenance of equipment, including replacements, cost $2,114 per locomotive, against $2,230 in 1905, $1,091 per passenger car against $893 in 1905 and $92 per freight car against $94 in 1905.

During the year there was an increase of mileage in operation of 119 miles, 85 miles of which came from the extension of the Big Sandy Railroad from Whitehouse, Ky., to Elkhorn City, at the breaks of the Big Sandy river. This branch opens up important new coal territory. New branch line construction authorized includes the Potts Creek branch 20 miles long connecting with the main line at Covington, Va., and several extensions of the Coal River Railway aggregating about 50 miles, the former to develop iron ore and the latter, coal properties. The most important construction work which has been under way has been double tracking. Work has been carried on from year to year and is being especially actively prosecuted at present. Some 90 miles of new second track have now been authorized, whose completion will make a total of about 360 miles in operation. The Chesapeake & Ohio will then have, counting the two main lines between Richmond, Va., and Clifton Forge as double track, with the exception of 131 miles, 103 of which are in Kentucky, a double track line from tidewater at Newport News to Cincinnati, 655 miles. Most of the double tracking has been done at points where it will expedite the company's heavy eastbound bituminous coal traffic.

It is by improvements such as this that the road is able to make a good profit from the low rate which it receives. The average ton mile earnings from all freight were last year 0.42 cents and on coal 0.327 cents. To make these rates profitable it is of course necessary to haul coal in heavy train loads. Here the Chesapeake & Ohio has an exceptional record. Ten years ago in 1896 the average revenue train load was 325 tons, at that time considered a remarkable figure. Last year the company carried an average revenue load of 586 tons and, including company freight, the train load averaged 616 tons, the former an increase of 29 tons and the latter of 31 tons over the preceding year. These loadings would not be possible if it were not that over half the tonnage carried is coal. Bituminous coal in 1906 made up 57.46 per cent. of the total, and with coke 60.33 per cent., the next largest items of traffic in their order being lumber 10.73 per cent., miscellaneous 4.37 per cent., grain 3.53 per cent. and merchandise 3.32 per cent.

On the whole road there are 568 miles of main track laid with 100-pound rails, 209 miles with 85-pound rails, 818 miles with 75 and 70-pound rails and only 270 miles out of the total 1,865 miles laid with rails of lighter section. Last year there were 19,571 tons of new rails used in renewals and 5,571 in new second track, a total of 25,142 tons of new rails covering 172 miles of track.

Through new equipment trusts 53 consolidation locomotives and 2,999 steel gondola cars were added to the equipment. There were bought outright and charged to income as extraordinary expenditures, 10 first-class coaches, 2 parlor, 1 dining and 2 express cars. Five hundred gondola cars were purchased and charged to operating expenses and 500 box cars of 80,000 lbs. capacity bought from the proceeds of a special fund received from the sale of the controlling securities of the Chesapeake & Ohio Steamship Company to the minority stockholders in England. In all there was an increase of 53 locomotives, 15 passenger cars and 3,255 freight and miscellaneous cars in the equipment owned and leased.

Although burdened with a somewhat larger capitalization and not making as extensive appropriations for betterments as its near and similar neighbor, the Norfolk & Western, the Chesapeake & Ohio, along with the great prosperity in the bituminous coal trade is rapidly coming into a stronger and stronger financial position, so much so that it is probable that the demand which is under way for a larger dividend than the 1 per cent. now annually distributed, must shortly be recognized. The road earned last year, after charges, 7.33 per cent. on its capital stock, and after payment of more than $2,500,000 for betterments out of this net income, 3.27 per cent.

The principal results of the year's operation are given below:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,793 | 1,672 |
| Passenger earnings | $4,242,556 | $3,894,145 |
| Freight earnings | 19,395,648 | 16,039,313 |
| Gross earnings | 24,602,989 | 20,724,371 |
| Maint. way and structures | 2,649,557 | 2,188,835 |
| Maint. of equipment | 4,469,590 | 4,077,943 |
| Conducting transportation: | | |
| Traffic | 434,755 | 409,768 |
| Operation | 6,959,355 | 6,037,680 |
| Operating expenses | 14,869,649 | 13,021,160 |
| Net earnings | 9,733,339 | 7,703,211 |
| Net income | 4,607,223 | 2,871,639 |

## Norfolk & Western.

The past year has in several ways been of more than ordinary importance in the history of the Norfolk & Western. In December, 1905, the dividend rate on the common stock was raised from 3 to 4 per cent., a step recognizing in some degree the recent prosperity of the road. More important than this was the formulation in January, 1906, of a general program of improvements and financing to cover the new requirements. A third event which came early this month (after the close of the fiscal year) was the announcement that the Pennsylvania had sold $16,000,000 of its $33,830,000 holdings of Norfolk & Western stock, thus reducing its ownership from about 40 to about 20 per cent. of the total. A fourth fact that makes the year notable is that earnings are by far the largest on record.

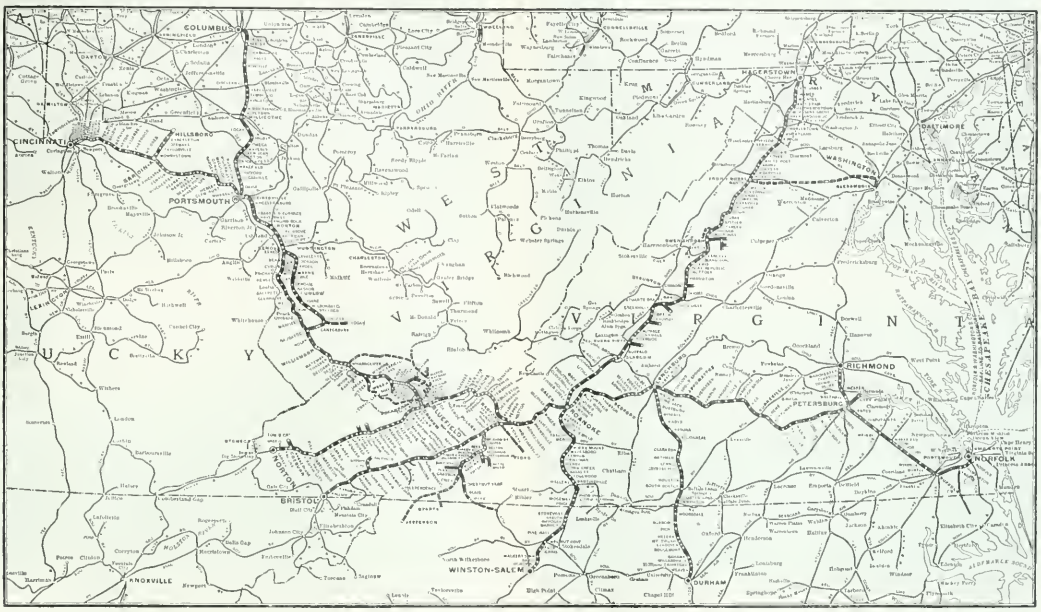
The improvement policy as outlined by the President marks an era in the history of the road in that for the first time since the reorganization in 1896 it has felt itself strong enough to begin a definite improvement policy covering a term of years. Admitting that the industrial demands of its territory have not been fully met, the company now adopts a broader and more permanent policy for future betterments. Among the more important improvements already under way are two low grade lines known as the Forest branch and the Concord branch, west and east of Lynchburg, Va., with a length together of 14.5 miles and a revised line with second track from Forest to Montvale 26.6 miles. This work, in addition to furnishing new local transportation facilities, will give when finished a new low grade line which can be operated in connection with the existing line as a double track and will do away with present heavy grades against eastbound traffic. The other important improvements already being made include a storage and assembly yard at South Norfolk, extensive enlargements of the Roanoke, Bloomfield and Williamson yards and large additions in both locomotive and car departments to the Roanoke and Portsmouth shops. Among more important improvements yet to be undertaken are new lines to reach the iron ore deposits of the Potts Creek valley, the continuation of the double track system by the building of some 70 miles of new track, much of which necessitates revision of the line and many new tunnels, and new passing tracks at various points on the system. With the completion of the double track work indicated, the company will have a continuous double track with grades and curvatures favorable to economical operation from Concord, Va., to Kenova, W. Va., 377 miles. There has not been mentioned the need for additional equipment which for the past few years has regularly grown faster than it was possible to fill it. To cover the new requirements the stockholders have been asked to authorize an increase of $34,000,000 in the common stock, raising the total to $100,000,000. The new stock is to be held against a new issue of $34,000,000 convertible bonds, also to be authorized, to be issued from time to time to provide for the improvements.

The income account for the past year shows clearly enough why there is a necessity for putting the company's affairs on a broader basis. After the decidedly favorable results of 1905, the year ended June 30, 1906, shows a surprisingly large increase in earnings. Gross earnings were $28,487,766, an increase of $4,398,506, or 18 per cent. over 1905. Net earnings show an even larger proportionate gain (20 per cent.), being $11,423,142, against $9,474,826 in 1905. After dividend payments larger by $644,692, and appropriations for betterments and equipment larger by $700,000 than in the previous year, there was a profit and loss credit for 1906 of $760,000, against $450,000 in 1905.

The all important majority of the company's traffic is comprised in the two commodities, bituminous coal and coke, which together furnish 61.5 per cent. of the total tonnage. It was in these and the other classes of heavy traffic that the year's large increases came, bituminous coal showing an increase of 1,325,246 tons or 16.2 per cent.; coke, of 411,511 tons or 21.1 per cent.; iron ore, of 262,648 tons or 43.9 per cent.; limestone, of 173,654 tons or 98.9 per cent., and pig iron, an increase of 134,704 tons or 30 per cent.

These latter increases go to show the rapidly increasing importance of the iron industry along the lines of the road.

The large proportion of heavy traffic is reflected both in the average train load and in the ton mile rate, two factors which are in reality dependent on each other, for without economy in carrying, the average rate of 0.481 cents per ton mile could not be made profitable. In 1897 the Norfolk & Western hauled an average train load of 325 tons, in 1905 the figure was 531 tons and last year showed the striking addition of 48 tons to the total, bringing the average figure to 579 tons, with the average freight loading per loaded car mile 25.57 tons, an increase of 1.42 tons over the preceding year. These figures of course show clearly enough the efficiency with which the road is operated.




Norfolk & Western.

In view of the recent agitation in regard to car distribution to bituminous coal mines, it is interesting to observe the amount of new equipment received by the Norfolk & Western during the past year. This was obtained through three channels. First, from a fund for acquiring additional equipment, appropriated out of surplus earnings. Second, through an equipment renewal fund used for replacement of destroyed equipment. Third, and most important, through equipment trust agreements. Without considering in detail from which of these three sources the year's new equipment was received, the total acquisitions amounted to 5 passenger locomotives, 26 passenger train cars, 29 miscellaneous cars, 65 freight locomotives, 1,000 box cars of 80,000 pounds capacity, 1,500 drop bottom gondolas of 100,000 pounds capacity and 3,120 hopper coal cars of 100,000 pounds capacity. These represent increases in the equipment roster of 26 passenger cars, 66 freight locomotives and 4,780 freight cars. That cars and engines are well maintained may be judged from the fact that the charge for repairs only (replacements not included) was $2,203 per locomotive in 1906 against $2,129 in 1905; $627 per passenger car against $667 in 1905, and $51 per freight car against $49 in 1905. A further evidence of the good condition of the equipment is the fact that at the close of the year there were in the shops undergoing or awaiting repairs 57 locomotives or 7.8 per cent. of the total (of which 14 needed only light repairs), 22 passenger cars or 6.3 per cent. of the total and 696 freight cars or 2.2 per cent. of the company's freight cars.

Maintenance of way and structures in 1906 cost $1,856 per mile of road as compared with $1,721 in 1905. In addition to this regular expenditure there was a charge against the betterment fund for similar expenditures during the year of $2,346,442 out of a total expenditure for construction betterments of $5,649,198. At the same time there was appropriated to the betterment fund from surplus earnings $2,250,000 against $1,000,000 in 1905. It is evident that the physical improvement and betterment of the road is being steadily and extensively carried on.

In the official circular announcing the sale of nearly half its Norfolk & Western holdings, the Pennsylvania Railroad gave as its reason for the purchase of this stock some six years ago, a purpose to secure co-operation in doing away with secret rebates. The increase in the ton mile rate received by the Norfolk & Western from 0.397 cents in 1899 to 0.481 cents last year shows that this object was accomplished and the rapidly increasing earnings of the road have shown with how great advantage to the Norfolk & Western. Provided that as indicated further in the Pennsylvania's public statement there is no likelihood that the railroads of the country will fall back into the old and costly practice of rate demoralization, there appears to be a splendid future for the Norfolk & Western, for its territory is enormously rich in bituminous coal of the highest quality and its line is becoming more and more efficient for handling its traffic.

The principal results of the year's operation are given below:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,853 | 1,799 |
| Passenger earnings | $3,598,558 | $3,158,773 |
| Freight earnings | 24,111,801 | 20,249,399 |
| Gross earnings | 28,487,766 | 24,089,260 |
| Maint. way and structures | 3,439,797 | 3,095,910 |
| Maint. of equipment | 4,749,832 | 3,917,268 |
| Conducting transportation: | | |
| Traffic | 441,678 | 415,285 |
| Operation | 7,913,695 | 6,724,199 |
| Operating expenses | 17,064,624 | 14,914,434 |
| Net earnings | 11,423,142 | 9,174,826 |
| Net income | 7,452,375 | 5,833,454 |

## Grade Crossings in Yonkers.

The New York State Board of Railroad Commissioners has ordered the elimination of the following grade crossings of the New York Central & Hudson River in the city of Yonkers: Pier street, Fernbrook street, Dock street, Wells avenue, Ashburton avenue, Main street, Vark street and Babcock place. The board further determined that the one-fourth share which the state should pay shall not exceed $138,000. The New York Central has stipulated that the city of Yonkers shall not pay more than this sum. The total grade crossing appropriation made by the Legislature this year was $250,000. In addition to the Yonkers cases, a large number of other eliminations have been ordered.

A question having been raised concerning the powers of the Commission in the New York Central's electric zone, the board has decided, after securing the opinion of the Attorney General, that it has full power to order changes there, regardless of motive power used, but that neither the state nor the city shall bear any larger proportion of the cost than if the number of tracks were not increased. When, in order to do away with a crossing, the location of railroad tracks is changed, the state and city cannot be charged with more than if the crossing were left at its original location.

## Grade Crossing Elimination—An Object Lesson.

What grade crossing elimination means in congested parts of the country, and how urgent the need for it is, can in no way be better shown than by a series of pictures like the accompanying ones. New York is too rich a state and too populous to allow a continuance of conditions such as those shown in the "before removal" series. The railroads are most ready and eager to assume their lion's share of the burden; it remains for the communities to share the spirit of willingness to assist in the work, and for the state to appropriate something more than the miserably inadequate pittances of the past. Both state and municipality ought to be able to take the matter of grade crossing elimination clear out of the realm of politics, and view it as being a duty as simple and as urgent as police protection of the lives and property of citizens.

Sample of Eleven Crossings on Port Morris Branch.

Port Morris Branch; Grade Crossings Eliminated.

Westerloo Turnpike, Ravena, N. Y., as It Was.

Westerloo Turnpike After Elimination.

The Disgrace of Schenectady—Before Elimination.

Work in Progress on State Street Crossing, Schenectady.

Bloomfield Road, Ionia, New York.

Bloomfield Road—Present Ionia Crossing.

University Heights, N. Y. City—Before Elimination.

University Heights; Same Crossing After Elimination.

Gun Hill Road, Van Cortlandt Park, N. Y.—Before.

Gun Hill Road, Van Cortlandt Park, N. Y.—After.

Woodlawn, 233d Street Crossing, Before Change.

233d Street Crossing To-day.

Typical Eastern New York Crossing—Before Elimination.

Same Crossing, After Separation of Grades.

### Repairs to Wide and Narrow Fireboxes.

In an address before the recent convention of the Master Boiler Makers, Mr. James F. De Voy, the mechanical engineer of the Chicago, Milwaukee & St. Paul, gave some interesting data regarding the repairs required by wide and narrow fireboxes. From this it appears that in repairs the narrow box is the more economical of the two, especially in high-speed locomotives. Of 18 Atlantic type passenger locomotives built in 1896 to 1901, with the narrow firebox, four have had new door, flue, crown or side sheets; while of 28 Atlantic type with wide fireboxes, built in 1901 to 1903, each has had new door, flue, crown or side sheets, and some of these locomotives have had the sheets renewed as many as three times. For a period of one year we applied 140 staybolts to the narrow firebox engines, while for the same period 585 were applied to the wide fireboxes.

In one year seven arch tubes were applied to the narrow boxes, and for the same time 79 were applied to the wide boxes. In nearly every case where a new flue sheet, side sheet or arch flue was applied, the brick arch had to be destroyed.

In the case of freight engines with a slower speed than the Atlantics, the wide firebox shows up to better advantage. Sixteen 10-wheel freight locomotives built in 1900, with narrow fireboxes, are still running with their original boxes. Of 66 locomotives of this type, but with wide fireboxes and built from 1901 to 1903, 14 have had new door, flue, crown and side sheets. During a period of 1½ years, 152 staybolts have been applied to narrow boxes, 1,127 have been applied to the wide boxes.

For a period of one year, 14 arch tubes were required for the narrow boxes, while the wide required 72. In looking up the reports of leaky flues and staybolts, we find it is about one in the narrow to 10 in the wide box. A set of flues lasts nearly twice as long in the narrow firebox as in the wide.

In comparing the fuel consumption of the above freight engines doing the same work, and over the same division, it was found that for a period of three months the narrow firebox engine used 17.45 lbs. of coal per 100 ton-miles, while the wide box engines used 17.56 lbs., a saving of .11 lbs. per 100 ton-miles in favor of the narrow firebox. As regards comparative coal consumption, I believe a great deal depends on the fireman, who has to be more precise in the performance of his work with a wide firebox, because he carries a lighter fire, and any inattention on his part is liable to allow a hole to be burned in it, which will seriously effect the steaming. With the larger grate area there is more air admitted to the furnace than is necessary for proper combustion, and this, with a hole in the fire, would have a tendency to lower the temperature of the firebox gases and reduce the rate of evaporation, besides its effect on the flues and side sheets. We have found that firemen are more extravagant in coal consumption when firing wide fireboxes, and believe that a good many cases of leaky flues and cracked side sheets can be laid to the irregular firing in wide boxes.

I believe that the wide firebox is an essential factor in the large modern boiler of to-day, and has an important bearing on the ability of the boiler being capable of furnishing steam as fast as the engine demands it. In a boiler of about 3,400 sq. ft. total heating surface, with a wide firebox and a grate area of 51 sq. ft. the ratio of heating surface to grate area is 66.6 sq. ft. If the same boiler had a narrow firebox, the greatest dimensions we probably could make, it would be 41 in. wide by about 120 in. long, as the ordinary fireman could not throw the coal much more than 10 ft. This would give a grate area of 35.84 sq. ft., leaving a ratio of total heating surface to grate area of 94.8. This ratio taken from about a dozen of the latest designs of locomotive boilers shows an average of 65. So that were this boiler equipped with the narrow box, it would be a departure from all present designs, and would not supply sufficient heat to generate steam as fast as would be demanded by an engine that would require this size boiler. A moderately wide firebox, with flat firebox side sheets and wide water legs to admit of free circulation is what we are coming to. In the narrow box, where the fire is forced to its utmost, the flow of steam upwards in the water legs must be so great that there is not much water flowing down, so that most of the water coming into the legs gets in at the front, through the space between the flue sheet and outer shell, and if the water leg is made wide, this will greatly help the circulation and decrease the number of burned side sheets.

In certain designs of locomotives where the wide firebox is used a flue of 14 ft. or longer is necessary, unless the front flue sheet is set considerably back in the boiler, or a combustion chamber is used. Our records show that more leaks have developed from long flues than from short ones, and as the decrease in the efficiency of tube heating surface, taken from the back to the front flue sheet, is very rapid, probably a ratio of 10, there is nothing gained by the long flue, so that it would be better to put in a combustion chamber, or extend the back flue sheet forward until the proper length of flue is reached, as this would give a greater firebox heating surface, and is just where it will do the most good, since the firebox heating surface is exposed to the highest temperature and evaporates about 50 per cent. of the total. This combustion chamber would also keep the flues further away from the fire door and grates, and any cold air coming in through these openings would be heated to nearly the firebox temperature before reaching the flues. The influx of cold air against overheated flues and cracked side sheets, and the wide range of temperature to which flues are subjected loosens the circumference and draws them in and out longitudinally. A generous depth of throat should be given whenever practicable. In a shallow throat where the brick arch is supported on arch tubes, very little space is left between fire and brick arch, and in a sloping firebox the coal and clinkers have a tendency to work down in the corner and choke up. The deep throat also gives greater firebox heating surface.

The possibilities are that we will have a firebox which will be dropped still a foot further. It will go 36 to 38 in. below the throat sheet. In order to prove that that can be done, I want to say that the average wide firebox locomotive in the United States has a 36-in. wheel on the engine truck—for a trailer. There is no good reason why a wheel should be set up there and take away the space which you should have for heating surface. There should be sufficient room for the gases to mingle.

To-day a 21-ft. flue is being put in many boilers, and we are coming to a 24 or 35 ft. flue. It isn't the length of the flue that is causing the trouble, for a long one can be handled just as easily as a short one. If, however, there is an objection to this, the thing to do is to go back to the old combustion chamber and so shorten the flue by three feet.

### Demurrage and Private Sidings.

The Supreme Court of the United States has decided that a railroad need not send cars of bulk freight out of its possession that is to say, set them on a private siding—when demurrage charges are due, as the lien on the freight for these charges is the railroad's only security. This decision was in a case which came up in North Carolina, and the North Carolina Car Service Association has issued a pamphlet giving an account of it.

The Greensboro Ice and Coal Company had a private siding for the delivery of coal, and a dispute arose concerning demurrage charges on thirteen cars of coal and wood. The coal company refused to pay these charges, and the railroad (the Southern Railway) refused thereafter to deliver cars except on the public team track. Thereafter the coal company ordered four cars of coal from points in Pennsylvania, West Virginia and Tennessee. The coal company declined to receive the cars, except on its private siding. After about ten days the road placed these cars on a distant siding, to prevent unnecessary interfering with other business. The laws of North Carolina of 1899, chapter 164, and acts amendatory, prescribed penalties upon railway companies for violation of the rules of the Commission. The Corporation Commission, after informal correspondence, made an order for the delivery of the four cars of coal upon the private siding, to which the railway company excepted, and hearing was had before the Commission on December 10, 1903. At this hearing the railroad averred that there was $146 demurrage due on the cars; that this sum accrued under the Commission's rule No. 36 and that to force delivery would force the road to give credit and lose its lien. But the Commission sustained its former order. On January 5, 1904, a bill was filed in the United States Circuit Court to perpetually enjoin bringing of actions by the coal company and by the Commission to recover penalties or damages under the authority of the aforesaid statutory provisions, because of the non-compliance of the railway company with the order of the Commission. The railway company averred that it had a common defence, based upon the Commerce Clause of the Constitution of the United States, the provisions of the Act of Congress to regulate commerce, and the due process clause of the Constitution, and also because the Corporation Commission was an illegal body, as it was empowered to exercise judicial, executive and legislative functions, contrary to the Constitution of the State of North Carolina and of the United States. The Circuit Court decreed that the order of the Commission was repugnant to the Commerce Clause of the Constitution, and the defendants were perpetually enjoined.

The United States Supreme Court in its opinion held, first, that though the amount of demurrage charges may have been the origin of the litigation, yet the right of the railroad company to carry on interstate commerce in North Carolina without becoming subject to the orders or directions of the Commission and the right to carry on its interstate commerce, freed from penalties imposed by the said statute exceeded the sum of $2,000, exclusive of interest and cost and a much greater sum, and therefore removal to the Federal Court was proper. Second, that the suit was not one against the state, but against those assuming to act for the state, in violation of the rights of the railroad company, protected by the Constitution of the United States. Third, the four cars in question were the subject of interstate commerce.

The order of the Commission directly burdened interstate commerce, and is a regulation of interstate commerce that is repugnant to the Constitution of the United States.

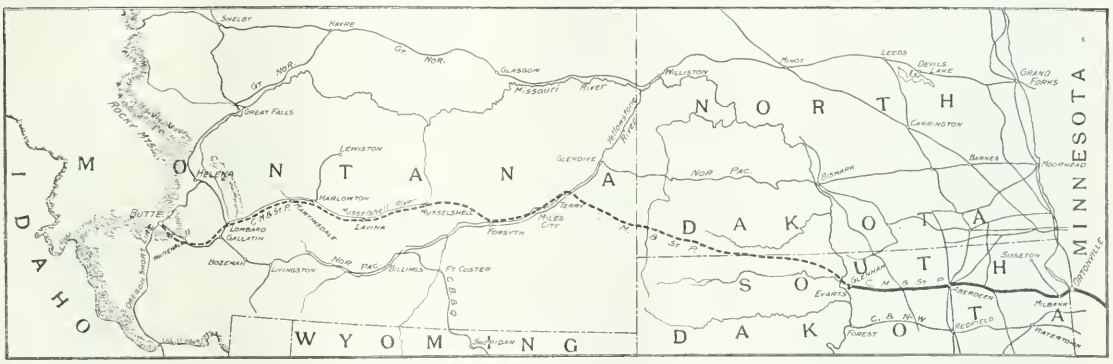
## The St. Paul's Pacific Extension.

The Chicago, Milwaukee & St. Paul has issued a map which shows in a general way the location of the portion of its new line to the Pacific Coast between Glenham, S. D., and Butte, Mont. Glenham is the last station but one on the Aberdeen-Evarts line, being eight miles north of Evarts. Crossing the Missouri River about 12 miles northwest of Evarts, the line runs northwesterly through the Standing Rock Indian Reservation, which is about 80 miles wide. It parallels the state line between North and South Dakota for a short distance, finally crossing into the former. The Little Missouri River is crossed about 10 miles east of the Montana boundary, the line continuing northwesterly to a crossing of the Northern Pacific Railroad and the Yellowstone River a few miles east of Terry, Mont. The objective of this portion of the line is Miles City and a more southerly route, approximating more nearly to an air line between Glenham and Mile's City, was considered; but the country to be traversed is quite rough, with high divides between north and south creeks, while the route chosen follows the direction of drainage into the Yellowstone.

The portion of the line east of the Yellowstone River lies from 40 to 60 miles south of the Northern Pacific. From its junction with the latter near Terry, to Forsyth, 85 miles, it parallels the Northern Pacific, following the Yellowstone, there being no other route possible, although it was preferred to avoid doing this had topographical conditions permitted. The line lies on the north bank of the river, except where it crosses to get into Miles City, which is to be a division point.

From Forsyth the line strikes northwest toward the Musselshell River, the valley of which is followed to a junction with the Montana Railroad at Harlowton. The C. M. & St. P. has a proprietary interest in this line and the portion from Harlowton to Lombard, already in operation—95 miles—will form a link in the new transcontinental line. Suitable revision of its grades is to be made and heavier rails laid. At Lombard the Missouri river is again crossed and the Northern Pacific is paralleled into Butte, the two lines crossing once more near Whitehall. Entrance to Butte will be through Pipestone Pass, at an elevation of about 6,350 feet. Three tunnels will be required, the longest of which will be about 2,400 feet.

The total length of the line to Butte is 731 miles. Work was begun in April and at the present time is being prosecuted quite generally along the entire route. Most of the work will be of heavy and difficult character, but it is hoped to have it completed by the early part of 1908. The largest river crossing will be the Missouri, at the eastern end of the line. The three Yellowstone crossings will be from 1,000 to 1,200 feet long, and the Little Missouri at Lombard 500 to 600 feet. No official announcement has yet been made regarding the remainder of the route to the Coast, but it is expected that this will be done shortly.




Map Showing the Eastern Part of the St. Paul's Pacific Extension.

## Tonnage Rating for Locomotives.*

As a basis for calculating the maximum rating we start out with a resistance of 5 lbs. per ton rolling or frictional resistance, 20 lbs. per ton of each per cent. of grade, and ½ lb. resistance for each degree of curvature, where the curves are compensated for 45 miles per hour speed. For the minimum rating we allow the same for grades and for curvature as with the maximum, but for the rolling resistance we allow 8.5 to 10 lbs. per ton, so with an engine of 40,000 lbs. tractive power, weighing 160 tons, we find on a one per cent. grade that it could pull 1,270 tons.

Another factor entering into the resistance column, very often the controlling one, is the wind resistance. This factor, I regret to state, has not been satisfactorily adjusted anywhere, although we all know that a quarter wind offers the greatest resistance. Still on account of the variety of cars composing the average freight train it is impossible to fix any set percentage of reduction. The writer had an experience which is a practical example of wind resistance. It was on a freight train in Western Kansas on a light grade. The wind was blowing about 25 miles an hour, but the train being protected from the full force of the wind by the bluff and foot hills, made fairly good speed. Upon running out into the open country and crossing a trestle where the wind had a fair sweep at the train the resistance was sufficient to momentarily stall the train. For a few seconds there would be a lull in the wind and the engine would make some headway until a stronger gust of wind would strike the train and the engine would stall again. This was repeated for at least five times in the distance of 200 yds. I fear this question of what practical reduction to make for the various winds will for years to come be left in the hands of the train despatcher.

Another factor which enters the resistance column is the temperature. In the extreme southern section of the country where the temperature is even throughout the entire year or never below the freezing point, it is not necessary to take into consideration the temperature, but in the colder climates where the prevailing temperature in winter is below the freezing point we find it is necessary to make considerable reduction. It is a custom of the western roads and some of the divisions on the Santa Fe System, to make a reduction of 10 per cent. between the months of November and April under favorable winter conditions. But it has been our experience for a frosty or wet rail to make a 7 per cent. reduction, from 32 deg. down to zero Fahrenheit make a 10 per cent. reduction, and from zero below to make a 20 per cent. reduction.

In addition to this we have another reduction which the writer thinks should be made, but at the same time it is a very delicate question, namely, the reductions on account of the condition of the engine. We feel sure that were any road to simply make a reduction on the condition of the engine, there would be a continual warfare between the mechanical and transportation departments, unless the condition be based on the mileage the engine makes and allowance for the time the engine has been out of the shop; nor are we aware of any road that allows any reduction to be made on account of the condition of the engine. We do believe, however, that the reductions should be made for the condition of the engine, that is the master mechanic and traveling engineer should say what is the condition of the engine, and each engine should be placed under a certain class or number of condition rather than the time that it has been out of the shop. The engines should be divided into three classes. If an engine is in good condition and good for maximum tonnage, call it A class; when she reaches a certain condition a reduction of 10 per cent. should be made. Call this class B, and then the third class with a 20 per cent. reduction, call C. After this the engine should go to shop, for it does not pay any road to keep an engine in service if it is necessary to reduce the tonnage below 20 per cent. of the regular rating.

Of course we realize the fact that it would be quite a task for the Master Mechanic to say why the engine is not in No. 1 condition. Until the roads adopt or the officials stamp their approval upon a scheme of this nature, tonnage rating will continue to have a disagreeable drawback.

Recent tests which the writer has made with cars equipped with ball or roller center and side bearings, proved that with the modern roller or ball bearing an increase of about 7 per cent. tonnage can be hauled over divisions having a number of curves; in other words, on a 6 deg. curve the engine could start fully 100 tons more in cars having roller bearings than in cars having ordinary slide bearings.

While in motion, a train moving eight or nine miles an hour

*Extracts from a paper presented to the Convention of the Traveling Engineers' Association, by F. W. Thomas, Eng. of Tests, A., T. & S. F. Ry.

on a tangent with the common slide bearing the speed of the train would reduce from one and one-half to two miles an hour when pulling around curves; with roller bearings the speed would be reduced only three-fourths to one mile an hour. This slight increase of speed would allow the train with the roller bearings to attain a higher speed on a straight track, pick up speed on short tangents, and approach the next curve with a greater momentum.

We all are aware that there are very few trains of the same number of cars and the same weight which will pull alike. The writer, when making some tonnage tests on mountain divisions, got along nicely with the maximum theoretical tonnage with one set of cars; but on the second trip with the same weather conditions, same engine, same number and class of cars, and with 50 tons less load actually stalled and was unable to pull the tonnage over the same territory.

We have always been able to pull nearer the maximum tonnage with compound engines than with the simple engines. It is our custom to give simple engines a lighter rating than compound engines. With the simple engines, when they stall it is a matter of doubling the hill; with the compound engines we always have the simpling lever to fall back on to tide us over the critical point.

There is one point in reference to tonnage rating that I wish to dwell on for a moment; it does not particularly injure an engine to pull her tonnage, although it is a little harder on the cylinder and frame to work at full capacity. At a speed of six to seven miles an hour it is not as hard as it is when running at a higher speed, for more power is developed at a higher speed (evaporation is greater, fuel consumption per hour is greater) than will be developed at seven miles an hour. The engine will burn more coal per hour when running at 15 miles per hour than when running at seven miles an hour. It is true the total consumption over a division is greater on account of her being on the road longer; but what does the injury is to have the engine out for such long hours—the engine crew becomes worn out, the water in the boiler becomes foul, the fire-box becomes dirty, causing an irregular steam pressure, resulting in leaky flues, etc. This one thing is more harmful to an engine than the fact that she is pulling heavy tonnage.

We advocate that where the division is 100 to 110 miles in length the full rating should be given the engine; but where the division is longer the rating should be decreased in consideration of the length of the division. Not a decrease proportionally, but decreased sufficiently in order that the total time over the division should be reasonably close to the time over the division 100 to 110 miles in length with full tonnage.

I regret that I cannot say which is the most economical rating to give an engine, as no test has been made of sufficient reliability to determine this question. It would require at least 18 months' time and considerable outlay of expense to determine the question, it being necessary to know the actual cost of hauling the freight and the same class of freight should be used in the test, as well as the same territory and the same class of engines. Comparison between two or more roads would not be of any value, because there are few roads that have divisions of the same lengths and grade and engines of the same class. A test could easily be made to determine what rating would be most economical as to fuel, for this could be made within a few days, but to determine the amount of repairs to the engine as well as ascertain the revenue derived from the train hauled, will, as stated above, have to extend over a period of at least 18 months.

The full engine rating can be hauled cheaper on a double track than it can be hauled on a single track; for where there is a road with sufficient business to move the engines on a tonnage rating basis there are always sufficient trains to cause considerable delays. However, a good deal of the expense of pulling in and out of sidings is eliminated by roads having two or more tracks.

We do think that on roads where traffic is sufficiently heavy to cause 25 to 50 per cent. delays in taking siding and getting orders, fully 10 per cent. reduction from the maximum rating should be made. Such reductions would enable the engine to make faster time between stations and consequently shorten the time that it would be on the road. We believe also that over divisions where the grades are undulating the engine should be loaded nearer the maximum rating than over those divisions where the controlling grades are 10, 15 and more miles in length.

On the undulating grades where the maximum pull is only three to four miles in length the momentum will enable the first mile to be covered in good time, and leave only two or three miles to be gone over with drag speed. Whereas, over the divisions where the grades are longer sufficient reductions should be made to enable the engine to go up these grades at a faster speed than the speed which she would otherwise make with the maximum rating.

In moving stock, vegetables, fruits and other perishable freight it is necessary to move this with despatch and with as little liability as possible from cattle shrinking in weight, or late in reaching market, fruit decaying, etc., else the loss will overbalance the extra revenue gained by hauling heavy tonnage. These are classes of freight generally moved at a set schedule and are hardly classed as tonnage trains.

## The Use of Concrete Piles.*

Though the use of wooden piles for foundation work is very extensive the constantly increasing cost, as well as the necessity that they be kept submerged, coupled with the danger from the teredo in some climates and countries, has rendered it desirable that a substitute should be found. Metallic piles may be made to answer but they are unreliable in the matter of durability.

On the other hand, reinforced concrete, with its power to resist the action of water and mechanical stresses, seems to be especially well suited for this work. It is quite true that the making and driving of such piles must be accomplished with great care, but the rules are now so well known that, with these observed, the piles can be depended upon.

The Hennebique pile resembles the ordinary concrete columns of the same maker, and is strengthened by round bars of a rather larger diameter with cross ties. The section is usually square or triangular and a metal shoe is provided at the point. The piles are driven in the same way that wooden piles are, and, like wooden piles, must be provided with a cap in order to transmit the blow of the drop. Their resistance to driving and their adherence to the soil is all that could be asked, but they are quite difficult to cut down when they are driven to refusal, because of the hardness of the cement and the presence of the metal reinforcement. Again, it is quite necessary that they should be made several weeks in advance of the time of using, in order that the cement may be given time to set; a requirement which, at times, may result in a delay in construction, and always in an increased cost. Once they have been made it is also almost impossible to

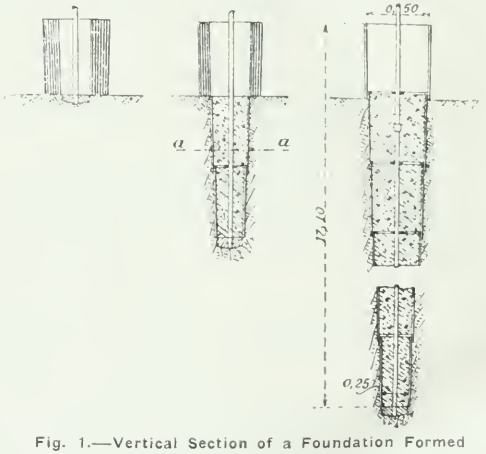



Fig. 1.—Vertical Section of a Foundation Formed on the Dulac-Compressol System.

lengthen them, for the transportation and the locating of the moulds is difficult and expensive while it requires a still longer time for the extension to harden.

The pile made by the Corrugated Concrete Pile Co. and that known as the Ferro-inclave are merely modifications of the Hennebique pile. Both are cylindrical or polygonal, with a large number of sides, and are slightly conical. The first is, however, characterized by the channels cut down each of its faces, whereby the friction of the pile against the earth is considerably increased; also by the fact that the main reinforcing bars are electrically welded to the circular ties, which are also peculiar in that they are formed of sheet steel bent in on itself and welded into a cylinder, of which the surface is bent into a number of corrugations. This method of reinforcement certainly ought to afford considerable resistance to lateral bending and insure a perfect union between the metal and the cement.

These two types of piles are usually made with a plate metal head, provided with a wooden striking piece, and are subject to the same objections cited in the case of the Hennebique pile. The first pile ever offered that was exempt from these disadvantages is the one used at the Exposition of 1900 for the foundation of the Creusot pavilion, and which was known first as the Dulac and then as the Dulac-Compressol.

Although the process is quite well known, it may be briefly reviewed. It consists in the use of a conical ram with a very sharp point that is driven directly down to refusal, thus making a cylindrical hole of its own diameter in any unstable ground in which the pile is to be formed. When the hole has been formed down to a solid layer, it is filled with concrete which is, in turn, compressed with another ram shaped like a rifle shell which tamps

*Translated from *Le Genie Civil* for the *Railroad Gazette*, by Geo. L. Fowler.

it and spreads it out laterally, thus enlarging the original hole by compressing the earth about it. In this way a sort of concrete pillar is formed, shaped like a truncated cone and standing on the solid ground, but with no reinforcement. The chief defect of this system lies in the large quantity of concrete that is used.

The next process, known as the Gow and Palmer pile, is a modification of the Dulac, and avoids this waste of the concrete. It is formed in soft earth by driving down an iron pipe, the in-

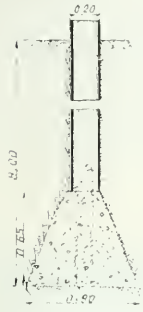


Fig. 2.—Gow & Palmer Pile.

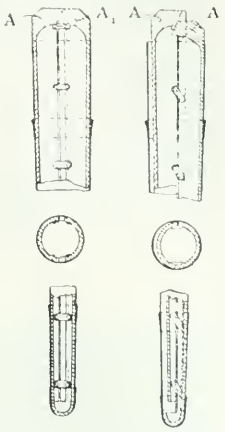



Fig. 3.—Mandrils for Forming the Raymond Concrete Pile.

side of which is kept empty by a stream of water under pressure, until it has reached the required depth. The pipe is then slightly withdrawn and a lozenge-shaped cutter is sent down to the bottom of the hole. By turning this tool and, at the same time, opening it gradually, the earth that is cut away may be removed by the current of water. In this way a hollow cylinder ending in an enlarged base is obtained. This is then filled with concrete and tamped. As the hole is filled the pipe is gradually withdrawn, so that at the end a true concrete column is formed in place and rests upon its own enlarged base.

If a reinforced column is desired it is merely necessary to put the necessary rods in the tube before the hole is filled in order to obtain a construction that can resist any lateral stresses.

The piles of the Raymond Concrete Piling Co., of Chicago, are built up in a manner similar to the preceding but without the en-

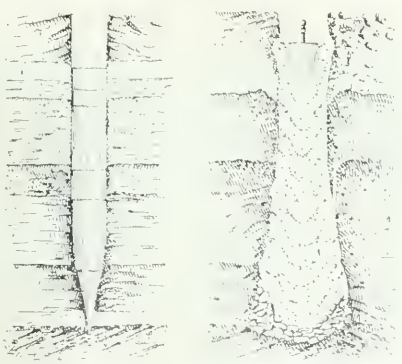


Fig. 4.—Raymond Pile for Soft Ground.

larged base. On the contrary, they are given a slightly conical form with the point downward, so that the pile is enabled to carry the load that is put upon it by the frictional resistance that is thus set up between its purposely roughened surface and the surrounding earth.

There are two forms of the Raymond pile. The first is ordinarily used in earth of a somewhat uniform consistency. In order to make these piles a mandril having the external dimensions and length of the pile to be set is driven into the ground by means of a drop. This mandril is divided longitudinally into two or three similar parts, immovable in the direction of driving, but fastened together by iron plates that can turn about their points of attachment, so that the several pieces can be displaced with reference to each other and thus change the diameter of the mandril. The latter is shown in the illustration. While being driven, the two halves are held with their heads AA (Fig. 3) flush with each other by a conical cap, so as to hold the mandril at its maximum diameter. When it has been driven to depth the cap is removed and a blow struck upon the head A with the drop, which drives it down with reference to A and thus lessens the diameter of the mandril so that it can be readily pulled out of the hole. The latter is, then, filled with concrete, tamped in place, and reinforced with steel.

To prevent the entrance of the earth into the mandril it is usually covered with a fender that protects the two halves in their working position. This consists of a thin sheet of steel fastened to one of them. This method of pile construction is especially advantageous where the pile is to be carried down through a water bearing stratum, for it is possible to cover the mandril with a metal shield, or even a simple paraffined cardboard, at the point where it passes through this stratum, which is driven down at the same time as the pile, and which can be left in the hole to shut off the water when the mandril is withdrawn.

In miry ground the Raymond pile is formed by filling a conical tube with concrete, this tube being formed of successive sections made of sheet steel and fastened like those of a telescope. The smallest socket at the center and bottom has a tube attached for carrying down water under pressure. This small shell is then gradually forced down to the required depth by cutting the ground away beneath it by means of the jet of water, the several conical sections being added successively, thus lining the hole, and they are filled with concrete as fast as they are put in position. The

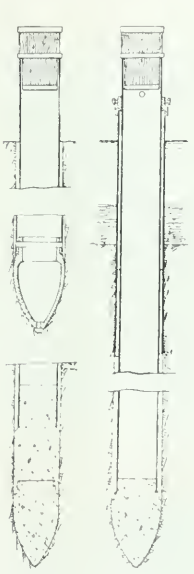


Fig. 5.—Simplex Pile with Steel Shoe.

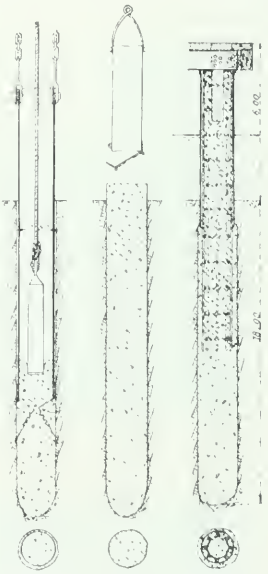


Fig. 6.—Simplex Pile with Alligator Shoe.

lining is naturally sacrificed by being left in place, nor can it be depended upon in the calculation of the strength of the pile, as it disappears very soon, but the central tube forms a true reinforcement.

The Simplex piles are made as follows: A shoe in the form of a rifle shell made of a steel casting or even concrete is set down in the ground. At the upper end there is a collar to which a tube is attached. The shoe is driven down by a drop striking on a wooden block set on the upper end of the tube. The tube is then gradually filled with concrete tamped in place as it is sunk. When the pile has to pass through a certain depth of water a pilot tube is first driven into the ground from which the water is pumped. The shoe and the tube which lengthens it are then put inside it. A tight ring is sometimes used at the upper end of the first tube, thus forming a stuffing box. In this way a cylindrical pile is formed that is perfectly homogeneous, presenting a roughened surface and one offering great resistance to movement.

In recent construction the Simplex pile has been made much less expensive by doing away with the metal shoe that is always lost, and which is high priced, and by using a special Alligator shoe. This is made of two half cones of strong sheet steel hinged to the end of the tube and each provided with a row of square teeth that mesh in with one another when they come together. In the driving position this cone is quite rigid and fulfills the functions of a shoe; but, when the concrete is dumped in and tamped, the two jaws of the Alligator open and permit it to pass so that the hole may be gradually filled as the tube is withdrawn. In this case the pile can be reinforced, but this is usually done only when

the upper portion is to form pillars projecting above the ground.

By the use of seven steam pile drivers 6,000 Simplex piles of about 20 in. in diameter and with a length of from 30 ft. to 50 ft. were driven for the foundations of the River Railroad Terminal Warehouse in 75 days, at the end of which time the erection of the steel framing for the building was begun, the caps connecting the heads of the pile and the anchor bolts having been put in as the piles were finished and became hard.

## Raising of Canal Bridge at Schenectady, New York.

On account of the abolition of grade crossings through the city of Schenectady, it was necessary for the New York Central to raise several existing bridges at this place. Chief among these was Bridge 381 over the Erie Canal. This is a modified Pratt, through riveted truss bridge of 162-ft. span, and is built on a skew of 35 deg. It is a three truss, transverse trough, ballast floor bridge and carries four tracks, two on each side of center truss.

At the east end of this bridge is Union street, a highway about at right angles to line of trusses. Three hundred feet west of bridge is another street.

The general plan for doing the work in this vicinity was as follows: Tracks 1 and 2, the two tracks which crossed the south half of bridge 381, were abandoned, all traffic being carried on the other two tracks. Then the concrete abutments of the new street bridges were built and the necessary fill was made to carry the abandoned tracks in their new proposed elevation. When this part was completed, the plan was to change traffic from the low to these elevated tracks, and then raise the low tracks to the new elevation. When the transfer was made the bridge had not been raised at all. The track to be placed to its new elevation, required a raise of 8 ft. at east end of the bridge. This could not be done at first on account of not allowing sufficient underclearance beneath portals and top of bracing. Six feet was the maximum raise possible, and this was given by carrying the two tracks across the bridge on cribbing. In building this false work, eight lines of 12 in. by 12 in. yellow pine were laid longitudinally along floor of bridge and arranged so that four would come under each track. This 12 in. x 12 in. yellow pine was in about 6-ft. pieces, placed under each bent, short pieces being used so as to save weight and time in handling when removed.

At intervals of about 10 ft. across the bridge and on these longitudinal pieces, bents were built by laying timber flatwise, one piece upon the other. Four pieces of 8 in. x 12 in. yellow pine were used, and one piece of 4 in. x 12 in. The top and bottom pieces were longer than the others in order that a track jack might be set in between. To carry from bent to bent, two 8 in. x 16 in. yellow pine stringers were laid under each rail. Seven-inch sawed track ties were used for the deck.

The approaches to the bridge were made on pile bent trestles. As before stated, this is a skew bridge, and in order to support the skew ends of the troughs when the bridge was being raised, lattice trusses were hung under each end of bridge parallel to the abutments and as close to them as possible. Two trusses were used at each end, lapping at the center. They were hung from the bottom chord of the trusses by heavy rods close to bottom of troughs, and the skew ends of the troughs wedged up on them.

In order to jack up the bridge, jacking beams were placed on each side of the shoe at each end of each truss. The bearing shoe is shown in Fig. 2. The jacking beams had a bearing on the bottom angle of the bottom chord. These jacking beams were built of 24 in. 100 lb. I-beams for center truss and 20 in. 85 lb. I-beams for outside trusses with cross diaphragms to prevent distortion. The beams were of sufficient length so that a jack could be placed under each end and clear the bottom of the shoe. An angle stiffener was placed at the point where the jack was to bear. The I-beam diaphragms were placed between these jacking beams and riveted to them, one in front and one behind the shoe. At two points where the end of jacking beam overhung masonry on account of the skew, the jack was placed under the diaphragm, which in these cases was made stronger.

Between top of jacking beam and bottom chord, three inch oak blocking was placed. Wooden struts were also driven between top and bottom angles of bottom chord to prevent bottom angles from bending.

The grillage for supporting the bridge when raised was composed of 10½ in. and 15 in. I-beams. These 15-in. I-beams were put up in sets of four each for outside trusses and five each for center trusses. A separator made by riveting two pairs of angles to a web piece so that it resembled a section of a girder, was placed between each two I-beams and bolted to them with four bolts at the center of the beams. Holes were drilled in both ends of each beam so that a long bolt could be run through and each set bolted securely together. Gas pipe separators were strung on this bolt between I-beams. These I-beam grillages were built to slip in between the jacks and the ends come even with the edges of the shoe.

To raise the bridge twenty-four Watson-Stillman hydraulic jacks were used, four jacks being placed under each truss end. One hundred ton jacks were ordered for the center truss and 60-ton jacks for outside trusses, although about one-half of the number furnished were 100-ton jacks.

Preparatory to raising the bridge, sufficient oak and yellow pine, ranging from 1 in. x 12 in. to 8 in. x 12 in., was cut up into about 5-ft. lengths, and piled up close by jacking points for following up as the bridge was raised. Two men were selected to work each jack, and four men to handle blocking at each point. About 30 men were stationed to take care of track. In raising, one end of the bridge was raised at a time. Blocking was kept close up under bottom of shoe, to prevent damage in case of a jack failing. As a rule, 8-in. lifts were made, but at times smaller lifts were made, depending only on the amount of time to work before throwing track in service for passage of a train. On the completion of a lift, ¼-in. plates were placed on top of the blocking, and eight iron wedges, four on a side, were driven in between the plates and the shoe. These wedges were 4 ft. and 5 ft. long, 4 in. wide and tapered from 1½ in. to zero. They were driven in with heavy mauls, the object being to force the blocking to a bearing and take part of the load off of the jacks so that if any failed to release at the signal, no damage would be done to them.

After each 15 in. of raise the bridge was supported on the jacks for several minutes while the blocking was removed and replaced by a 15-in. I-beam grillage. Bottom grillage was placed with I-beams transversely to line of bridge, the second parallel to line of bridge, and so on. The top grillage was of 10½ in. I-beams, and was parallel to line of bridge. As each grillage was on top of each preceding one, it was bolted to it at each corner by ½-in. bolts.

The grillages of the center truss were too heavy to be handled by hand, and so it was necessary to erect a gin pole with block and falls to raise the pieces. The grillages to the outside trusses were handled by hand.

As each succeeding lift was made, blocking was placed under the jacks until the bridge was raised enough to allow a 15-in. I-beam to be used. Then the blocking was removed and two pairs of I-beams were substituted. Each pair consisted of two I-beams

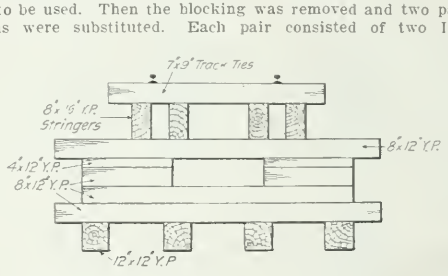



Fig. 1—Elevation Showing False Work.

somewhat longer than the grillage beams, so as to give a bearing for base of jack. Each pair had a 6-in. separator between. These were placed transversely to line of the bridge and parallel to the grillage, one in front and one behind the grillage, so that the base of the jack, when in position, had a good bearing. The long rods, which passed through ends of grillage, also passed through these additional I-beams, so that the whole was secured as one piece.

All of the transverse grillages had this same addition and were treated in the same way.

The longitudinal grillages had extensions for the jacks to rest on. Four pairs of I-beams 12 in. long were used for each grillage, each pair having a separator similar to those used in the grillages. Each extension was secured to the grillage proper by iron straps and bolts. As each piece was placed on top of each succeeding piece it was securely bolted at each corner to the bottom piece, as in the case of the grillage.

While a lift was being made, the gang in charge of the track were removing blocking from the bents supporting it, and shimming up the rack and stringers so that the track could be used as soon as a lift was completed. In all, the bridge was raised 7 ft. 2 in., and the raise was taken up by five 15-in. grillages and one 10½-in. grillage under each truss end. Forms were immediately built around these grillages and concrete and grout were run in. Masonry was then built up to its proper height.

As previously stated, the false work on the bridge was kept 2 ft. below the proposed elevation, because it was not possible to get under the top bracing with the tracks at the proper height. When all of the cribbing and false work had been removed from the bridge and the base of rail rested on top of the troughs, the track was given the remaining required raise with the bridge. In order to do this, it was necessary to raise the approaches at both ends. This was done on the west end by blocking up on top of the stringers of the pile trestle approach. On the east end, the framed bent trestle over Union street was jacked up bodily and blocking was driven under sills. This work was under the direction of G

Fig. 2—Shoe of Truss, Together with Bottom Angle of Bottom Chord.

Fig. 3—Wooden Struts Between Top and Bottom Angles of Bottom Chord. Also Oak Blocking on Top of Jacking Beams.

Fig. 4—Jacks and Grillages in Place. Also Iron Wedges Between Top Grillages and Shoe.

Fig. 5—Trestle Approach to Bridge.

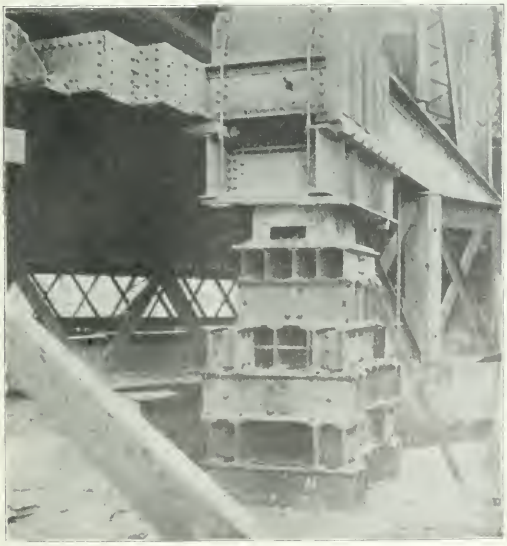


Fig. 6—Jacking Beams, Grillages in Place, and Trusses Supporting Ends of Troughs.

Fig. 7—Jacking Beams and Jacks in Position. Also Grillages and Trusses to Support Ends of Troughs.

W. Vaughan, Engineer of Maintenance of Way; A. W. Carpenter, Engineer of Bridges; C. E. Lindsay, Division Engineer, and N. W. McCallum, Supervisor of Bridges. The men worked ten hours per day, and two and one-half days were consumed in raising the bridge. Only one of the 27 regular trains which run daily within the ten working hours was held up or delayed. In addition to regular trains, it was necessary to clear up many times a day to allow yard pulls and shifting engines to pass. The work was completed without a mishap or accident of any kind. The total weight raised by the jacks was 1,100 tons.

## Organization and Construction Methods Used on the Ivorydale Shops of the C. H. & D.

The Cincinnati, Hamilton & Dayton Railway completed the first of the present year terminal locomotive repair shops at Ivorydale, seven miles out from its terminal station in Cincinnati, on the main line of the road. These shops are intended to supplement the main shops at Lima, and, though not a large plant, are thoroughly modern in every respect. The accompanying ground plan (Fig. 1) shows the layout and dimensions of the buildings, etc. The plans and specifications for the entire equipment, except the coaling station, were prepared by The Arnold Company, Chicago, and this company also had the contract for the entire construction, including buildings and equipment. Inasmuch as this plant is a fair example of a project handled entirely through both the stages of engineering and construction work by one concern, the description in some detail of the methods by which this was accomplished, both in the office and field, is of interest. The following is taken from a bulletin of this company, also containing a detailed description of the plant.

The Arnold Company was instructed by the railroad officials to prepare a detailed report upon the capacity of the buildings and the facilities to be provided throughout the plant. This was done after a preliminary study had been made by the railway officials themselves. As a basis upon which to work, The Arnold Company was furnished with a plat of the ground available, together with information regarding the number of locomotives and cars to be handled at this division point and the relation of their operation to that of the complete system.

As is often the case in connection with railroad shop construction, the amount of money provided for the improvement was found by the engineering department to be somewhat limited. This made it necessary to omit some of the more improved machinery that is available to-day for the class of work contemplated in the plant and to substitute other devices at a less cost. In other words, it became necessary to a certain extent to engineer around a fixed sum of money somewhat less than might be wished, and this necessity resulted in the adoption of certain special provisions for making running repairs on locomotives and for taking care of bad order cars.

With due consideration to the above points, a block plan of the buildings and yards was prepared providing the necessary capacity and also adapted to the physical peculiarities of the site. This block plan, together with a description of the proposed improvements and accompanying estimate of cost, were presented to the officials of the railway company at a final conference and their approval of the plans and estimates was obtained.

In preparing an outline of improvements and an estimate of costs for the improvement a classification of the work was made which served not only for the estimates but for all correspondence, requisitions, accounts, progress of work and completed costs. This classification covered all the material and work proposed in the improvement and served not only to guard against omissions in any part of the equipment at the time the estimate was made, but also to keep the records of the progress of the work complete under each section of the classification.

The work was taken up in the following order: Detailed specifications were drawn for each part of the plant and bids were received from outside sources upon the work, but the estimate which was furnished by the Arnold Company with the completed plans and specifications, and intended to represent the cost of the completed construction work, closely conformed to the consistent bids. It is generally conceded that it is better policy to place the contract for the entire work in the hands of one reliable concern than to let various parts of the work to different bidders, who, on this class of work, would aggregate a large number. The time required for the completion of a plant of this character is also largely modified by placing the control under one head. Each class of work follows in its natural sequence, and in a great many instances several classes of work are carried along together which under ordinary circumstances would follow consecutively. The necessity for early completion of the Ivorydale plant was so urgent that the railroad company considered it expedient to have the entire construction carried on by the Arnold Company, who planned the complete plant. They, being thoroughly familiar with all the requirements, were able to immediately place orders for the various materials and having available an efficient organization familiar with this class of work, were shortly ready to begin construction.

The rapid and efficient construction of the Ivorydale shops is due in no small measure to a few simple and direct principles governing the relation between the main and the construction offices. The construction office is advised as to the material ordered and as to the delivery of this material. The home office is advised as to the receipt of material on the job as well as to the progress of the construction work and any reports and advices as to the labor situation. To accomplish the former copies of contracts for apparatus and orders for material are sent to the superintendent in charge of construction. Such reports and orders contain exact information as to the material covered by them as well as to the time at which this

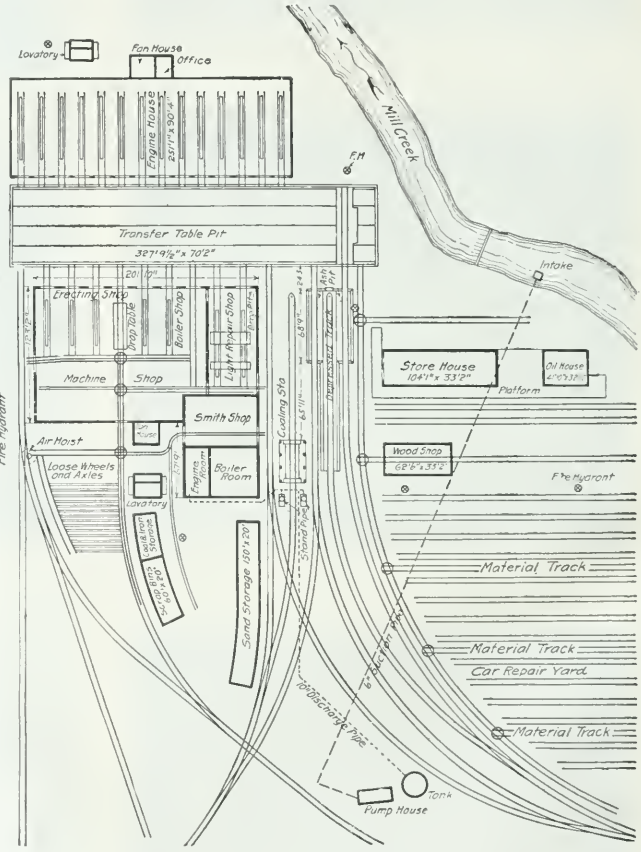



Fig. 1—Ground Plan of C. H. & D. Ivorydale Shops.

material is expected to arrive on the work. A card system, in which are entered all orders and contracts, is used in the home office and is designed to follow up and secure prompt delivery of material and apparatus. In case of any changes in time of delivery of material the construction superintendent is advised in advance, and is thus in position to make any changes necessary in his programme. The importance of promptly delivering the material on the job cannot be overestimated, and the value of a system that will provide for the delivery of the materials on the job in accordance with an approximate schedule previously arranged for will appeal to all interested in construction work.

Practically all of the material is ordered by the home office. In case, however, it is more advantageous to order small quantities at the seat of the work such orders are issued by the superintendent, a copy of all such orders being sent to the home office, after which they are recorded and handled in all respects similar to orders issued from the office. Records of all material received on the job are kept by the superintendent in the form of a material report. These

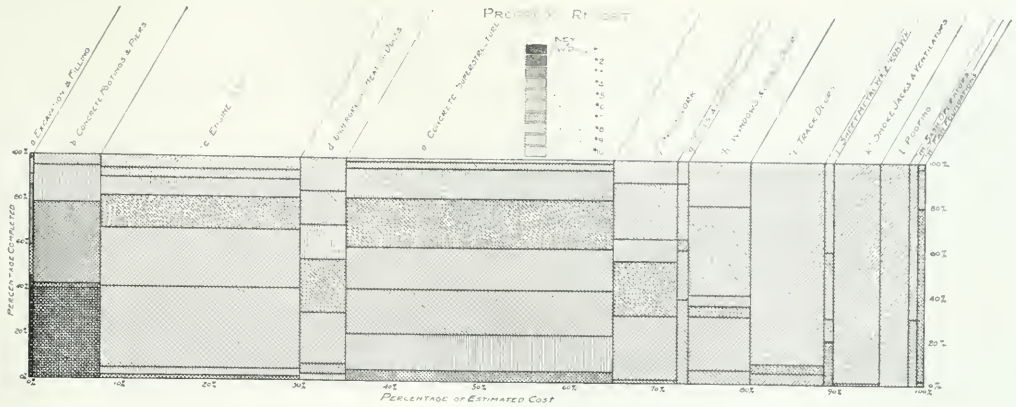



Fig. 2—Method of Reporting Progress of Construction Work.

reports are written out in a duplicate book as each shipment is received, and one copy is sent without delay to the main office. This serves to keep the home office very closely in touch, so far as the receipt of material is concerned.

In construction work consisting of a great many items, such as will be found in railroad shops, it is very desirable to know with a fair degree of accuracy the exact progress of the work. Certain lines of the work, such as the delivery and installation of machinery, are dependent upon the progress of other work such as the completion of the buildings and foundations. In order that such information may be always at hand progress reports from the work are received at stated intervals, usually two weeks apart, giving in detail the progress of the work under each classification head. This information is kept in form for convenient reference and is useful in a variety of ways. Not only does it keep the engineering force in touch with the progress of the work, making it possible to more efficiently make such provision as will insure the work coming in proper sequence, but also providing the information necessary to make decisions as to changes in detail, in case such are found necessary after the work has been begun. These progress reports, together with a record of moneys expended for material and labor at any date, give timely information as to the actual cost of the work as compared to the estimated cost. As such reports are made on the work under each classification heading, any variation of the cost from the estimate is at once detected. This is of importance to the contractor who proposes to complete a certain improvement within a definite estimated cost.

Wherever it is possible curves or diagrams are used to represent the condition of affairs of which record is to be kept. A chart showing the progress of the work on building construction is easily made and shows very clearly at a glance the exact condition of the work at any time. Such a chart is shown herewith (Fig. 2), which indicates the progress of the work on the engine house building at the time of completion. On this chart the base represents the total estimated cost and is divided into the various classifications covering the cost of this particular building. In this case these

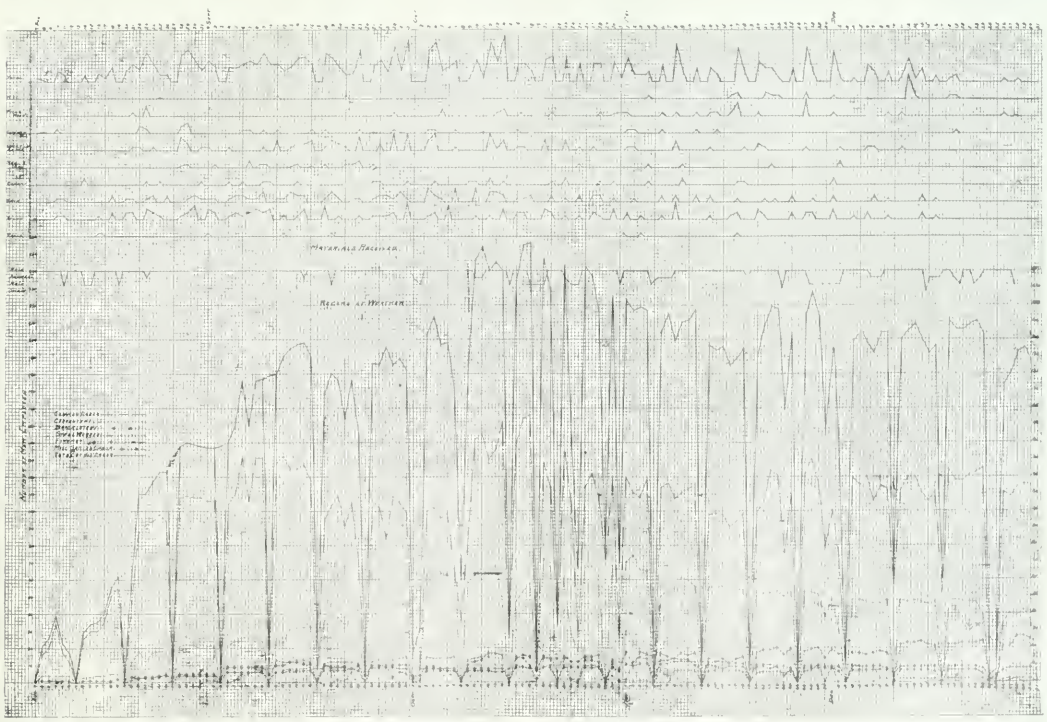


Fig. 3—Record Chart of Construction Work.

classifications cover excavation and fill (about ⅔ per cent. of the total cost), concrete footings and piers (about 6⅔ per cent. of the total cost), etc., the other divisions, such as engine pits, underground heating ducts, concrete superstructure, etc., making up the total cost of the building. At the end of each two-week period the total expense that had been incurred during the two weeks previous is plotted under each classification head, and this area on the chart indicated in such a way as to designate the progress made during the particular two-week period in question. A glance at the chart will show the total amount completed under each classification represented on the chart at the time the last entry was made, as well as the amount of work that was done under the various classifications during each period considered.

Moreover, it is at once evident that during the period of the fifth payroll nearly 40 per cent. of the work on the engine pits, 20 per cent. of the concrete superstructure, 2 per cent. of the brick work, 40 per cent. of the sills and coping, 6 per cent. of the windows and small doors was completed, and no work was done on the sheet metal and iron, none on track doors, smoke jacks and ventilators, none on the roofing and none on the sash operators and foundations. In other words, these progress reports become the graphical history of the job. After having made out the necessary reports covering both the material and the labor that have been used on the work, it is a very simple matter to embody these results in a chart. A copy of this chart is then sent to the main office where it remains until the time for the next report, at which time it is sent back to the job for the additions that have occurred during the period.

In addition to these some other curves showing the progress of the work are shown (Fig. 3). These contain in graphical form a record of the number of workmen employed on the work at all times, together with information as to the number of carloads of material received, the weather conditions and other matters of interest. It will be seen that within three weeks after construction work was started about 125 men were at work on the job, and this number was increased at the end of the fifth week to about 200 men, at which point the working force remained constant until very nearly the completion of the work.

Progress photographs are taken of the work at stated intervals, in the case of the Ivorydale shops about two weeks apart. These show at a glance not only the general progress of the work, but many construction details as well which are of interest and value. These photographs are of a standard size and mounted on cloth so as to be bound in convenient form for reference. All the reports just referred to, viz.: the progress reports, charts and diagrams, while very easily obtained and requiring but little work in their preparation, supply a great deal of valuable information, and are of worth far exceeding the trouble and expense contracted in securing them.

Although every facility is provided for keeping the main office and the construction office in close touch, it should not be understood that the engineering is done at arm's length, and that all plans and specifications are devised and completed by an engineering force in the office, to be sent down to the construction superintendent on the job for his execution. A competent engineer is in charge of all construction work and spends a certain amount of time in the field, thus putting him in close touch with the situation and enabling him to more efficiently direct the detailed engineering work that is done in the main office.

The salient features in the method used by the Arnold Company for handling a proposition such as the Ivorydale shops, when briefly stated, are as follows:

(a) A general survey of the improvement proposed, together with data from the railroad company as to the facilities and functions to be provided in the improvement, and as to the amount of money available for the improvement.

(b) A complete report upon the plant proposed, together with an estimate of cost; such report and estimate to be approved by the railroad company's officials. This estimate is subdivided in accordance with a predetermined classification, which classification will be adhered to throughout the progress of the work.

(c) The preparation of detailed specifications and plans covering the entire work to be submitted to the railroad company for their approval.

(d) The purchase of all material and the organization of the necessary force required for the construction of the complete property under one head.

(e) The prosecution of the work under the direction of one responsible engineer, and the use of a system which keeps the main and construction offices in close touch during the progress of the work.

(f) The furnishing to the railroad company of a complete installation in accordance with their definite requirements, and at the same time relieving them of all detail work in connection with the improvement. In short, allowing them to contract for a complete plant to perform a definite service, rather than necessitating their entering into a large number of contracts for various parts of the plant and assuming the responsibility and detailed work incident to bringing these separate contracts together as a completed whole.

## Status of M. C. B. Standards for the Protection of Trainmen.

The results of the letter ballot of the Master Car Builders' Association on matters referred for such action at the last convention have lately been announced by the Secretary and show that subject No. 4, "change in text relating to handholds," was rejected, while No. 5, "location of handholds on roofs of box or stock cars," was adopted. From the foregoing results, and from correspondence received from members on various phases of the subject, it was plain to the Committee on Revision of Standards and Recommended Practice that the standards for protection of trainmen were in an unsatisfactory state, and an immediate investigation of the matter was decided on. A careful examination has therefore been made and an analysis and recommendations prepared for submission to the Executive Committee of the Association, suggesting that early consideration be given the matter. Through the courtesy of the Chairman of the Committee on the Revision of the Standards and Recommended Practice, Mr. T. S. Lloyd (C., R. I. & P.), we are permitted to print this report and recommendations to the Executive Committee. The matter was also presented to the September meeting of the Western Railway Club on Tuesday of this week by Mr. C. A. Seley (C., R. I. & P.), who made the investigation for the committee. It is desired by the committee, and the Secretary of the Association, that all other railroad clubs take up the subject at an early meeting and discuss it thoroughly. The report is as follows:

In view of some uncertainty in interpreting the M. C. B. standards for the protection of trainmen, as noted in some recent correspondence, particularly in reference to the application of steps and handholds, consideration is respectfully desired of the following argument.

A general examination of the standards of the M. C. B. Association for the Protection of Trainmen shows a number of inconsistencies, as between the written text and the drawings on M. C. B. Plate 19, these discrepancies running back for several years in some instances. The earliest action of the Association in reference to this matter was taken in 1888 but this was considerably amplified and made Recommended Practice in 1893. In the 1896 Proceedings is found the basis of present practice. A special committee of 11 members, under the direction of the Executive Committee, presented a report that was embodied in circulars sent to all members for an informal ballot. (See 1896 Proc., pages 463-6.) The formal report of this committee, made at the convention of 1896 (see Proc., pages 304-311 and 328-335) with some slight subsequent modifications has been recognized as conforming to the intent and purpose of the law as expressed in the Safety Appliance Acts.

In 1902, by letter ballot the matter was advanced from Recommended Practice to Standard Practice. In 1905 Plate 19 was revised, adding notes, etc., but no change of the text was authorized. In 1906 the Committee on Standards recommended some changes of text which were discussed and referred to letter ballot, but the result of this ballot has been to defeat the proposed changes of text and the entire matter is therefore as shown in the 1905 Proceedings, as regards text and drawings, except the change of position of roof handhold, which has carried in the ballot and is included in this argument.

The idea of the Interstate Commerce Commission in reference to this matter, as explained by the Chairman of the Committee on Standards (see page 94, 1905 Proc.) is "to have grab irons on all cars in a common place, that is, regardless of whether it is a flat car, a gondola or a box car, that the trainmen may expect to find a grab iron in a certain place on any car." This should also apply to steps and the principle expressed should rule on all cars which may be considered regular equipment.

Cars which may be classed as "special equipment" may require a modification, but these cars should have the regular equipment of steps and handholds common to their general type, and may have such additional equipment of steps and handholds as their owners may deem necessary as a measure of safety. The Safety Appliance Acts do not specify the number and location of handholds, and it has been repeatedly stated that the practice and standards of the M. C. B. Association are the guides of the Interstate Commerce Commission's inspectors in enforcing the law. The "law," in this connection, and as referred to in Rule 39, is therefore the standard practice of the Association and should be clear and unmistakeable.

In endeavoring to arrive at conclusions in regard to each point, this analysis will give prior authority to the written text in case of disagreement between the text and the drawing, believing that the expressed intention should rule rather than one implied by drawings that can be variously interpreted. This is in accordance

with a well-known principle of law which cannot be successfully disputed.

As regards the matter of steps, the paragraph having that caption is considered authoritative regarding the number of steps on cars. In part this reads, "Two substantial steps . . . to be fastened, one to each side sill, next to the corner of the car to which the ladder is attached, on cars having ladders, and to diagonally opposite corners on all other cars . . . etc." The omitted and remaining portions of this paragraph do not modify these fundamental principles, which appear in the Proceedings back for several years. Nothing inconsistent therewith is found in the section under the caption of handholds, if reference to the drawings is omitted. It is a fact, however, that the drawings as shown on Plate 19, ever since 1896, do not agree with the text and a number of changes were made in the 1905 sheet which are not included or explained by the text.

Back of 1905, the cuts show steps on both sides of the same ends of drop end gondolas, tank and flat cars, whereas they should be shown only on left-hand side of end as on box, stock and fixed-end gondolas. These views are plainly intended to show one end only in each view, and to be consistent with each other and with the principle expressed as to the number of steps on cars, they should have been eliminated.

The 1905 revision of Plate 19 adds a lot of text to the views evidently intended for explanation, but some of it is manifestly not in accord with the authorized description, pages 456-7-8. Prior to 1905 the car views were marked A1, A2, A3, etc., but these designations are omitted in the 1905 Sheet 19, and as the views are still described in the text by these symbols, it would seem as though the Sheet 19 of 1905, as regards standards for the protection of trainmen is completely invalidated, or at least very incompletely supplements the authorized text.

This sheet, however, was submitted as a part of the report of the Committee on Standards, was received and ordered submitted to letter ballot, was passed by a large majority and is therefore a standard, in so far as it is consistent with the description. It was repeatedly stated in the discussion of the committee report (pages 91-101) that the changes of the drawings were merely the addition of explanatory notes and of cuts of a high-side gondola, not before shown. The committee's report also included the following: "In the construction of special equipment, grab irons or handholds should be placed on both ends of the car; sill steps and ladder rounds at the B end of the car. If the construction is such as to add an element of safety, they should also be placed on the right-hand side of the A end of the car." Inasmuch as the foregoing has to do with "special" equipment which has already been considered in this argument, as there is no authoritative ruling as to what may be considered special equipment, and as there has been no provision for the incorporation of the committee's recommendation in the descriptive text, either at the 1905 or 1906 conventions, a new paragraph is hereinafter proposed in lieu thereof, to be inserted in the descriptive text.

In discussing this matter with the Secretary of the Association he suggests that if revision of sheet 19 is made, that the entire sheet be given up to this subject, and other matters shown thereon be transferred to some other sheet; also that the views be made larger and clearer, and that the sides at both ends be shown instead of showing only ladder ends.

It is believed that for consistency, to have plate M. C. B. 19 properly represent what is described and to have the description agree with the plate and also include what is not now included, although common and general practice in some respects, that the text and the drawings should be changed at the earliest possible moment, in view of the importance of the matter to the railroads as regards their relation with the Interstate Commerce Commission, and also to establish a safe and readily understood instruction. To that end the following suggested revision is submitted for your consideration.

PROTECTION OF TRAINMEN.

SHEET M. C. B.—19.

Introductory paragraphs (1) (2) O.K.

*Position of Brake Shafts.*

O. K. (The word "about" being put before "20 inches" in last line, in accordance with action last year. Also add "Proc. 1905 and 1906.")

*Running Boards.*

Owing to the abolition of buffer blocks in 1904, reference to them in this paragraph is improper. It is proposed to eliminate the words, "so that the end of running boards shall not be more than 6 inches back of face of buffer block." It is suggested that location of end of running board be referred to a committee at the next convention.

*Steps.*

O. K.

*Ladders.*

First four lines—O. K. The semicolon after the word "Car" to be changed to a period and the balance of the sentence changed to agree with the action of the 1906 convention, as follows: "Car. Each car to have a handhold on roof directly over top of ladder and running parallel with the side or end of car on which the ladder is located; these handholds to be placed about 15 inches from the edge of the car and of a length suitable to the construction of the car." Last sentence, "When iron ladders are used and placed," etc., (lines 8 and 9) O. K.

Proceedings 1902, 1905, and 1906.

*Handholds.*

First paragraph O. K. (Reproduce drawing as in 1905, except roof handhold, which should be parallel with end. Notes are O. K. Mark A—1.)

Second paragraph, O. K. (Reproduce drawing as in 1905. Mark A—2.)

Third paragraph, O. K. (Reproduce drawing as in 1905, except roof handhold, which should be parallel with end. Notes are O. K. Mark A—3.)

Fourth paragraph. The language of the fourth line, in reference to end grabirons being two on right side of end, is manifestly wrong. It is proposed to revise this to read same as the second paragraph in this respect and as shown on drawing A—2 and A—4, the revision being as follows: First two lines and to period in third line, O. K. Next sentence to read, "They should also be provided with two horizontal grabirons or handholds about 24 inches long on each side of end of car, not less than 18 inches," etc., etc. Balance of paragraph O. K. While this is the language that has prevailed for years in the second paragraph, and is generally understood to mean, located "one" on each side of end, the word *one* is not used although it would make it clearer.

(Reproduce drawing 1905. Mark A—4.)

In order to authorize and use the note under box and stock car views A—1, A—2, A—3, and A—4 of sheet 19, a new paragraph is proposed, to follow the fourth paragraph on handholds, as follows: "All other classes of house cars, such as refrigerator, furniture cars, etc., if constructed with projecting end sills, are to have ladders, sill steps and handholds as described for box and stock cars, and as shown in Fig. A—1 or A—2. If not constructed with projecting end sills they are to have ladders, sill steps and handholds as described for box and stock cars, and as shown in Fig. A—3 or A—4." (Reproduce note.)

Fifth paragraph, O. K. (Reproduce drawing as in 1904, omitting step on right side, omitting coupler. Show deadwood and uncoupling rod as left-hand grabiron. Make title as in 1904.)

Sixth paragraph. It is believed that paragraph six should be revised by leaving out the words "high side" in the first line. Paragraph five refers to "all gondolas with drop ends" and if paragraph six could be made to read "all fixed end gondolas," more inclusive language would be used and the situation made clearer. It is thought best to suggest authorization as an alternate, the use of a suitable number of horizontal handholds on the sides of high-side gondolas, the argument being that it presents the same arrangement as on box and similar cars.

The original paragraph authorizes the side, vertical handholds which are not shown on the 1905 sheet, although so shown in former years to 1896, and it is believed that this should be restored. The committee report on the recommended change of text also cuts out the use of brake-step bracket as a handhold. This is a change of practice heretofore authorized for many years and should be retained.

Attention is called to the language of the last five lines of paragraph six, as being recommendatory rather than mandatory as to necessity for the end vertical handholds. If the alternate plan of using the horizontal handholds is contemplated, the end vertical handholds may be deemed unnecessary, and they have been omitted in the suggested revised drawing. This is in accordance with the 1906 sheet which shows the horizontal handholds and is consistent with the text as to mandatory requirements. It is therefore proposed to have the sixth paragraph read as follows: "All fixed-end gondolas should be equipped with a vertical grabiron or handhold over steps on the sides of the car, about 24 inches long, the lower end to be placed about 6 inches above the floor of the car; or with a suitable number of horizontal grabirons or handholds, about 24 inches long, over each step: and two horizontal grabirons or handholds on each end of car, about 24 inches long, 4 inches from the outside of car and not less than 18 nor over 30 inches above center line of drawbar; exception to be made where the car is provided with a brake step, in which case the bracket of the brake step can be used as a grabiron on that side of end of car, as shown on Fig. A—6, Sheet M. C. B. 19. "It is also recommended that, etc., etc.," and last four lines, O. K. (Reproduce drawing A—6, as in 1904, omitting coupler and right-hand side handhold. Add alternate low side car, omitting brake step, showing two end handholds. On high-side car omit platform on side view, show brake step. Also show alternate high-side car, showing same as B end on 1905 sheet, but omitting the top handholds and the handholds and step on right side. Show brake step. Title as in 1904.

Seventh paragraph, O. K. (Reproduce drawing as in 1905, but omit steps on right side of end views. Notes, O. K. Change title to read "Tank Cars, A—7."

Paragraph eight. The section on Steps requires two steps on all cars, but the present language of the eighth paragraph implies that some flat cars have none. It is thought wise to recommend revision of this paragraph, eliminating the words "and if not equipped with steps," etc., so that the arrangement common to gondolas and other cars will also be applicable to flat cars. The revision recommended is as follows: "All flat cars to be provided with horizontal grabirons or handholds, about 24 inches long, over steps near end of car where coupler unlocking rod is located, and two end grabirons or handholds, about 18 inches long, etc., etc., lines 5, 6, 7, 8 being O. K. (Reproduce drawing as in 1905, except last end view, which should show uncoupling rod and deadwood, one step only on left side, two handholds under end sill. Notes, O. K. Make title "Flat Cars." A8.)

It is proposed to introduce a new paragraph following the eighth, which shall cover the general question of handholds on regular and special equipment, as heretofore referred to, reading as follows: "Cars of other types of construction, not covered specifically in foregoing paragraphs of this section and not shown by the drawings on M. C. B. Plate 19, Standards for the Protection of Trainmen, may be deemed of special construction, but shall have the complement of grabirons or handholds and steps and ladders as is required for cars of the nearest approximate type, and such handholds shall be considered as required by the Rules of Interchange."

Paragraph nine, O. K.

Paragraph ten. This paragraph is not consistent with foregoing paragraphs in reference to special clearances. The paragraph on Ladders specifies a clearance of 21½ in. Paragraph five, of the section on handholds for drop-

end gondolas specifies a [illegible] clearance for the handholds on underside of end sills. Paragraph seven [illegible] tank cars, and paragraph eight, on flat cars, specify these under end sill handholds 'same as for drop end gondolas," which would carry the idea of a ... in. clearance. It is proposed, therefore, to change the paragraph so as to define the clearance in accordance with foregoing specifications, as follows: Handholds on face of end sills should have at least 2 inches clearance behind them, and all other handholds should have at least 2½ inches clearance behind them, except grabirons or handholds located on underside of end sills, which should have a space not less than 3 inches between them and the end sill."

Paragraph eleven. This paragraph is not consistent with foregoing paragraphs relative to end handholds on gondola, flat and tank cars, where grabirons or handholds 18 inches long are permitted, although a greater length may be possible. It is proposed therefore to revise this paragraph, and while doing so it is thought wise to include and validate the quite general custom of using the uncoupling rod as an end sill grabiron, when it has the proper clearance behind it as required by the preceding paragraph. Revised paragraph eleven is proposed as follows: "All handholds should be made of iron not less than ⅝ inch diameter: handholds on sides and ends of cars should be about 24 inches long in the clear, except end sill handholds, which may be from 18 to 24 inches long: provided, also that the coupler unlocking rod, if properly located and having 2 inches clearance between it and the car, will be a suitable end sill grabiron or handhold."

Paragraph twelve: Add "Proc. 1905, 1906."

## The Ventilation of Tunnels.*

In 1904 the writer presented to the International Engineering Congress, Paper No. 43, on the "Ventilation of Tunnels." Since that date improvements have been made in some of the tunnels and subways referred to, which are worthy of note, and the writer has obtained certain additional data, as to the condition of the air in some subways and tunnels in Europe, which are valuable for comparison in determining good practice.

*Gallitzin Tunnel.*—The ventilating plant at Gallitzin Tunnel, west of Altoona, on the main line of the Pennsylvania Railroad, was referred to in that discussion as being of the same type as that of the Elkhorn Tunnel, on the Norfolk & Western Railway, and as being practically completed at the date of the discussion.

This ventilated tunnel is 3,600 ft. long, and is built for a single track, being 17 ft. wide and 20 ft. 5 in. high, and is lined with concrete. Its sectional area is 324 sq. ft., and the cubical contents of the whole tunnel are 1,166,400 cu. ft. There is an ascending grade of 0.5 per cent. from the east end through the tunnel, but the east approach is on a heavier grade, so that westbound freight trains generally have a pusher engine at the rear of each in passing through the tunnel.

The accompanying drawing shows the general arrangement of the ventilating plant and all important details, its location being at the east or lower end of the tunnel.

With fans making 145 r.p.m. the observed flow of fresh air through this tunnel from east to west is at a velocity of 1,780 lin. ft. per min., equivalent to 576,000 cu. ft. per min. As usually operated, these fans make 130 r.p.m., while freight trains are in the tunnel, and the velocity of the air in the tunnel is 1,550 ft. per min., which results in 502,000 cu. ft. of fresh air being delivered through the tunnel each minute. With the fans running at this speed, the tunnel is cleared directly after the exit of a westbound train. Excepting when freight trains are in the tunnel, the fans run at from 40 to 60 r.p.m.

There are, as shown, two 8 x 16-ft. fans, one on each side of the track, each operated by a direct-coupled engine of about 200 h.p., the total rated horse-power of the plant being 400. This ventilating device was put into regular operation in April, 1905.

*St. Clair Tunnel.*—The St. Clair Tunnel, on the Grand Trunk Railway, with its insufficient ventilation, is described in the *Transactions* of the American Society of Civil Engineers, Vol. LIV., Part C, p. 529.

On Oct. 9, 1904, six employees of the railroad were killed in this tunnel by gas and smoke from a locomotive while necessarily standing in the tunnel on account of a break-in-two of a train. This accident is fully described in the *Railway and Engineering Review*, Oct. 15, 1904.

In lieu of installing a system of ventilation, the Tunnel Company has during this year contracted for the electrical operation of this tunnel by methods described in detail in *Engineering News*, Jan. 18, 1906.

This will remove all danger from such causes, and very greatly reduce the discomfort of persons in the tunnel; but, nevertheless, in the future some means of artificial ventilation may be found desirable, as in the case of the Mersey Tunnel, Liverpool.

*Park Avenue Tunnel, New York City.*—The work of providing for electrical operation, which was undertaken partly for the purpose of improving the ventilation, is rapidly progressing. The reasons given are, briefly: Improvement of ventilation, greater safety in operation, and increased capacity.

*Simplon Tunnel.*—This tunnel, which is 12.33 miles long, and is constructed for a single track, with one passing siding at the center, was completed early in 1906, and was formally opened on May 19, 1906. When the writer visited this tunnel, in the summer of 1905, a steel sliding door at each portal was arranged so as to be raised and lowered by electric power. The plan at that time was to lower the steel door after the entrance of a train and to force fresh air from the fans at that end of the tunnel into and through the tunnel with considerable pressure. The adoption of electricity as the power for handling trains through this tunnel has greatly simplified the problem of ventilation.

*The St. Gothard Railway Tunnel.*—This steam-railroad tunnel is 9.3 miles long, is located on light grades, and is double-tracked. It has a large section, the area being 603 sq. ft., or approximately 3.2 times the area of two trains occupying the tunnel section. The cars of trains while in the tunnel are lighted by gas.

This tunnel is ventilated by a Saccardo plant, at Goeschenen, at the north end of the tunnel. It consists of two large fans operated by water power. Ventilation is secured by reducing the area of the tunnel section by about 38 per cent. near its northern end. For comparative purposes, a sample of air was taken by the writer from a car of a northbound train, running 30 miles per hour, at a point about three miles from the south end. The temperature was 82 deg. Fahr., and the air contained 10.19 parts of carbonic acid gas per 10,000 volumes. The measured quantity of fresh air which the writer found to be passing into the north end of the tunnel from the ventilating plant was 413,000 cu. ft. per min. at a velocity of 686 ft. per min.

Special attention is called to the large area of the tunnel section relatively to the cars used, and the consequent small velocity and volume of fresh air used in ventilation. The other favorable condition in this tunnel is the light grade throughout its length, so that the coal consumption of locomotives while in the tunnel is kept low. At the measured velocity of the ventilating air current, a period of 1 hr. and 12 min. is required to change the air in this tunnel.

*The Berlin Elevated & Electric Railway.*—This electric railroad is largely above ground, but there are short sections of subway, having a rectangular section of about 231 sq. ft., in which single span there are two tracks. The stations are roomy, and each is provided with two large stairways leading directly to the surface, thus insuring fair ventilation. The air in these short subway sections was noted by the writer as being good.

*Metropolitan Railway, Paris.*—The Metropolitan Underground Railway of Paris is a double-track arched tunnel, nicely lined, and built as close to the surface of the streets as practicable. It is electrically operated. The stations are comparatively close together, averaging less than 1,700 ft. apart. The two tracks are in one span, the area of the tunnel section being 315 sq. ft. This section is greatly enlarged at each station, thus providing in one span ample room for platforms. The area of the tunnel is approximately twice that of the two trains occupying the tunnel section.

This railroad is specially notable for the large tunnel section, roomy stations at short distances apart, and the provision of two large stairways at each station, giving good direct outlets for ventilation. Two short portions of two lines of this road were examined by the writer. A sample of air taken at 7.40 o'clock on a bright morning, from a Metropolitan Railway car, between Palais Royal and Alma Stations (between which there were five stops at intermediate stations), temperature 70 deg. Fahr., contained 2.94 parts carbonic acid gas per 10,000 volumes of air, the outside air at that time containing 1.76 parts.

*The Mersey Tunnel, Liverpool.*—This tunnel is two miles long, has a section of about 425 sq. ft., and is provided with two tracks. It is now electrically operated, and is well ventilated by large fans. The air in this tunnel is now good. A sample taken by the writer from a car in this tunnel, July 24, 1905, contained 4.70 parts of carbonic acid gas per 10,000 volumes.

*The District Railway, London.*—The District Railway is a double-track subway, with its grade level generally as close as practicable to the streets above it, and with frequent openings to the surface, in addition to having stations approximately one-half mile apart. It is operated by steam, but it is being gradually electrified, primarily to secure better ventilation.

For comparative purposes, the writer quotes a test, made in 1902 for the London County Council, which showed that the air in a car contained 15.1 parts of carbonic acid gas per 10,000 volumes. A sample of air taken from a District Railway car by the writer, between Mansion House and Temple Stations, on a fair day, June 27, 1905, at 4.25 p.m., temperature 76 deg., contained 11.27 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing 3.55 parts.

*Metropolitan Railway, London.*—The Metropolitan Railway is similar to the District Railway in construction and operation, and is also being gradually electrified, for the same reasons.

A test made in 1902 for the London County Council showed that

*A paper presented before the American Society of Civil Engineers, Sept. 19, 1906, by Charles S. Churchill, Chief Engineer, Norfolk & Western, and printed in the *Proceedings*, Vol. XXXII., p. 440.

the air in a car on this road contained 28.8 parts of carbonic acid gas per 10,000 volumes. A sample of air taken from a Metropolitan Railway car by the writer, between Gower street and Portland Road Stations, on a very clear day, July 24, 1905, at 12.40 p.m., temperature 74 deg., contained 14.07 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing only 1.75 parts.

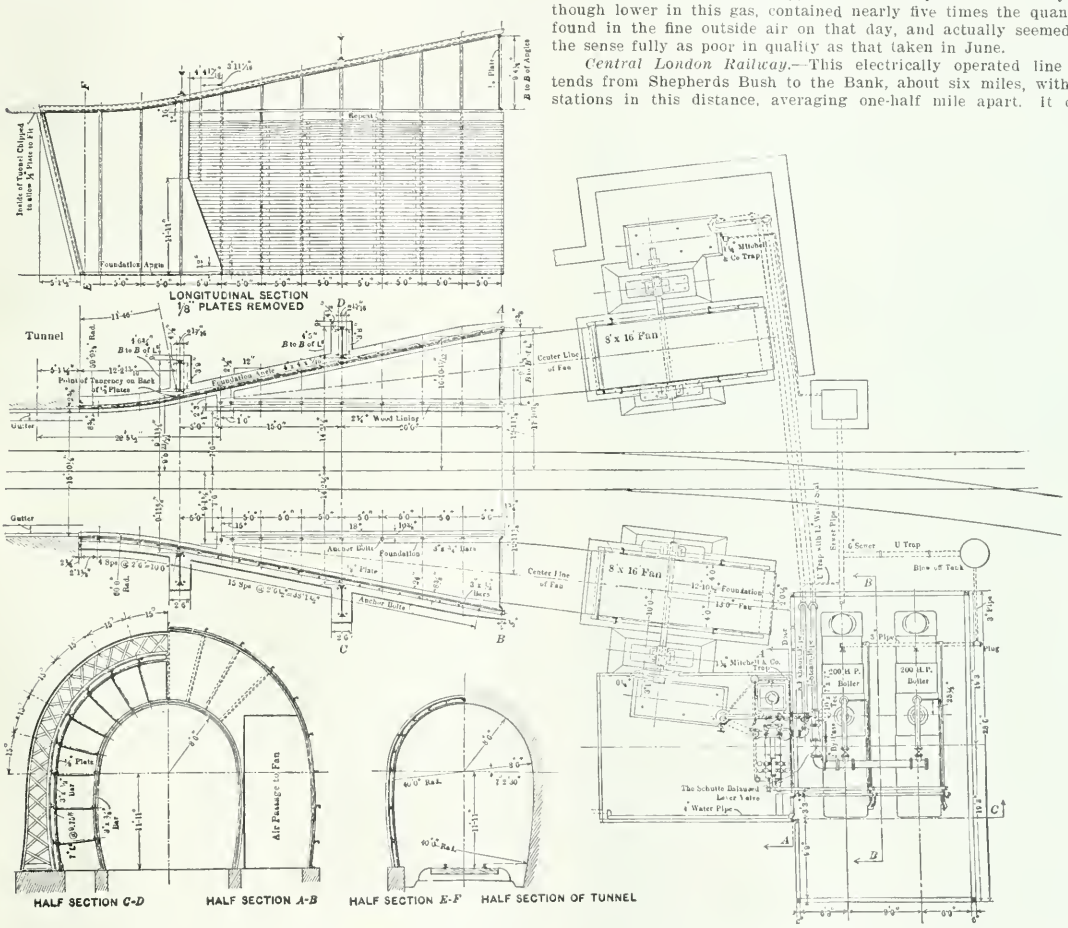
*City & South London Railway.*—This electrically operated line extends from Angel to Clapham Road, about six miles, with 13 stations on the entire line, the average distance apart being one-half mile. It consists of two single-track tubes, the inside diameter of each being 10 ft. 6 in. They are deep below the surface of the ground. As these tubes are small, the clearance around the trains is very narrow. The tubes are connected by small passages at the stations and by cross-overs near a few of them. The area of each tube is 86 sq. ft., the area of both tubes being, therefore, 172 sq. ft.; and one tunnel section equals about 1.4 times that of a train. The quantity per station is clearly insufficient to balance the vitiation of the air by the occupants of a train.

Tests made in 1902 for the London County Council showed that there were 14.2 parts of carbonic acid gas per 10,000 volumes of air in an empty carriage. A sample of air taken from a City & South London car by the writer, between London Bridge and Moorgate Stations, on a fair day, June 27, 1905, at 3.45 p.m., temperature 74 deg. Fahr., contained 11.78 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing 3.55 parts.

Another sample, taken on July 24, 1905, from a car of the same road between Elephant and Castle Station and London Bridge Station on a still brighter day, at 9.25 a.m., temperature 69 deg. Fahr., contained 8.69 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing only 1.75 parts.

The sample taken in June shows that the car air contained a little more than three times the quantity of carbonic acid gas found in the outside air on that day, while the sample taken on July 24, though lower in this gas, contained nearly five times the quantity found in the fine outside air on that day, and actually seemed to the sense fully as poor in quality as that taken in June.

*Central London Railway.*—This electrically operated line extends from Shepherds Bush to the Bank, about six miles, with 13 stations in this distance, averaging one-half mile apart. It consists of two single-track tubes, each 11 ft. 6 in., minimum inside diameter, connected by passages at the stations, also by six cross-overs in the entire length. The area of each tube is 100 sq. ft., the area of both tubes being 200 sq. ft. The cubical contents of the entire railroad tubes are equal to about 6⅓ million cu. ft.




General Plan of Ventilating Plant at the Gallitzin Tunnel, Pennsylvania Railroad, Completed in 1905.

The draft produced in the tunnel by an approaching train lasts only 1 min., and amounts to only about 17,000 cu. ft. The draft that follows a train lasts about ½ min., and amounts to only about 8,000 cu. ft. At the stairway of Borough Station, at the time of the passage of a train, a down-draft was noted for 1 min., equal to about 7,000 cu. ft. of air, followed by an up-draft for ½ min., amounting to about 2,000 cu. ft. of air. In addition to this, each lift removes in its upward passage about 2,500 cu. ft. of air. This travel on this line is not as heavy as on some others, notably the Central London Railway. It is not ventilated artificially, and the air is not as good as in other tubes of the electric railroads in London. The only natural ventilation is through a stairway and generally three lifts at each station. The stairway has a minimum opening of from 35 to 40 sq. ft. One lift contains about 2,500 cu. ft., and has a capacity of about 50 persons. During ordinary light traffic only one of these lifts is required per train.

The natural ventilation is by a narrow stairway and about three lifts at each station. Mechanical ventilation of the tunnels is secured by a fan at Shepherds Bush Station, which draws in fresh air from the opposite end of the line—that is, Bank Station, and other stations at intermediate points. The fan is 5 ft. wide, 20 ft. in diameter, and makes 145 r.p.m. It is operated by electricity, and is rated at 300 h.p. Its capacity is 100,000 cu. ft. per min. It is operated from 1 to 4 a.m. (three hours), with the outlet doors at all intermediate stations shut, therefore it draws in fresh air from Bank Station. During the operation of the fan, the water-gage pressure in the tunnel is 4½ in., and the linear

velocity of the air in the tunnel is 500 ft. per min. The fan is also operated during each day from 11 a.m. to 5.30 p.m., or 4½ hours, all the doors of the passageways at the stations being open. This improves the air in the tunnels for about one-half the length of the line—that is, for the three miles nearest to Shepherds Bush Station—it also clears out the cars as they come to this last station.

The result of night pumping, as indicated by an anemometer placed in the tunnels at the Post Office Station (the first one west of Bank Station), shows that each week an average of 123.9 million cubic feet of fresh air entered during the night pumpings, which is equivalent to 17.7 million cubic feet per night. As the tunnels contain 6⅓ million cu. ft., they are cleared about 2¾ times each night.

The result of this night ventilation is shown by tests taken on Feb. 15, 1905, at the Marble Arch Station cross-over siding, which is about half way between Shepherds Bush and Bank Stations. At 9.30 p.m. the air was found to contain 10.3 parts of carbonic acid gas per 10,000 volumes. The fan was started at 1.37 a.m., and at 2.15 a.m. the air at the same point contained only 3.7 parts, which was the same as that in the outside air.

The amount of natural ventilation procurable is shown by some other tests made during the same night. Between 9.30 p.m. and 1 a.m. (3½ hours), the air in the tunnel had cleared slowly from 10.3 parts to 6.0 parts of carbonic acid gas per 10,000 volumes at the latter time. During these tests the temperature of the tunnels was 66½ deg. Fahr. Another test, taken on Feb. 2, 1905, with the fans not running, and when the outside air contained 4.4 parts of carbonic acid gas per 10,000 volumes, showed that the tunnel air averaged 7.07 parts of carbonic acid gas, while the air in a full car contained 10.7 parts.

The methods now adopted for ventilating the Central London Railway have been put into force since 1902, and the question of adding to this ventilating system is now being considered. The first ventilating plant on this road was at Bond Street Station, but it has not been used since the installation of the present ventilating plant at Shepherds Bush.

A long series of tests made in 1902 for the London County Council showed that the air in the cars contained a minimum of 9.60 parts of carbonic acid gas per 10,000 volumes, at a time when the outside air contained 3.30 parts, and a maximum of 14.7 parts of carbonic acid gas per 10,000 volumes, when the outside air contained 3.30 parts.

A sample of the air taken from a Central London Railway car by the writer, between Chancery Lane and Post Office Stations, on a fair day, June 27, 1905, at 1.55 p.m., temperature 76 deg. Fahr., contained 5.92 parts of carbonic acid gas per 10,000 volumes, at a time when the outside air contained 3.55 parts.

Another sample taken by the writer on July 24, 1905, from a car on the same road, between Tottenham Court Road and Oxford Circus Stations, on a still brighter day, at 1 p.m., temperature 72½ deg. Fahr., contained 7.04 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing only 1.75 parts.

*Great Northern & City Railway, London.*—The Great Northern & City Railway extends from Moorgate Station to Finsbury Park, a distance of 3.43 miles. It is electrically operated and lighted, and there are six stations, varying from 2,000 to 6,200 ft. apart. Drayton Park Station, which is 4,200 ft. south of the northern terminus, is all in the open for 600 ft., therefore the main tunnel on this road extends from Drayton Park to Moorgate, a distance of 2.62 miles; the longest distance between stations being from Essex Road to Old Street, 6,200 ft. This line was put into operation in 1904, and is in many respects the best one examined by the writer. It consists of two single-track tubes, each 16 ft. inside diameter, connected by five small cross-passages at each of the station platforms, in addition to some cross-overs. The station platforms are generally 420 ft. long, to accommodate a standard train of seven coaches each 50 ft. long, carrying a total of 430 passengers. The special features of this subway are its large tubes and the large stairways and passageways, as compared with other London subways. Each of these items is claimed by the officials of the road to be a direct benefit in ventilation. The line is expected to handle 27,000,000 passengers per annum. The maximum train service arranged for is a 3-min. spacing, making 3½ miles in 13½ min., including 20 sec. for each of four intermediate stops.

The area of each tube is 190 sq. ft., the area of the two tubes being 380 sq. ft. The area of the tunnel, therefore, is about 1.8 times that of the large cars of the trains therein. The approximate cubical contents from the open end at Drayton Park to the closed end at Moorgate Station is 5½ million cu. ft.

Its natural ventilation is by two stairway passages at each station, the minimum area of each passage being 57 sq. ft., or a total of 114 sq. ft., in addition to that furnished by three lifts at every station, each having a floor area of 130 sq. ft., or cubical contents of about 1,500 cu. ft.

Its artificial ventilation, applied since the line was opened, is obtained by a fan, having a diameter of about 6 ft., located at Pool street, which is 6,330 ft. from the Moorgate end of the tubes. This fan has a capacity of 1,000,000 cu. ft. of air per hour, and, as operated, forces fresh air through a heading 10 ft. in diameter into the up-tunnel—that is, toward Moorgate Station, in the direction of travel. A large part of this current travels to Moorgate Station cross-over and then into the down-tube. The present practice is to operate this fan twice each day, during the busiest periods, from about 8 to 10 a.m., and from 5 to 8 p.m., so that a volume of fresh air practically equal to the cubical contents of the entire subway is forced into it each 24 hours.

As to natural ventilation: Measurements of the currents in the stairways on the arrival and departure of trains show approximately a total of down-currents for each train per station of 20,000 cu. ft., and about the same for up-currents. The total ventilation per train for each direction, therefore, amounts to about 90,000 cu. ft. On a 5-min. spacing of trains, each filled with 430 persons, the change of air per hour amounts to 1,080,000 cu. ft. in the entire subway, or 18,000 cu. ft. per min. However, as there are constantly four trains in the tubes carrying a maximum of 1,720 people, and as each person requires 30 cu. ft. of air per min., the total requirement is more than 51,000 cu. ft. of fresh air per min., in order to keep the tunnel air of the same quality as the outside air, or about 26,000 cu. ft. per min. in order not to increase the carbonic acid gas by more than twice the quantity in the outside air. These figures show why ventilation has been found necessary during the busy hours to maintain air of the desired purity even in this excellently constructed subway.

On March 5, 1904, before ventilation was established, a test of the air in this subway was made by Dr. Critchley, with the following results: The air in the street was found to contain 4.5 parts of carbonic acid gas per 10,000 volumes, that of a car in the subway was found to contain 9.0 parts, the temperature being 61½ deg. Fahr.

On Feb. 20, 1905, Dr. Southerland found that the air on the platform in the subway at Old Street Station contained 4.48 parts of carbonic acid gas per 10,000 volumes, temperature 54 deg. Fahr., while that in a car approaching this station was found to contain 7.22 parts, the temperature being 55½ deg. Fahr.

A sample of air taken from a Great Northern & City Railway car, by the writer, between Highbury and Old Street Stations, on a very bright day, July 24, 1905, a little after noon, temperature 68 deg. Fahr., contained 2.35 parts of carbonic acid gas per 10,000 volumes, the outside air at that time containing 1.75 parts.

*Rapid Transit Railway, New York City.*—The subway sections of this railway are either four-tracked, of rectangular cross-section, or of two double-tracked cross-sections. The former is the one used on the busiest part of the line, below Forty-second street. The stations on this portion average about 1,500 ft. apart. The area of this four-tracked cross-section is about 650 sq. ft. The sectional area of the tunnel therefore is 1.8 times that of the four trains occupying the subway.

This subway is of steel construction, with concrete, and is built quite close to the surface of the streets. The outlets to the street at the stations consist of from two to a maximum of eight stairways, which, while large enough for the people entering the stations, are not as direct as in some of the European subways, and have not a total outlet area as large in proportion to the tunnel cross-section, or to the number of trains and people in the subway at one time.

The writer predicted in 1904 that mechanical ventilation would be found necessary to secure a positive change of air.

On Nov. 21, 1904, a sample of air was taken from a car in the Rapid Transit Subway, between Forty-second and Twenty-eighth streets, and one between Spring street and Astor Place, and these were found to contain too great a percentage of carbonic acid gas. Again, on Dec. 28, 1905, at 4 p.m., the temperature being 60 deg. Fahr., a sample of air, taken from a car of the Rapid Transit Railway, between Twenty-third street and Brooklyn Bridge stations, was found to contain 15.58 parts of carbonic acid gas per 10,000 volumes of air.

The various tests of air made by the writer in London and Paris have shown that, except in the deeper subways, the air has as high a temperature as that outside. In the Rapid Transit Subway, during the summer of 1905, a considerably higher temperature of the air was recorded. This is another reason why it will become very urgent to establish a complete system of mechanical ventilation, for the health of the employees and the comfort of the patrons, as in the case of the subway tunnels in Boston, Liverpool and London.

*Subway Tunnels Generally.*—Among the statements heretofore made are included records of the determination of carbonic acid gas in the London subways as well as in their cars. From these data, also from other similar tests of air reported upon by the London County Council, in subway tunnels when they were not fully ventilated, the air found in subway cars contains about 45 per cent. more carbonic acid gas than the average air found in the subway tunnels and stations. Inasmuch as the patrons and a large number of the employees of a subway tunnel line spend most of their time in the cars, the vital fact to be determined, as to the health and comfort of these individuals, is the amount of carbonic

acid gas in the cars themselves. Therefore, tests of air in subway tunnels and stations are simply somewhat indicative of the conditions that will be found in the cars. It may be anticipated that the amount of carbonic acid gas in the cars will be at least 45 per cent. more than in the subway tunnel, and in crowded cars the proportion of carbonic acid gas will be still greater.

The writer, therefore, has confined his investigations everywhere to the vital question, namely, the quantity of carbonic acid gas found in the ordinary cars of tunnels, and the tests by him were taken in cars ranging from one-fourth to one-half full. Any reports of the amount of carbonic acid gas found in subway tunnels or stations, therefore, should be increased by about 45 per cent. in order to obtain any fair idea of the conditions met by the passengers and employees themselves; so that, if a subway contains as much as 6.5 parts of carbonic acid gas per 10,000 volumes of air, there will probably be found in the cars 8.4 parts or more.

It has further been shown by detailed measurements of natural ventilating currents in the London subway tunnels, from the smallest to those of the largest section, that an insufficient quantity of air is drawn into them to ventilate all parts of them properly. While the portions having light traffic may at times be free from too large a proportion of carbonic acid gas, those parts having heavy traffic will contain an excess. The conditions of traffic in the Rapid Transit Railway of New York, for example, are such as to indicate the presence of much more carbonic acid gas in the cars while traversing the lower portions of the subway tunnel than in the remainder.

Proper ventilation is not secured unless all parts of a subway tunnel receive a sufficient quantity of fresh air to balance properly the vitiation of that in the cars by the occupants thereof, and this result cannot be secured, as has been shown, except by an efficient system of mechanical ventilation that will distribute fresh cool air everywhere in the cars, as well as in the subway tunnel and its stations.

*Standard of Purity for Air.*—Much has been written as to what constitutes good air and what is dangerous. The most important test is the determination of the parts of carbonic acid gas ($CO_2$) in a given sample per 10,000 volumes. Ordinary air varies considerably, during different kinds of weather, from about 1½ parts to more than four parts of carbonic acid gas per 10,000 volumes, but the ordinary figure is about four parts. The best authorities state that the air in any subway should not contain more than twice the amount of carbonic acid gas found in the outer air (the two being nearly always directly compared), and that, therefore, the general limit is eight parts of carbonic acid gas per 10,000 volumes. The "Factory Act" of England makes nine parts of carbonic acid gas as the maximum in rooms, etc. The report to the London County Council in 1902 places the safe limit at eight parts, as being the maximum that should exist in the air of subways; and that report states further that the number of bacteria in subway air was generally found to increase and decrease in proportion to the carbonic acid gas in the air. The writer, while investigating this subject in London, during July, 1905, learned that public opinion is very strong in demanding air in subways that shall generally not contain more than eight parts of carbonic acid gas per 10,000 volumes of air, and that periodical attacks by the press are made, substantiated by detailed reports of noted chemists, against any subway tunnel where, for a period, air is found to contain more than this quantity of carbonic acid gas. Hence, it may be stated that eight parts of carbonic acid gas per 10,000 volumes is the maximum proportion of carbonic acid gas that should be allowed in the air of cars in subway tunnels.

## Freight Terminal Facilities at St. Louis.

Messrs. Robert Moore and Albert T. Perkins, Consulting Engineers, have made a report to the Municipal Bridge and Terminals Commission of St. Louis in which they give much interesting information concerning the freight facilities of that city and what is needed to make them adequate to its growing needs; and from their report we take the notes given below.

The report is not a final one. One of the principal recommendations is for a new bridge across the Mississippi river at Poplar street, two-thirds of a mile below the Eads bridge. Such a bridge would be on a line with the main east and west railroad which now gives access to the Union station; and on the east side of the river (as well as on the west side) would be sufficiently high to be connected by inclined tracks with any part of the railroad system.

The freight received and forwarded at St. Louis and East St. Louis in 1905 amounted to 40,000,000 tons, or double the amount handled in 1898. In view of the development of the southern and western states it is believed that this rapid rate of increase will continue. St. Louis and East St. Louis, though divided by a great river, should be dealt with as a single traffic and manufacturing district. The engineers recommend that grounds and franchises for all necessary enlargements of the railroad system and terminals be acquired without delay, and that all railroad facilities should be made available for all of the roads, and the establishment of individual facilities by different roads should be reduced to a minimum. The new freight houses and team tracks needed should be furnished by a combination of the railroads and operated by them rather than by an association doing terminal business for profit.

The city owns six miles of the river front, or nearly all from Grand avenue on the north to Dorcas street on the south. The United States government has established harbor lines so that permanent structures may now be extended. At North Market street, for example, the present wharf, 400 ft. wide, can be made 770 ft. wide. The necessary filling can be easily accomplished. The grade from the water up to the level of Third street is steep, making a great obstacle to the teaming of freight by wagons coming over on ferry boats. Profiles are given of these grades. The transfer of cars across the river by ferry boats is considerable, and is likely to increase. There has been some difficulty with the floating ice, but only for a very few days in a year, and with a deepened river this branch of the business can be enlarged. In the year 1905 about one-third of the freight crossing the river was carried in cars on ferry boats. One-half went over the railroad bridges and one-sixth by wagons either on the bridge or the Wiggins ferry boats.

The business of the Terminal Railroad Association is heavier than ever before and is constantly increasing. In the month of March last the number of cars interchanged was 184,000. The recent reduction in the arbitraries which are added to the freight rates from the east has increased the business at the freight houses in St. Louis so that many of them are badly crowded, causing serious delays.

The Terminal Railroad Association has team tracks at 13 places with room for 1,123 cars. It is declared that there will be need in the immediate future for twice this amount of room, and the yards which should be enlarged are specified. In this connection the report calls attention to the need of economy in the use of team tracks. One acre of land will accommodate 25 cars. Estimating the cost of this land at $200,000, with interest at 4 per cent. and taxes at the prevailing rate in St. Louis on one-half of the cost of the land, the charge on each car for land interest and taxes would be $3.81, estimating that the car occupied the track three days. In this estimate Sundays and holidays are not counted. The team track problem has been complicated by the insufficient storage room provided by consignees. Some large hotels and buildings are unable to take more than a 24 hours' supply of coal.

The cost of land being high, the use of freight houses is also expensive. House room to handle 250 tons a day will cost $500,000, on which the interest and taxes would make a charge of about 33 cents a ton. The cost of elevating freight to upper stories is from 7 cents to 11 cents a ton.

The engineers have examined freight houses in the principal eastern cities. In Pittsburg the Pennsylvania Company has seven stations, at four of which freight is received for all divisions of the road. In Philadelphia the Pennsylvania has 31 stations, at 28 of which freight is received for all divisions. In New York the Pennsylvania receives at four stations, the New York Central at eight, and each receives at four places in Brooklyn. Freight houses of two or more stories are now common. Some of those visited, with the number of stories, are: The Pennsylvania at Pittsburg, two stories; Pittsburg & Lake Erie, at Pittsburg (planned), two stories, with a driveway to both stories; Wabash, at Pittsburg, four stories, with tracks on the fourth floor and hydraulic elevators down to the street; Reading, at Philadelphia, two stories. Other houses which will have upper stories to be used exclusively for storage of inbound freight are those of the Pennsylvania at Pittsburg, four stories; Baltimore & Ohio Southwestern, Cincinnati, six stories, with electric elevators; Central of New Jersey, at Newark, six stories, with electric elevators. At Baltimore and Washington, to economize freight house space, the railroads have contracted with a teaming company to deliver goods to store doors within a certain district. The great Cupples station at St. Louis, which handles 25,000 tons of freight a month, has now a number of imitators, notably the Pittsburg Terminal, Warehouse & Transfer Company and the Bush Terminal at Brooklyn. The Cupples station was started primarily to accommodate a large number of wholesale merchants occupying a single large building, which does not seem to be the case at Pittsburg and Brooklyn, though the Bush Terminal Company owns large buildings to be rented for manufacturing purposes.

The report then goes on to recommend the consolidation of the Cupples and the Tenth street stations, which are close together, and the building of a station 1,200 ft. long and six stories high north of the Eads bridge.

For the proposed new bridge across the river a plan and elevation are shown. It is proposed to have a main span 1,600 ft. long, which is necessary not only to comply with the law, but to avoid interference with ferry traffic. The bridge should be built for four tracks, as that width is necessary for lateral stability in so large a span. The estimated cost, including right of way, is $8,000,000.

## The Flaman Speed Indicator.

On the continent of Europe it is common practice to provide passenger locomotives with a speed indicator which records automatically the speed attained throughout the run. This puts a check on the driver and enables the superintendent to be sure that prescribed speed limits are not exceeded. The value of a means of preventing a driver from making up lost time by an excessive burst of speed is beyond argument. On the Eastern Railway of France, M. Flaman, chief designing engineer of the motive power department, has designed the apparatus described herewith. The accompanying figure shows clearly the appearance and general arrangement. In the upper part is a semi-circular scale on which two hands move. One hand is painted red and is movable from the outside of the case, being merely used to mark the highest allowable speed. The other hand, which in the illustration stands at 31, is connected to the mechanism and shows the speed of the locomotive. The small circular dial with divisions numbered from 1 to 10, is merely a clock face, the small hand making a revolution every 10 minutes. In the lower part of the case is seen the recording mechanism by which the speed is recorded by a moving pen on a traveling strip of paper in the usual way. It will be noticed that the recording pen is always in

The action of the mechanism by which the speed is measured is simple in principle and positive in operation. In principle it con-

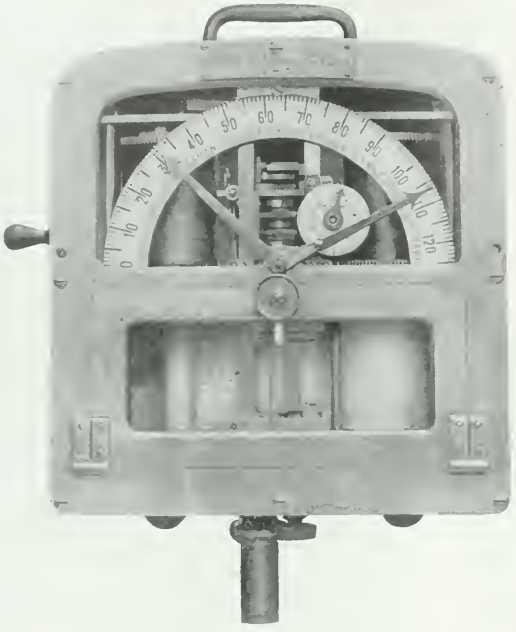


Fig. 1—The Flaman Speed Indicator.

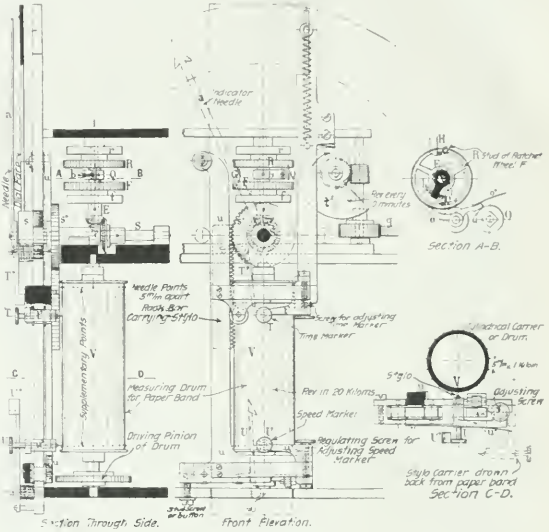
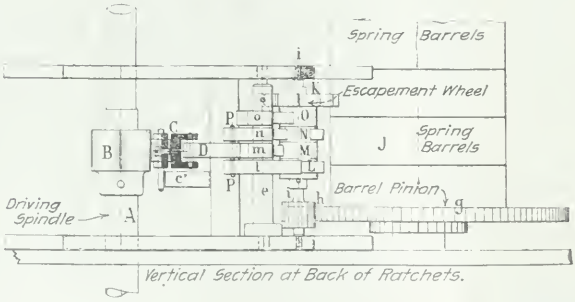
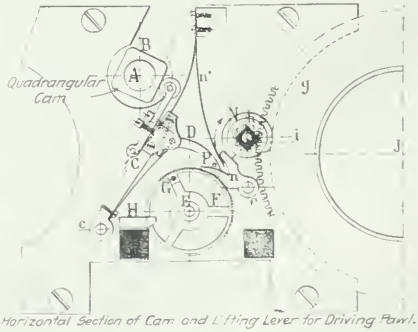



Fig. 2—General Arrangement of Flaman Tachograph.

*1—Measuring drum.*
*T—Time marker.*
*F—Ratchet pinion, measuring speed and carrying driving stud G.*
*t—Cam with archimedian spiral, turning once in ten minutes.*
*l—Speed marker.*
*a—Rack gearing.*



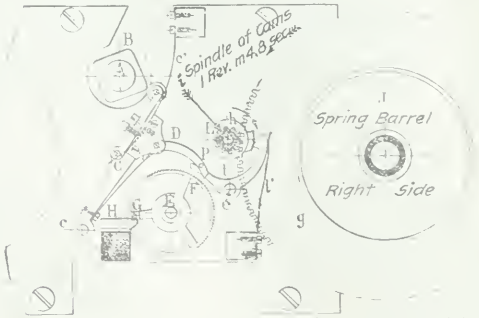



Fig. 3—Details of Flaman Tachograph.

sists in rotating a wheel connected to the driving wheels during a fixed unit of time and then measuring the distance this wheel has turned through in the fixed time. In practice it is connected to turn with the driving wheels, and a connection is provided by means of a pawl acting on a ratchet wheel, so that this ratchet wheel receives four impulses, the pawl moves through four notches, during a revolution, This ratchet wheel is driven from the locomotive driving wheels during 3.6 seconds (the one-thousandth part of an hour), and then during the next 1.2 seconds the distance through which it has turned is measured and the wheel returned to its original position, to be again connected to the driving wheels. Thus the speed of the locomotive is measured every 4.8 seconds, that is 12.5 times each minute, and the speed shown is the average speed during the preceding 3.6 seconds. As the ratchet wheel from which the speed is measured receives four impulses during each revolution of the driving wheels, the speed can be measured accurately to within a quarter revolution of the driving wheel.

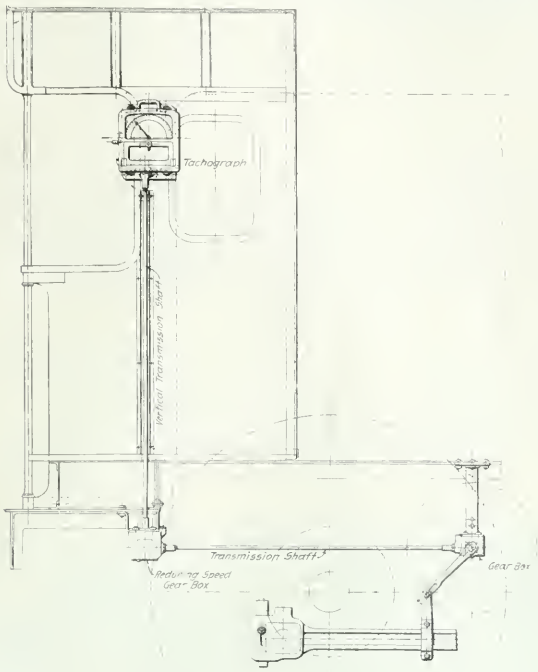



Fig. 5—Transmission Shafts, Flaman Tachograph.

The action is shown in Figs. 2 and 3. The driving shaft A (Fig. 3) carries the square cam B which turns the ratchet wheel F through the pawl D. When released the wheel F is returned by a spring until the pin G rests against the stop H. The escapement wheel K has 12 teeth and under the influence of an escapement beating fifth seconds makes a revolution in 4.8 seconds. This escapement wheel carries on its shaft the four cams L M N and O, which control the cycle of the operations which measure the speed. The cam N throws out the pawl D after it has driven the wheel F for 3.6 seconds, then the cam L holds the pawl out of connection with the wheel F for the remaining 1.2 seconds of the period and drops it back into connection at the beginning of a new period. When the pawl D is thrown out the wheel F is held by another pawl for about $\frac{3}{5}$ of a second, while the measurement of the speed is made and then this pawl is released by the cam M and the wheel F returns to its zero position to begin another cycle of movements. The measurement of the speed, that is of the angle through which the wheel F has turned, is made by the wheel R which is connected to the hand which works on the dial. When the wheel F, after turning for 3.6 seconds under the influence of the driving wheels is brought to rest as described above, the cam O releases the wheel R, which turns under the influence of a spring until the pin Q on the wheel R comes against the pin G on the wheel F. The amount of this turning, as measured by the hand on the scales, shows the average speed during the preceding period. The position of the hand on the scale is adjusted to the speed every 4.8 seconds. If the speed is increasing the wheel F will turn through an increasing angle in each period and during the end of its course will therefore carry the wheel R (and the hand) forward with it, while when the speed is decreasing the wheel R will drop back at the end of each period. The recording mechanism is shown in Fig. 2. The pen U carried by the frame U is connected with the previously described mechanism and is lifted as the speed increases. Another pen T serves to record the time and makes a vertical stroke with an instantaneous return every 10 minutes. A record is reproduced in Fig. 4.

Up to May 1, 1906, there were 359 of these speed indicators in service and 205 in course of application in France and Italy.

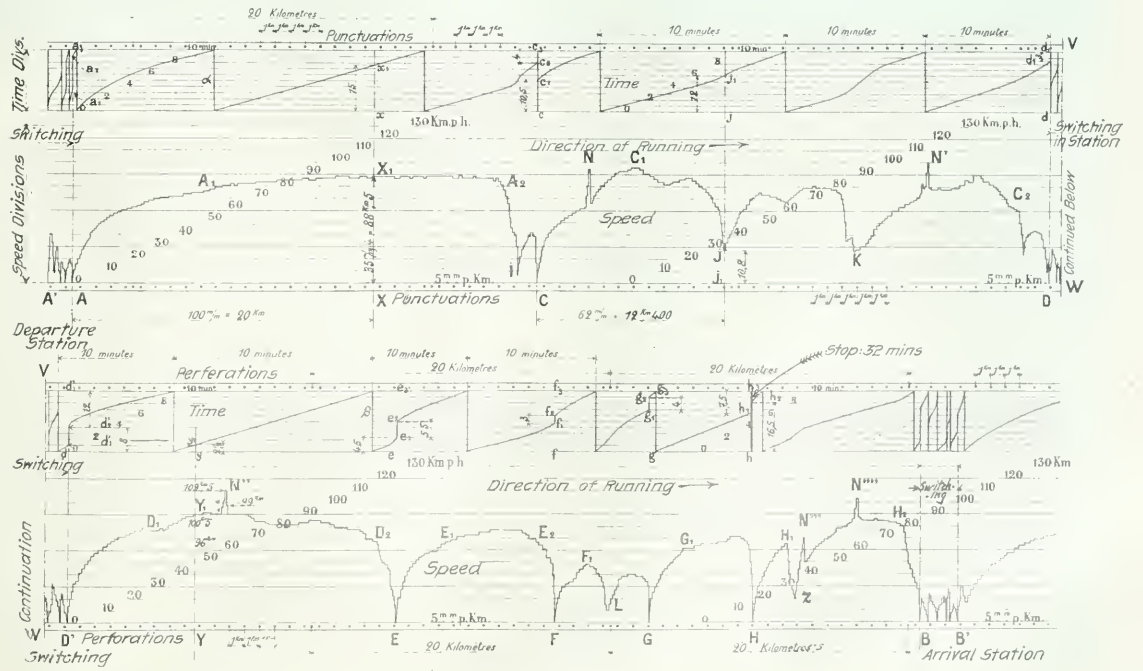


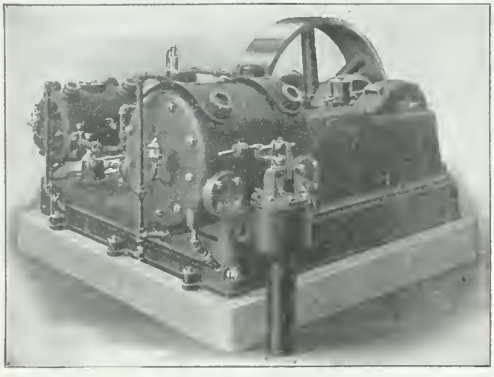

Fig. 4—Flaman Indicator Diagrams.

## A New Sullivan Air Compressor.

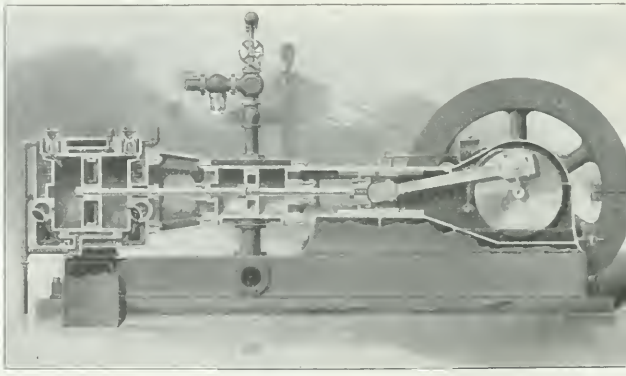
The accompanying engravings illustrate a new type of Sullivan air compressor, especially designed to meet the requirements of industrial service, of railroad and machine shops, foundries and large buildings, as well as the general purposes of contracting, mining and quarrying work. It is a duplex pattern and is built in several combinations of steam and air cylinders, and also for belt and power drive. The dominant feature of the different types is the box frame, with housing, which forms a tight enclosure about the crank discs, main bearings, eccentrics, connecting rods and crossheads. This housing excludes dust and dirt and permits the use of a system of self-lubrication of the principal working parts. As shown in the sectional view, an oil well is provided in each frame, in which the lower edges of the crank discs are immersed The oil clinging to the discs is removed by scrapers in contact with their upper edges, and thence conveyed by means of a storage chamber and suitable pipes to the main journals, crank pins, eccentrics and crosshead guides, being finally returned to the well by gravity to be used again. The machines require the minimum of attention and care, and it is necessary to add oil to the wells only at long intervals.

These compressors are very compactly and substantially built. All sizes except those of largest capacity are mounted on a heavy sub-base, in which the intercooler and steam reheater (on cross-compound machines) are situated. The frames are of the heavy duty type or tangye pattern, with long bearings on the base, securing rigidity and maintenance of correct alinement of working parts. The steam valve gear is controlled by a Meyer adjustable cut-off, the throttle being regulated by a sensitive steam and air governor.

The air cylinders are not cored out, but instead separate liners are forced into the casting, thus precluding shrinkage strains. The



Sullivan Air Compressor—Two-Stage Belt-Driven Type.



Sectional View of Sullivan Air Compressor.

space between the liner and the cylinder forms the water jacket, and outside of this again is the air inlet passage. Incoming air is thus admitted to the cylinder without contact with heated walls. The air cylinder heads are also water jacketed, and in two-stage compressors an efficient intercooler is provided.

The inlet valves on all air cylinders are of the semi-rotary or Corliss type and are moved by steel valve stems connected by adjustable connecting rods to independent eccentrics on the engine shaft. The moving parts start from and arrive at the ends of their travel with a slow and easy motion, but at the points of opening and closing of the valves these parts attain their greatest speed. It is thus possible for the valves to remain open during the entire stroke, allowing the cylinder to fill with air at barometric pressure, and trapping it instantly before the piston begins its return.

The valves themselves are made of close-grained semi-steel, of large diameter, fitted with accuracy. Provision is made to permit a thin film of air to get behind the closed valve, pressing the cutting edges to the seat and making the valve tight against leakage. The valve stems have T-shaped heads on their inner ends, carefully planed and fitted to the slots in the ends of the valves. The attachment is such that the valves are free to follow up wear automatically without hindrance from the stems. These valves may be removed through the back bonnets without disturbing the setting of the valve gear. This valve gear, it is claimed, is simple, strong and durable, is positive and reliable in action, and insures high volumetric efficiency

The discharge valves are placed radially on top of the cylinder head castings. They are set with removable seats in shallow ports or pockets, as shown in the sectional view, at a sufficient distance from the ends of the cylinder for the piston to travel completely past the openings to these pockets, at each end of the stroke, thereby minimizing the clearance. These valves are of the poppet type, internally guided on cast iron plugs and held to their seats by light steel springs. They are seated in bronze cages, readily removable by unscrewing the valve plug. As seen in the sectional view, they are completely surrounded by water jackets to reduce the temperature of the air at its terminal pressure.

These compressors are built in capacities ranging from 100 to 2,600 cu. ft. of free air per minute. The Sullivan Machinery Co., Chicago, the maker, has built an addition to its works at Claremont, N. H., to make these compressors.

## Publication of Rate Changes and Other Things.

The Interstate Commerce Commission has issued the following rulings:

Nothing but money can be lawfully received or accepted in payment for transportation subject to the act, whether of passengers, property, or for any service in connection therewith, it being the opinion of the Commission that the prohibition against charging or collecting a greater or less or different compensation than the established rates in effect at the time precludes the acceptance of services, property, or other payment in lieu of the amount of money specified in the published schedules.

Where two or more connecting carriers establish a joint rate which is less or greater than the sum of their local rates, such joint rate is a change of rates and requires a notice of thirty days. In such case the joint rate when duly established and in force becomes the only lawful rate for through transportation.

On new lines of road, including branches and extensions of existing roads, individual rates may be established in the first instance and also joint rates to and from points on such new lines, without notice, on posting a tariff of such rates and filing the same with the Commission.

It is the opinion of the Commission that the provisions of the amended sixth section in respect of the publishing, filing and posting of tariffs apply to the mileage, excursion and commutation rates authorized by the twenty-second section. Such a rate when first established or offered is held to be a change of rates which requires a notice of thirty days. No reason appears why this notice should not be given in the case of mileage rates, commutation rates, round trip rates or other reduced rates which, like ordinary passenger rates, are established for an indefinite period, and appear to be a matter of permanent policy. Strictly excursion rates, however, covering a named and limited period, are of a different character in this regard, and may properly be established on much shorter notice.

To avoid the necessity for special application in cases of this kind, the Commission has made a general order fixing the following named time of notice of round trip excursion rates, and carriers may govern themselves accordingly:

Rates for an excursion limited to a designated period of not more than three days may be established without further notice upon posting a tariff one day in advance in two public and conspicuous places in the waiting room of each station where tickets for such excursion are sold and mailing a copy thereof to the Commission.

Rates for an excursion limited to a designated period of more than three days and not more than thirty days may be established upon a notice of three days in place of the thirty days' notice otherwise required by the amended sixth section.

Rates for an excursion limited to a designated period exceeding thirty days will require the statutory notice unless shorter notice is allowed in special cases by the Commission.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS. We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 13. FRIDAY, SEPTEMBER 28, 1906.

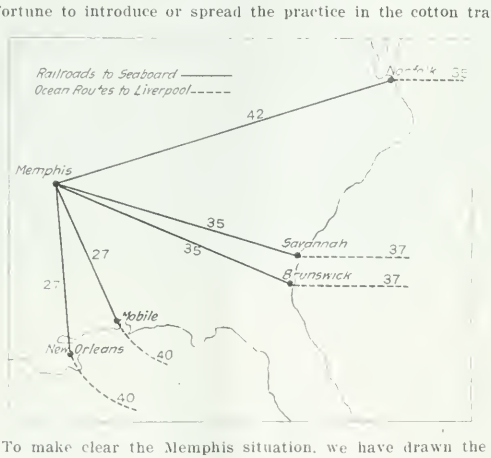

If any one wishes to try to keep in mind an accurate image of the magnitude of the railroads of the country and their business it is necessary, usually, to tell him to do a lot of careful studying, comparing and memorizing; so easy is it to get such a top-heavy memory-load unbalanced. But the report of the Interstate Commerce Commission that is issued this week has one or two landmarks that are easy. The gross receipts for the year—not the last fiscal year, but the one before that—amount to two billions. We should like to be able to say that the receipts per mile were ten thousand, and therefore equally easy to remember; but they were only $9,598. At the present rate of increase, however, if it keeps up, the ten thousand mark will be reached in less than two years. Though new railroads are being built all over the country, the increase of traffic on existing roads is a far more important item in the financial world than what the new roads add. It is gratifying to see, also, that during the past five years earnings per mile have increased more than twice as fast as the capital per mile, indicating less water in the stock. The length of railroad in the hands of receivers is only 796 miles, almost too small to notice when surveying such a large field. Automatic car couplers and air brakes are still reported, but the figures are now of no particular interest, because they are so near 100 per cent. The usual space is given to statistics of deaths and injuries; but to readers of the *Railroad Gazette* these have little meaning, for we all know already what ought to be done to reduce the number of these casualties.

The Traffic Club of New York held its opening session on Tuesday evening, with a large representation not only of railroad traffic managers, but of the traffic managers of a number of industrial concerns as well. An interesting feature of the informal discussion was the bewilderment, apparently shared by all, as to the way the new Interstate Commerce Law was going to work out, and what it meant. One speaker, quoting the remark that language was a mode of concealing thought, congratulated Mr. Hepburn on his mastery of language; another was puzzled by the rate outlook; he did not know how to make rates any more, and had no place to turn to for enlightenment. Most significant of all was the belief expressed that, just as the agitation which led to the new law was begun by the shippers and fostered by the newspapers, it would take but a short time for the current of outspoken public opinion to become completely reversed, to the end that the shippers first, and then the newspapers would clamor effectively for repeal of certain portions of the law. It is probably safe to assume that these opinions would be upheld by traffic leagues in all parts of the country, even in the granger states, which for so many years have been foremost in hostile criticisms of their transportation systems. It is quite vain to hope that the tremendous, complex and often conflicting interests of shipper versus carrier and shipper versus shipper will ever be solved in this great country to the satisfaction of all. An unusually clear retrospect of some of these problems will be found in another column, in a liberal extract from an extremely readable and scholarly paper printed in the *Political Science Quarterly* by W. Z. Ripley, Professor of Economics at Harvard University. Yet we believe that Professor Ripley errs in advocating a rehabilitation of the long and short haul law as a remedy for the present economic wastes incident to our transportation system. The American railroad problem, as we see it, calls for the exercise of a considerable amount of Federal police power to prevent the unjust and extortionate practices roughly grouped under the names rebate and discrimination. The new Interstate Commerce Law provides this police power, but along with it there are introduced serious elements of inflexibility and complexity not less than that which existed heretofore. The trouble with Professor Ripley's plan and with what may be called the paternal parts of the Interstate Commerce Law is that the country is too big for them; if similar efforts towards law-ordained economics have failed in tight little England, how can we expect them to succeed in this great rambling country, with its separate state governments and its constant shifting of the producing and traffic centers? It seems clear that we need the police power without the paternalism, and if our railroads can be kept out of national politics long enough for the Hepburn experiment to clarify the situation, it seems probable that we shall get it.

## RAILROAD RATES ON EXPORT COTTON.

The salient feature of the export cotton tariff order issued by the Interstate Commerce Commission and published in the *Railroad Gazette* last week is that a pretty good opportunity is given to the railroads to reduce rates, but practically none to raise them. Rates may be reduced on three days' notice; but having been put down they cannot again be put up except on 30 days' notice. This would seem to mean that the Commission believes that the railroads should as soon as possible get their rates down to bedrock and

then keep them there. So far as concerns the chief shipping point, Memphis, the following of this course by the railroads would throw the European business all to one line, that by way of New Orleans, the Illinois Central's railroad from Memphis to New Orleans being so much more favorably situated than the lines to the Atlantic seaboard that it could undoubtedly exhaust the others in an open war. What would be the effect on the cotton industry as a whole to thus kill off competition and perhaps injuriously curtail facilities we shall not here consider. We have not become sufficiently accustomed to Government-made rates to take readily to guessing in this line. But it seems quite clear that the only way to insure a choice of routes from Memphis is either to allow free competition, as in the past, or else for the Commission to establish arbitrary rates over each line; and the establishment of arbitrary rates would necessitate drawing a line at the seaboard, beyond which the Commission has no power, and the establishment of great warehouses there. Whether the Memphis brokers and shippers would find it necessary to move their offices to the sea we do not know; but so far as can be judged from the testimony that has been given concerning the facility with which the export trade is now conducted, any addition whatever to the burdens of storage, transfer or delays would be an additional dead load on the business, to be borne either by the farmer or the consumer; and probably the farmer, for the English market fixes prices. It is true that the export grain traffic from northern ports endures some burdens of this kind; but the two situations lack several elements of parallelism. The grain taken by the regular liners from New York is such a large proportion of the whole that the burdens of storage at that port are greatly modified; and at the other ports regular lines of steamers tend to steady the volume of ocean room available. At all the grain ports the use of cars as storehouses for long periods of time has helped to keep the grain trade out of trouble; but this is an illegitimate use of cars, and it would be a misfortune to introduce or spread the practice in the cotton traffic.




To make clear the Memphis situation, we have drawn the accompanying geographical sketch, showing the relative positions of the lines to the different ports. Only one line is indicated to each port, although to some of them there are competing lines. The figures shown in connection with the lines are the freight rates on cotton in cents per 100 lbs. to the several seaports and from all the seaports to Liverpool. The rail rate includes the cost of compression, which is, we believe, ten cents per 100 lbs. It will be seen that at the rates shown, the New Orleans route is the cheapest; the other roads, to get any of the export cotton, must carry it for less than these inland rates. This they do, making such reductions each day as the variations in the ocean rate may make necessary. For example, a road running to Savannah would have to accept 30 cents, instead of 35 cents, on a shipment going to Liverpool. Each day as the ocean rate is announced, the through rate is telegraphed from the railroad headquarters to the local agents at the shipping points. In addition to the necessity of adjusting the rates day by day, the freedom of the railroads is also limited by the number of vessels available; a road must take care and not accept more cotton than it can find ships for. There are no regular steamship lines, except from Galveston, New Orleans and Mobile.

Amicus Curiæ Stickney, in his long letter to the Commission, says that to continue the present free competition in cotton rates will foster the midnight tariff evil, and that if that evil is winked at in the south it will soon have to be winked at in Kansas City. If the Commission can have the courage to consider the condition that confronts it, and not mind the theory, this bugbear need not frighten it, for the condition is that the Southern roads have for years made changes every 24 hours, with apparent satisfaction to all concerned, while the Kansas City roads were unable to do this without giving offense to some of the shippers. In other words free competition has in the south proved beneficial, while in the beef and grain business at Chicago and Kansas City there was so much secrecy or trickery, or both, that there was a demand for reform. Looking first and mainly at conditions, the Commission might well say that in the competitive cotton shipping cities changes every 24 hours, and without notice, should be freely allowed. Forbidding the making of changes except at some suitable fixed hour, say 9 a. m., would prevent any midnight jugglery.

The trouble is with our theory; the theory that all rates must be stable, and that what is good in Chicago or San Francisco must be deemed good in Memphis and New York, and all over the country. But theories usually have to give way to facts, and it is to be hoped that the Commission, in giving only temporary force to its present decision, is intending to put theories in their proper place in this cotton problem. With a little more frankness and fairness, it is quite possible that daily tariffs—midday, not midnight—would improve matters even at Chicago. That might meet Mr. Stickney's wishes as fully as could be done by his own plan, though in an opposite way. It is to be remembered that the satisfactory regulation of rates by a Government Commission is going to require a good deal more than $70,000 worth of talent yearly, unless the Commission can contrive in some way to introduce a little automatic elasticity here and there. That is to say, with only seven men, the work will be too great, and government regulation will break down. Not even a short-sighted railroad man should desire to see that outcome, for, the experiment having been begun, we may as well have a real trial at once.

## AMERICAN AND FOREIGN RAIL SPECIFICATIONS.

The fact that in recent years the output of American rail mills has been so greatly increased that it has been possible to meet the competition from abroad, and lay down rails in foreign ports is a matter not only of commercial importance but of technical value in that European engineers have come to recognize the value of the American output and make concessions in the matter of specifications. At the London meeting of the American Institute of Mining Engineers, Mr. Albert Ladd Colby made this the subject of a paper, and called attention to the conditions under which American rails are delivered without any "general acknowledgment, on the part of foreign engineers, that their rail specifications must be modified if American tenders are particularly desired," although these modifications consist, for the most part, of concessions in the way of reducing the amount of tests that have no effect upon the quality of the output.

In a general way the specifications governing in American mills are fewer and more definite than those abroad. Foreign specifications are sometimes quite elaborate in their requirements, to an extent considered unnecessary in the United States, as the specification is and should be regarded as a contract by which the desired quality of rails may be produced with the least possible expense and delay to both parties.

"The gradual increase in the daily output of American rail mills during the last decade is not due to an increase in the speed of the rail train, prompted by a reckless desire for increased tonnage, independent of the quality, strength and finish of the product, but rather to radical improvements resulting in a much better balance between the producing and finishing ends of the mill. In the first place, the finishing train is used only for rolling rails, hence there are few delays due to roll changes; furthermore, the rail train is now kept much busier; the bars are brought more quickly and continuously to the rail train by the use of tables with rapidly revolving rollers; the blooming train is seldom idle, owing to the ample heating capacity of the modern soaking pits and the quick stripping and handling of ingots; sufficient air pressure is available to blow all the converters at once, if necessary; and, finally, there is always an excess supply of melted pig iron for the converters."

The variations in the present American and foreign specifications are marked, and are probably due in part to the methods of manufacture and in part to the national characteristics of the en-

gineers who have drawn them. In general, those of the United States require that the best current practice shall be followed, certain precautions intended to secure a sound rail being mentioned. Foreign specifications frequently mention the sources of supply of the raw material; a requirement which should, of course, be omitted or waived when applied to American mills, as well as that requiring the metal to be melted in air furnaces or cupolas before being run into the converters, since direct metal is almost exclusively used in this country.

In chemical composition there is a marked difference in the specifications on the two sides of the Atlantic, not only in the actual amount of carbon required but in the principle governing its proportion. In the United States, the lighter the rail the lower the carbon content, which ranges from a minimum of .35 per cent. in rails weighing from 50 to 60 lbs. per yard to .60 per cent. in those of from 90 to 100 lbs. In these there is usually an allowable variation of ten points, so that the possible range of carbon in the light rails would be from .35 to .45 per cent., and so on. In the foreign specifications, on the other hand, there is seldom any change in carbon or manganese with an increase in the weight of the section, where the maximum carbon is fixed at .50 per cent. with an allowable range of 15 points, except in the case of certain tramway rails where the maximum carbon content is higher and the range less.

The phosphorus content of from .075 to .080 per cent. required abroad is too low to be met by any of the American mills, except the one using foreign ores entirely, and has to be raised to .10 per cent. for American tenders. English makers of acid Bessemer steel rails can meet these requirements, because the Cumberland and Spanish hematites have less phosphorus than the American ores used here. So while phosphorus is concededly an undesirable element, careful heating and lower finishing temperatures can readily overcome this difference of .02 per cent. That this is so, is proven by the fact that the difficulties with the breakage of American rails on home or foreign roads has not been attributed to the presence of .10 instead of .08 per cent. of phosphorus.

The chemical analyses by which these determinations are effected are more elaborate and numerous abroad than they are in this country, where they are unnecessary; in fact, it would be quite impossible to apply them to American practice on account of the delays that they would involve through independent check analyses. The reason why such analyses are unnecessary here is that the direct metal used in our Bessemer converters is smelted from a uniform mixture of ores and the variation of phosphorus is small, while the "blowing is so constant and regular that temperatures vary, within narrow limits, and hence the silicon in the steel is practically constant." Therefore, check analyses are objected to by American makers, not only because the chemists of their own works are specialists in their line, but because it is considered unreasonable to specify that check analyses shall be made on rails and that the finished product "shall be piled into 500-ton lots until an analysis on one piece of rail is reported by some independent and probably far-distant chemist, who has been selected by the engineer."

The drop-test requirements of American specifications are exceedingly simple. A tup of 2,000 lbs. is allowed to fall once on the specimen from heights varying with the weight of the rail, and that on but one piece cut from every fifth heat at the hot saws. So that the requirement of one for each heat, where there may be as many as 125 in 24 hours, is not only unnecessary but a hardship on the inspector and manufacturer alike. Foreign specifications also require that the rail shall be bent to an angle of 110 degs. without cracking. This seems useless, for the drop test is merely a check against brittleness, and the fact that a section from an American mill will not show as much deflection as one from a British mill does not prove at all that it will be less safe or wear more rapidly.

American mills usually object to the tensile test requirements of foreign specifications, not only because they regard these requirements as unnecessary and the data so accumulated appears to be of no value, but because they are usually not equipped to do the work rapidly enough to keep up with the output, and because it is inconsistent to specify a given chemical composition for rails varying from 20 to 100 lbs. per yard, and require that they shall, at the same time, fulfill the same minimum elongation, in which no attention is paid to the more rapid cooling of the smaller section. These requirements may be further complicated by the fact that the specified tensile strength is often inconsistent with the specified elongation. Aside from the general uselessness of the test, the amount required is frequently prohibitive. For example, in a mill rolling 80-lb. rails at the rate of 2,000 tons in 24 hours, the output will be about 5,100 rails in that time. To meet some foreign specifications it would be necessary to make three tests for each 250 rails rolled, or 60 per day. Others require tests at the rate of 2 per cent. of production or 102 per day.

The static test also finds no place in American specifications, since, like the tensile, it is regarded as useless, though it appears in foreign requirements where it is used to determine deflection under load. The same statement holds regarding the bending test, although this is sometimes employed in the United States.

The practical adoption of the standard sections of the American Society of Civil Engineers, has so reduced the number in use in this country that little more need be specified than the limitation of weight variations, which is usually put at 0.5 per cent. for the entire order, and has been found to be sufficient to prevent any complaint on the part of the purchaser. Abroad there is usually a requirement that the manufacturer shall furnish templates of both rail and fish plates, and some even call for a short length of rail, prepared under ordinary conditions, while the rolling is not allowed to proceed until a written approval of this sample has been received from the engineer.

In regard to length, there is a universal recognition of 30 ft. and 33 ft. as the standard with an allowable variation of $\frac{1}{4}$ in. and a right to deliver 10 per cent. of the order in shorter rails. Abroad there are a number of standard lengths, and some specifications permit a variation of but $\frac{1}{8}$ in., which can only be met by cold milling and is here regarded as an unnecessary refinement.

The details for inspection are also very much simpler in America than they are abroad. Here the inspector is given free access to the works, and the maker knows that all inspection and tests will be made at the mills, and all disputes settled at once upon their merits. This agrees with foreign practice in so far as the access to the works is concerned, but there the maker is hampered by the necessity of paying for the inspection and tests by independent laboratories to any amount required by the inspector, thus introducing great uncertainty as to cost and complicating matters by the fact that the dictum of these laboratories may result in rejection without appeal. It is also required that rails shall be sorted into lots of uniform length before examination, involving rehandling, a condition impossible to comply with in this country. Again, it is regarded as unreasonable to require that all discarded rails shall be stacked and kept apart until the completion of the contract, and that none shall be sold or consigned until that time. Further requirements that are considered a hardship are those by which there is no appeal from the decision of the engineer, that rejections may be made after delivery and that the final acceptance shall be at the port of delivery; in other words, the maker is required to guarantee the delivery of his sales in good condition.

From the foregoing it will be seen that the elaborate specifications in force abroad must necessarily be modified in many particulars, which we regard as unimportant, but which may be regarded otherwise by the engineers by whom they were drawn. The apparent aim of the American specifications is to permit the production to go on with the least possible delay consistent with a high grade of rail; while it is also intended that the manufacturer shall not be hampered by useless requirements, nor the records clogged with a mass of worthless data. That the specifications meet the necessities of the case is evidenced by the high quality and satisfactory results obtained with American rails.

On the other hand, the foreign specifications enter into unessential details with bureaucratic minuteness and seem especially designed to establish the autocratic greatness of the engineer by whom they were drawn, and, through him, of the inspectors, who, at times, might well cause more trouble than their services were worth.

It is to be hoped, therefore, that the movement, now on foot, to establish a uniform specification for American rails intended for export, will meet with all the success it deserves, and that these minor and hampering requirements of the average foreign specification will be removed.

## August Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of August, printed in another column, contains accounts of 24 collisions, 23 derailments and three other accidents. Those which were most serious, or which

are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | August | Killed. | Injured. |
|---|---|---|---|---|
| 1. | St. Genevieve, Mo | 5th | 0 | 20 |
| 2. | Silver Lake, Ohio. | 5th | 0 | 12 |
| 3. | Fruitland, Texas | 10th | 0 | 55 |
| 4. | Rensselaer, Ind. | 11th | 0 | 12 |
| 5. | Fort Worth, Texas | 13th | 2 | 12 |
| 6. | McCook, Ill. | 13th | 1 | 1 |
| 7. | Forney, Texas | 17th | 0 | 6 |
| 8. | Sang Hollow, | 19th | 10 | 7 |
| 9. | Charlotte, Mich. | 20th | 5 | 10 |
| 10. | Fordham, N. Y. | 29th | 1 | 2 |

The most of these 10 accidents are notable more for the fortunate escapes of the passengers than for anything else. The collision at Sang Hollow is typical of a kind that is becoming so frequent enough in this country as to be liable to discredit the block system; collisions, we mean, occurring on block signalled roads but under suspension of the rigid rules which are essential to the success of the block system. Permissive blocking is no blocking at all; but the explanation why it is necessary or desirable to have permissive blocking is one that does not appeal to the public, and, therefore, a road which practises it is likely to suffer indefinitely in the estimation of the public. A road introducing the block system and allowing the frequent use of permissive signals finds itself in a somewhat anomalous position; in the use of the strict space interval it improves its discipline greatly by simplifying it, while in the general use of permissive blocking it makes the discipline of enginemen more difficult than before. Permissive blocking involves much running "under control," and "under control" is a term which has to be re-taught pretty often if the practice is to be employed with a satisfactory degree of safety.

The collision at Fordham, N. Y., on the 29th is notable because it occurred within the limits of New York city, where trainmen are arrested for slight causes. In this case the conductor and the engineman of the freight and the engineman of the passenger train were arrested by the police or the coroner (without warrants) on the assumption that they might be blameworthy for the death of the freight brakeman! This incident may have little interest to those of our readers who are remote from New York, though it may not be amiss for them to bear it in mind against the time when some foolish law permitting such illogical practice may be proposed in their own states. At the inquest in this case it was shown that the conductor of the freight in making up his train had connected up the air-brakes through only about one-third of the train instead of through one-half, as the Federal law requires; and it appears to have been held that this made him responsible for the damage done. While the conductor is condemned, and properly, for this disregard of the law, it is to be borne in mind that even with 75 per cent. of the cars air-braked, which would be a compliance with the Federal law as it now stands, damage from a break-in-two would by no means be fully provided against; it requires 100 per cent. to do that. To arrest a man on a criminal charge when the presumption is strongly against criminality is a grievous wrong; and this is only a sample of frequent occurrences in New York.

The number of electric car accidents reported in the newspapers of the United States in the month of August was 15, in which 11 persons were killed and 181 were injured.

## Boston & Maine.

The year's business of this road, as compared with that of the previous year, shows considerable increases. Earnings from passengers (exclusive of mail, express, etc.), which furnish 34 per cent. of the total, were $13,291,584 against $12,530,472 in 1905, and total passenger train earnings, which make up 39 per cent. of all transportation receipts, were $15,235,420 against $14,291,615 in 1905. Freight earnings increased from $21,800,000 in 1905 to $23,800,000, and gross earnings were $39,214,203 against $36,213,246 in 1905. Thus, with an increase in passenger earnings of $943,805 and in freight earnings of $2,039,480, gross earnings were larger by $3,035,454 than in the previous fiscal year. With this growth in gross receipts, operating expenses gained almost as much, being larger by $2,733,628 than in 1905, which resulted in an increase in the operating ratio from 73.5 per cent. in 1905 to 74.85 per cent. in 1906.

The year's operating expenses, amounting to $29,353,369, although so much larger than those of the previous year, include, with the exception of a charge of $1,691,596 to capital account, the cost of all improvements and other expenditures made during the year, including $1,076,427 for new equipment.

This policy of charging a large proportion of the expenditures for improvements to income has been in full force for the past six years, during which time, as a result, the operating ratio has risen from 70.8 in 1901 to 74.85 last year. The company makes a point of calling to the attention of its stockholders the aggregate spent on what are spoken of as the "nine fundamental items of yearly maintenance and renewal expenditure," the items being repairs of locomotives, repairs of passenger train cars, repairs of freight cars, repairs of roadbed and track, steel rails laid, ties laid, maintenance of bridges, maintenance of buildings and structures, and reballasting track. The past year's expenditure on these nine accounts was $7,844,692. On the same nine accounts six years ago (during which period there has been an increase in mileage of only 23 miles), there was spent the sum of $5,645,809, showing an increase of $2,198,884, or 39 per cent. since 1901 in these particularly important maintenance expenditures. The successful carrying out of this policy has, of course, been made possible by the increases in earnings during the six-year period, which are larger by $8,460,668 than in 1901. So long as there is no setback in this respect, the general improvement of the road through liberality in the maintenance accounts will undoubtedly continue.

As set forth in the report for 1905, it had become clear to the management at that time that the road had outgrown the point where all necessary improvements could be made out of earnings. To that end, the directors recommended the adoption of a general financial plan under which, by the issue of new common stock, sufficient funds should be provided for more extensive improvements than could otherwise be met. As part of this general plan, $3,627,500 par value, common stock, has been subscribed for by stockholders at 165, the price fixed for the issue by the railroad commissioners of Massachusetts, Maine and New Hampshire, and a further $576,200, par value, is to be disposed of at public auction at such time as the directors shall decide. No large expenditures have as yet been made from the proceeds of this issue, except for new freight cars, for 1,000 of which contracts were this year placed. Work on the new motive power shops and various second track extensions authorized is to be begun in the spring of 1907. Grade crossing improvement work, the other announced purpose of the new funds, has been carried on during the year at a net cost of $432,661, which, however, has been charged to construction account on the general balance sheet. Further expenditures of this character will probably be covered by the proceeds of the new stock issue.

The additions to rolling stock during the year include 55 locomotives, 44 passenger train cars, 23 caboose cars and 1,742 freight cars. The total expense of $2,455,538 for this new equipment was divided between income and capital accounts at the rate of $1,076,427 charged to the year's operating expenses (against $807,782 in 1905) and $1,379,111 charged to capital account.

The striking feature of the operating expense accounts is the large increase in conducting transportation, which amounted to $1,547,723, or nearly 10 per cent. Almost every one of the subdivisions of this account shows an increase, particularly those which are made up of wage payments. For instance, engine and roundhouse men increased from $2,566,000 to $2,708,000, and switchmen, flagmen and watchmen increased from $2,033,400 to $2,187,100. Fuel for locomotives increased from $4,241,969 to $4,528,277. The collision at Baker Bridge, Mass., last November, in which 17 persons were killed and 30 or more injured, is responsible for the increase in the item injuries to passengers, which rose from $128,000 in 1905 to $455,000 in 1906.

Gross earnings per mile of road increased from $16,082 to $17,419 and net earnings per mile from $4,192 to $4,312. The net earnings per revenue train mile were 49 cents in 1904, 48 cents in 1905 and 47 cents in 1906. The rates received last year were slightly higher than in 1905, the average rate per passenger mile being 1.769 cents against 1.755 cents in 1905 and per ton mile 1.162 cents against 1.152 cents in 1905. In neither case, however, are the present figures up to the average receipts in 1904, when the passenger mile rate was 1.784 cents and the ton mile rate 1.178 cents.

The Boston & Maine, owing to the great concentration of its ownership in New England, has been one of the few large railroads which have kept in force the system of carrying stockholders free to and from its annual meetings. This year the announcement is made that, under advice of counsel that the new Interstate Commerce law definitely prohibits the custom of carrying stockholders to the meetings of the company free on presentation of their stock certificates, the directors are unable to authorize the transportation of stockholders so and from the annual meeting at any other than current transportation rates and by regular trains.

The Maine Central, which is the most important railroad system in Maine and which is controlled by majority stock ownership by the Boston & Maine, has also had a favorable year, gross earnings ($7,794,745), having increased $556,810. Net earnings were $3,024,240 against $2,567,097 in 1905, an increase of $457,143. Owing, however, to a charge of $828,000 against earnings for new equipment (this charge was only $192,000 in 1905) and one of $434,554 for various improvements (against a similar charge of $350,000 in 1905), the net income after fixed charges was only $404,587 against $527,236 in 1905. The appropriations include $100,000 in addition to the $300,000 set aside in 1905 for terminal improvements at Bangor, $71,551 for enlargement of the Thompson's Point (Portland) shops, $103,500 for five miles of new second track now under construction, and $160,000 for new ferry slips at Bath and Wool-

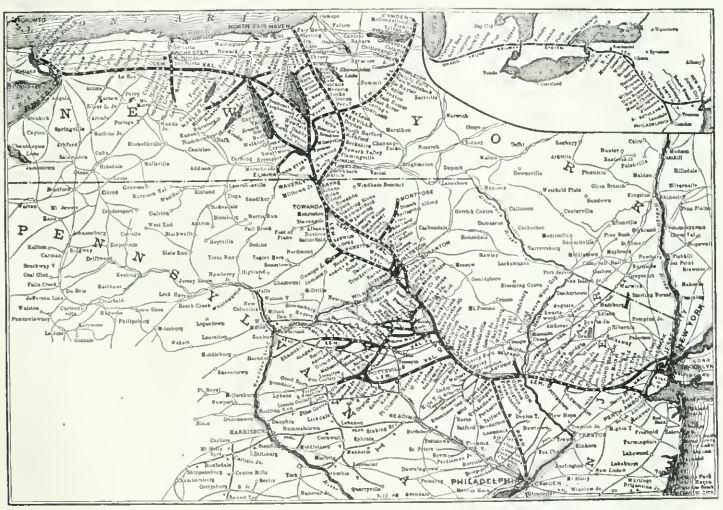
wich, the latter improvement to be finished during the present season.

For the Boston & Maine the principal statistics of operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,288 | 2,288 |
| Freight earnings | $23,847,550 | $21,808,070 |
| Passenger earnings | 15,235,420 | 14,291,615 |
| Gross earnings | 39,214,205 | 36,215,246 |
| Maint. of way and struct. | 5,383,302 | 4,501,378 |
| Maint. of equipment | 3,339,013 | 3,396,380 |
| Conducting transportation | 18,665,030 | 17,117,307 |
| New equipment | 1,076,427 | 807,782 |
| Operating expenses | 29,353,369 | 26,619,740 |
| Net earnings | 9,860,834 | 9,595,505 |
| Net income | 2,188,205 | 2,019,857 |

## Lehigh Valley.

The gross earnings of this company for the year ended June 30, 1906, were $32,789,857, an increase of more than $1,500,000 over the preceding year—this in spite of a decrease of $281,772 in coal freight earnings which make up, on the average, almost exactly half of the company's traffic earnings. An increase of $1,501,544 in other freight earnings and of $461,567 in passenger earnings, with smaller increases in express and mail earnings, more than made up for this decrease. There was a decrease of $208,000 in miscellaneous earnings, due principally to a decrease of over 100 per cent. in car service receipts and large decreases in the items of trackage and rents, brought about through the purchase and absorption of the Delaware, Susquehanna & Schuylkill, which had rented 133 miles of trackage. To offset the increase in gross earnings, operating expenses increased




Lehigh Valley.

over $1,200,000, leaving net earnings of $12,637,646, larger by $291,505 than in 1905. The loss in coal freight earnings was, of course, due to the suspension of both anthracite and bituminous mining during April and May of this year. Without this interruption, the Lehigh Valley could hardly have failed to have had a year exceptionally prosperous—not that the year's results as they stand do not show prosperity, but that undoubtedly much better results would have been obtained had it not been for the labor troubles in the coal regions.

The Delaware, Susquehanna & Schuylkill Railroad, together with all the other property of Coxe Bros. & Company, Inc., came under the operation of the Lehigh Valley on November 1, 1905. This represented the acquisition of the most important independent coal producing interest remaining in the anthracite territory and was significant as showing the closer and closer monopoly of the coal lands by the transportation companies in control. The new mileage acquired amounted to about 50 miles of branch lines, the company having rented trackage rights over the main line of the Lehigh Valley from Penn Haven Junction to Perth Amboy for its outlet to tidewater. The purchase was financed by an issue of $19,000,000 4 per cent. collateral trust bonds, with the stocks of Coxe Bros. & Company and the Delaware, Susquehanna & Schuylkill pledged thereunder as security.

Other financial operations of the year included the issuing of $4,000,000 general consolidated mortgage 4 per cent. bonds, $2,000,000 of which were used in refunding and the remaining $2,000,000 held in the treasury. In return for advances made to cover the cost of building and equipping the new shops of the road at Sayre, Pa., the Consolidated Real Estate Company, formed for this purpose, made a mortgage securing $2,600,000 of 4 per cent. bonds, all of which were turned over to the Lehigh Valley in full reimbursement for the amount advanced for such expenditure. In partial settlement for advances made during the year for the construction of the Lehigh & Lake Erie Railroad, the company's new terminal line at Buffalo, N. Y., $620,000 of that company's first mortgage 4 per cent. bonds were turned over to the Lehigh Valley, making $1,200,000 of these bonds received on this account to date. Besides this, the report states that "the amounts due from railroad and water lines in the Lehigh Valley System for advances on account of construction and new property, amounting at the close of the last fiscal year to $5,498,067, have been reimbursed to the company by the issue of additional stocks or bonds of these companies. Your company, therefore, now owns securities in lieu of the book accounts representing the amounts which were from time to time advanced." While it is of no great importance so long as finances are in good condition by what method such advances to subsidiary companies are made, the advantage in the event of financial disaster or reorganization of having past advances represented in the treasury of the parent company by actual securities instead of by bookkeeping accounts is obvious, for in this way something more definite than a bookkeeping claim is in the hands of the controlling company.

Numerous improvements are being made to the property. The new shops, water pumping plant and reservoir at Sayre are now in operation, and the Lehigh & Lake Erie is to be ready for laying the last rails by the end of next September. Work on reducing grades and changing alinement on the Pennsylvania division —including a new and heavier double-track steel girder bridge over the Susquehanna river—is to be finished within a year, an improvement which will result in substantially increasing the average train load on this division. This is being done at an estimated cost of $805,000. During the year the third track over the Wilkesbarre mountain has been extended 4.26 miles, at a cost of $64,600, making a total of 14.16 miles of continuous third track which is used in facilitating the movement of westbound freight over the mountain. Third and fourth tracks from East Penn Junction to a point west of Freemansburg have been authorized at an estimated cost of $247,300. The fourth track from Packerton to Mauch Chunk is now being extended to Glen Onoko, 2.3 miles, an improvement which, on completion, will relieve the Packerton yard and improve the movement of westbound freight. A new freight terminal has been established at 149th street, New York City, to serve the Harlem and Bronx districts. Three water tanks of 50,000 gallons capacity each, and one of 60,000 gallons capacity were built during the year. Additional real estate was acquired at various points, the principal purchases having been at Jersey City, Bayonne and Newark, N. J., and South Bethlehem and Wilkesbarre, Pa. This list does not include numerous less important improvements.

The total production of anthracite coal from lands in which the Lehigh Valley is interested was 7,667,665 tons as against 7,975,210 tons for 1905, a decrease of 3.86 per cent. The Lehigh Valley Coal Company and affiliated companies produced and bought 85 per cent. of the anthracite coal transported by the Lehigh Valley Railroad. The coal properties were improved by new breakers at Blackwood and Mount Carmel, and other improvements were made at a cost of $621,323. New coal storage plants with capacities of 100,000, 200,000 and 375,000 tons respectively were built at Wende, Black Creek and Ransom, at a total cost of $790,629.

Further examination of the income account shows that in addition to the gain of $290,000 in net earnings there was an increase of $355,000 in other income. From the total income of $13,446,000 there was deducted for additions and improvements $1,570,227. Net income was $5,451,581, against $5,392,889 in 1905. The net income from the Lehigh Valley Coal Company to be added to this was, however, $317,000 smaller than in 1905, so that the total net income for the year was $5,770,073, against $6,028,437 in 1905, a decrease of $258,000.

From an operating standpoint the year was not as favorable as 1905, largely owing to higher wages, increased cost of supplies, and the suspension of mining. With an increase of 5.21 per cent. in freight and 4.60 per cent. in passenger train earnings there was an increase of 7 per cent., or $712,916, in the expense of conducting transportation. The average train load, however, shows a small increase of 3 tons, from 501 tons to 504. The average rate received (0.626 cents) was slightly smaller than the year before, but in comparison with the average rate received by bituminous roads shows how profitable an article of traffic from the railroad's standpoint is anthracite coal. When companies like the Chesapeake & Ohio and

the Norfolk & Western are able to make a profit from an average rate of somewhere around 4 mills it is natural to expect favorable results on a road like the Lehigh Valley with an average revenue per ton mile of over 6 mills.

Maintenance of way cost $2,207 per mile, against $2,347 in 1905. Maintenance of equipment cost $3,020 per locomotive in 1906, against $3,150 in 1905; $685 per passenger car, against $695 in 1905, and $61 per freight car, against $51 in 1905, the last figure being a noteworthy increase, particularly in view of the large amount of new equipment recently placed in service.

The principal statistics of the year's operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,429 | 1,393 |
| Coal earnings | $13,248,565 | $13,530,337 |
| Other freight earnings | 13,934,127 | 12,432,583 |
| Passenger earnings | 3,971,392 | 3,509,825 |
| Gross earnings | 32,789,857 | 31,275,843 |
| Maint. way and structures | 3,153,245 | 3,269,383 |
| Maint. of equipment | 5,485,794 | 4,894,269 |
| Conducting transportation | 10,891,054 | 10,179,038 |
| Operating expenses | 20,152,211 | 18,929,701 |
| Net earnings | 12,637,646 | 12,346,141 |
| Total net income | 5,770,073 | 6,028,437 |

## Chicago Great Western.

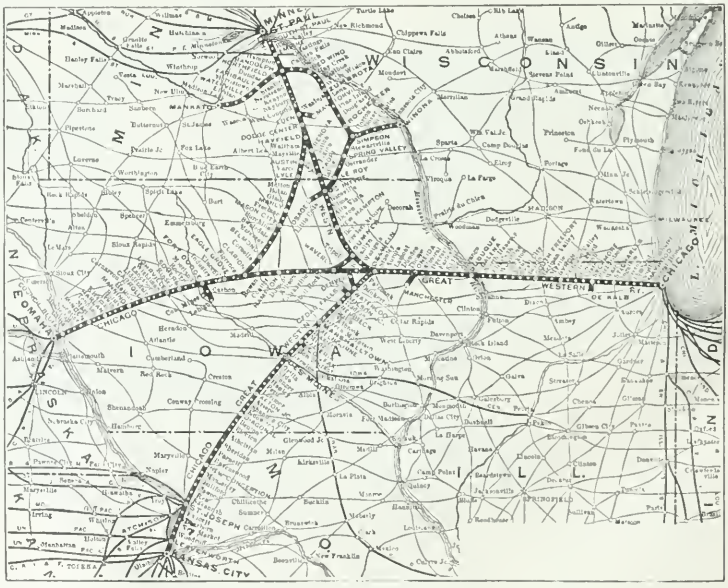
The Chicago Great Western is an American railroad organized, so far as its finances are concerned, largely on the English model. It is made up of three parts, the Chicago Great Western proper, with 818 miles of operated line, including the main stems to Chicago, St. Paul and Kansas City; the Mason City & Fort Dodge, a proprietary road operating 386 miles of line, including the Omaha main stem, and the Wisconsin, Minnesota & Pacific, another subsidiary company having 271 miles of road made up largely of branch lines in Minnesota. The Chicago Great Western owns all the stocks of the two subsidiary companies, having issued its own stock in exchange. Separate accounts are kept for the two smaller companies and the surplus from operation of each company after payment of all operating expenses and charges belongs to the Chicago Great Western. To the extent of such surplus earnings as have been received by the parent company from each of the subsidiary roads, the Chicago Great Western guarantees the future payment of their bonds.

The bonds issued by these two companies make up the entire long term bonded indebtedness of the system. An issue of 4 per cent. debenture stock which has most of the attributes of bonds except the power of foreclosure takes the place of a first mortgage bond issue for the Chicago Great Western. It has, however, at present outstanding $8,473,061 in short term notes maturing during the next five years, and $272,271 in equipment lease warrants. The Mason City & Fort Dodge has $12,000,000 50-year first mortgage bonds issued in 1905 outstanding, and the Wisconsin, Minnesota & Pacific, $5,796,000 first mortgage bonds outstanding. It can therefore hardly be claimed with justice that the Chicago Great Western is a trunk line railroad without a mortgage, although it is true that, leaving its debenture stock out of consideration, it has, including its two subsidiaries, an exceedingly low bonded debt. The bonds issued on the subsidiary companies, however, about cover the cost of their construction. The principal change in capital liabilities of the parent company during the year was an increase of over $13,000,000 in preferred B stock issued. This was in exchange for the similar amount of stocks of the subsidiary companies, and was handed over to the syndicates which were responsible for the construction of those roads.

From the standpoint of earnings the year was a very successful one. The three companies with a total mileage of 1,467 miles earned $11,147,687 gross, an increase of $1,628,576, and $3,823,733 net, an increase of $782,147 over the fiscal year ended June 30, 1905. On the Chicago Great Western proper gross earnings increased $1,461 and net earnings $612 a mile. From the $2,539,493 income after operating expenses and taxes, there was paid besides the regular 4 per cent. interest payment amounting to $1,044,978 on the debenture stock, a semi-annual dividend of 2½ per cent on the preferred A stock, the first payment made on this security since February, 1904. Even after this extra payment of $283,423 there remained income enough to appropriate $686,724 to a fund for improvements and renewals, in marked contrast with 1905 when no such appropriation out of income was made. At the same time there was a profit and loss surplus for the year remaining of $419,980, of which, however, $283,000 must be allotted to the 2½ per cent. dividend payment on the A stock payable October 1, 1906. Besides larger railroad earnings, which were, of course, the main cause of the successful income results of the year, there was an increase of $124,000 in the amount received by the present company as the surplus earnings of the proprietary lines.

In the review of the annual report of this company in the *Railroad Gazette* last year, the maintenance figures were severely criticised as compared with amounts spent by other railroads in similar territory. There has been little improvement during the past year in this respect. Maintenance of way on the parent line, including, according to the company's statement, "renewals" (though it is difficult to tell where there is any room for renewals in last year's figures), cost $894 a mile against $890 in 1905 and about $1,000 in 1904. On the Mason City & Fort Dodge the figure was $372 against $364 in 1905, and on the Wisconsin, Minnesota & Pacific $415 against $445 in 1905. This makes an average charge of $669 a mile on the 1,476 miles of the whole system, which for a trunk line railroad with a large proportion of through traffic and freight density during the past year of 1,065,196 tons one mile per mile of road on the 818 miles directly operated is a very low figure.

All traffic and mileage statistics are for the Chicago Great Western proper, so that it is not possible to judge of the operating efficiency of the through and branch lines as a whole. On this 818 miles of line, all but 20 miles of which are main line, the revenue train load in 1906 was 295 tons, a decrease of one ton from the previous year. The average train load to each freight engine mile was 254 tons. The car mileage figures show somewhat better results than in 1905 but are hardly satisfactory, the average number of empty freight cars per train mile having increased 5 per cent. along with a decrease of 2½ per cent. in the number of loaded cars per train mile. With an increase of 19 per cent. in the mileage of loaded freight cars east, the mileage of empty freight cars in the same direction increased 16 per cent. Westbound the mileage of empty freight cars increased 34 per cent. against an increase of 11 per cent. in the loaded freight car mileage.




## Chicago Great Western.

Passenger train earnings for the year were $2,254,366, or $2,755 per mile against $2,526 in 1905, an increase of 9 per cent. The average amount received from passengers shows an increase of 95 per cent., and the average distance each passenger was carried of 102 per cent., two unusual figures resulting from the taking off of motor trains in suburban service between St. Paul and South St. Paul. This feature also reduced the number of passengers carried 44 per cent., but at the same time there was an increase of 13 per cent. in the number of passenger miles.

One feature of the company's balance sheet which must be criticised is the item "Advances from earnings," which appears among the capital liabilities. This account, which amounted to over $1,000,000, is also carried among current accounts as an asset, the two entries thus exactly balancing on the complete balance sheet. This simply means that the amount mentioned has been spent out of earnings and will eventually be capitalized, but it seems an unnecessary confusing of the balance sheet to carry such an item, especially as it grows larger year by year. The principal statistics

of operation for the Chicago Great Western proper are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 818 | 818 |
| Freight earnings | $5,093,374 | $5,096,543 |
| Passenger earnings | 1,984,403 | 1,820,564 |
| Surplus earnings* | 227,431 | 103,686 |
| Gross earnings | 8,573,148 | 7,377,711 |
| Maint. way and renewals | 731,396 | 728,015 |
| Maint. of equipment | 982,709 | 904,554 |
| Fuel for locomotives | 1,011,798 | 795,015 |
| Conducting transportation | 2,631,516 | 2,276,677 |
| Operating expenses | 5,817,655 | 5,125,093 |
| Net earnings | 2,755,493 | 2,254,618 |

*Of proprietary lines.

## Canadian Pacific.

The Canadian Pacific is far too big a corporation to be adequately covered in the space of a brief 30-page annual report. As a railroad, it has in addition to the 593 miles of the Duluth, South Shore & Atlantic and the 2,153 miles of the Minneapolis, St. Paul & Sault Ste. Marie, its two controlled companies in the United States, a grand total mileage of 10,139 miles, on 8,777 miles of which are based the traffic returns for the past year, and 924 miles of which, a good sized railroad in itself, are now under construction. More than this, the company operates its own parlor and sleeping cars, express and telegraph services, and a fleet of 54 ocean, lake and river steamers, of which 18 on the Pacific and 15 on the Atlantic Ocean, are ocean-going steamships. The operating results of these extensive and varied activities are presented to the stockholders very briefly. The statement of earnings and expenses, for example, for the year ended June 30, 1906, occupies 14 printed lines. Most of the space in the report is taken up with the balance sheet items, the operations of the land department and the mileage and extensions of and improvements to the company's railroad lines.

Even the brief information available makes it evident that the year has been a remarkable one for its large increases in earnings. Gross earnings, including earnings from sleeping cars, express, elevators, telegraph and miscellaneous, as well as profit from ocean steamships, were $61,670,000, against $50,482,000 in 1905, a gain in one year of $11,188,000, or over 22 per cent. Even more remarkable is the fact that with this large increase in gross earnings operating expenses increased only $3,690,000, or a little more than 10 per cent. Net earnings, therefore, show a gain of nearly $7,500,000, being $22,973,000, against $15,475,000 in 1905. An idea may be gained of the rapid growth of the company by the fact that in 1896 total gross earnings were only $20,682,000 so that there has been an increase of over 200 per cent. in ten years. Of the increase of over $11,000,000 last year in gross earnings, passenger earnings furnished $2,458,564, and freight earnings $7,787,683. Earnings from sleeping cars, express, elevators, telegraph and miscellaneous, including *profit* from ocean steamships, were $5,408,161, against $4,469,643, an increase of nearly $1,000,000 in this item.

Half of the increase of $3,600,000 in operating expenses was in the item of conducting transportation, which was $18,785,696, against $16,905,849 in 1905. There were smaller increases in maintenance of way and structures, maintenance of equipment and parlor and sleeping car expenses, while there was a slight decrease in expenses of lake and river steamers. Maintenance of way works out at $1,037 per mile of road, against $995 in 1905, an average increase of $42 per mile on each of the 8,777 miles operated. The operating ratio dropped from 69.35 in 1905 to 62.75 per cent., reflecting the small increase in operating expenses compared with the increase in gross earnings.

The year has seen an increase of $16,900,000 in the stock outstanding, raising the total to $101,400,000. There was also issued during the year $12,000,000 4 per cent. consolidated debenture stock, part of which was used to pay a debt of $7,000,000 due the province of Quebec in connection with purchase of the railroad between Ottawa and Quebec, the remainder being used for construction of branch lines and the two additional Atlantic steamships, the "Empress of Britain" and the "Empress of Ireland," which have been put in commission during the year. These two new steamships, it is worth mentioning, are among the finest in the transatlantic service, and have brought up the standard of the Canadian Pacific steamship line to that of the best of the American lines.

The land sales were 1,115,743 acres, which realized $6,513,452, an average of $5.84 an acre. The sum of $6,500,000, received from land sales, was, in addition to earlier payments, deposited with the Dominion Government toward the redemption of the $15,000,000 land bonds mortgage, leaving a balance due on account of this mortgage of $1,500,000. Against this, deferred payments are due on account of land and town sites sold amounting to $16,382,823. After the redemption of these land bonds the net receipts from land sales will be a clear profit to the road, an item of revenue which it is fignred will, even at the average price now being received, amount, by the time the lands are exhausted, to about $125 a share on the present outstanding stock, this calculation taking no consideration of probable increase in the price received for the land or the great increase in traffic which must result through settlement of the now unoccupied land.

The only unfavorable financial item of the year's results is the fact that the Duluth, South Shore & Atlantic, of whose 4 per cent. consolidated mortgage bonds the Canadian Pacific holds $15,107,000, besides $3,000,000 income certificates, failed to meet any portion of the year's interest. Although the 1906 earnings of this road show a good increase, the necessity of defraying out of revenue certain large and unusual expenditures, particularly the cost of a new ore dock at Marquette, left nothing for the bond interest. It is mentioned, however, that very much better results from this property are anticipated in the present year.

Perhaps the most striking feature of the report is the expansion of the railroad lines shown. As already mentioned, 924 miles are under construction. The following is a summary of the progress of this work. The Guelph & Goderich Railway, which is to run from Guelph, Ont., west to Goderich, on Lake Huron, 80 miles, is nearing completion. Work on the line between Toronto and Sudbury, Ont., 226 miles, is well advanced. This line runs from Bolton, the junction with an existing branch west from Toronto, north along the eastern shore of Georgian Bay to Sudbury. It is expected that the Wolseley branch, from Wolseley, Sask., to Reston, Man., 122 miles, will be finished this fall. Grading is being done in both directions between Wetaskiwin, Alb., Strassburg and Sheho, Sask., on a through connection between the Manitoba & North-Western line, the Pheasant Hills branch, and the city of Edmonton, this to be completed in the year 1907. This line will require an important bridge over the Saskatchewan river at Edmonton. In order to provide a new and more economical route between Montreal and Georgian Bay, a road is to be built from Peterboro, on the Ontario & Winnipeg line, to Victoria Harbor, 96 miles. This will shorten the distance from Montreal to Georgian Bay over the Canadian Pacific from 149 miles by the present Owen Sound route to 258 miles, with much more favorable grades. The new line is to be built by the Georgian Bay & Seaboard, which is to be leased to the Canadian Pacific at a rental equivalent to 4 per cent. interest on its bonds. Arrangements have also been made for a lease of the Joliet & Brandon (formerly the Montreal & Lake Maskinonge) which runs from St. Felix de Valois, Que., on the Joliet branch to Lake Maskinonge, as well as for a lease of the Walkerton & Lucknow, which runs from Proton, Ont., on the Toronto, Grey & Bruce line to Walkerton, 37 miles; also of the Berlin, Waterloo, Wellesley & Lake Huron, and of the roads built and to be built by that company in Ontario, including those bought by it from the Galt, Preston & Hespeler and the Preston & Berlin.

To pay for construction of the following branch lines, the stockholders will be asked to authorize the issue of 4 per cent. consolidated debenture stock: The Moose Jaw branch, northwesterly for about 50 miles, from Moose Jaw, Sask., the junction of the main line with the "Soo" connection to St. Paul; the Weyburn branch, from Weyburn, Sask., on the northwestern extension of the Souris branch to Stoughton on the Arcola-Regina extension of the Souris branch, about 36 miles; an extension of the Stonewall branch from Teulon, Man., northerly about 20 miles; an extension of the West Selkirk branch from Winnipeg Beach, Man., to Gimli, 10 miles; a branch from Lauder, Man., on the Souris branch, westerly to Broomhill, about 20 miles, and a six-mile branch from a point near Darlingford on the Manitoba South-Western Colonization Railway southerly. In addition to all this branch line construction, the company is actively engaged on the double tracking of the main line from Winnipeg east to Fort William on Lake Superior, 427 miles, an improvement which it will take at least two years more to finish.

The principal statistics of operation follow:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 8,777 | 8,568 |
| Freight earnings | $39,512,973 | $31,725,290 |
| Passenger earnings | 16,041,616 | 13,583,052 |
| Gross earnings | 61,669,758 | 50,481,882 |
| Maint. of way and struct. | 9,105,250 | 8,527,135 |
| Maint. of equipment | 7,369,566 | 6,616,258 |
| Conducting transportation | 18,785,696 | 16,905,849 |
| Operating expenses | 38,696,146 | 35,006,794 |
| Net earnings | 22,973,313 | 15,475,088 |
| Net income | 16,012,216 | 8,875,686 |

## Chicago, St. Paul, Minneapolis & Omaha.

This road, operating 1,698 miles of line, is an important part of the Chicago & North-Western system, since it includes that part of the lines about St. Paul and Minneapolis, with a connection through those cities from Duluth and Ashland on the north to Sioux City and Omaha on the south, besides various branches. It also makes up the northern half of the through line from Chicago to St. Paul and Minneapolis, and connects closely at some dozen other points with the Chicago & North-Western. In spite of its close relationship with the controlling company the road is only informally united with it under the title, adopted apparently mainly for the convenience of the traffic departments, The North-Western Line, but otherwise is still maintained as a distinct property and presents a separate annual report.

Attention was called in reviewing the report of the Chicago & North-Western in these columns two weeks ago (the map published at that time shows the C., St. P., M. & O. lines) to the low main-

tenance charges on that road. Maintenance expenses on the smaller road are still lower. For instance, maintenance of way, which cost a little over $1,000 a mile last year on the C. & N.-W., cost only $960 a mile on the C., St. P., M. & O. Repairs of equipment, against $1,600 per locomotive, $500 per passenger car and $40 per freight car on the larger road, cost $1,250 per locomotive, $390 per passenger car and $40 per freight car on the smaller, with $40,649 spent for renewals, comparing with some $3,750,000 for renewals on the North-Western proper. Of course, certain of the Omaha's lines are lines of light traffic and yet, with the important Twin City territory included in its mileage, it is surprising to find that maintenance is not more costly.

So far as earnings are concerned, the year has been a satisfactory one. Gross increased over $1,000,000 and net more than $380,000. Freight earnings brought $615,000, and passenger earnings $342,000 of the increase. The larger net earnings made it possible for $600,000 instead of $400,000 as in 1905, to be appropriated for future improvements, while even after the deduction of this extra $200,000 the profit and loss surplus for the year was $331,000—$177,000 larger than in 1905.

Various improvements were made during the year, including a 10-mile extension from Winter, Wis., east to Draper, new second track, new yards, and four changes in the line. There are now under way further betterments of the same sort, including an extension from Hartington, Neb., northeast to Crofton, 15 miles, and new second track at Duluth and third and fourth track and a new yard at St. Paul.

The following table summarizes the principal results of the year's operation:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,693 | 1,686 |
| Passenger earnings | $3,422,426 | $3,080,575 |
| Freight earnings | 8,753,166 | 8,138,065 |
| Gross earnings | 12,943,750 | 11,926,000 |
| Maint. way and structures | 1,625,043 | 1,381,588 |
| Maint. of equipment | 1,209,831 | 1,153,178 |
| Conducting transportation | 4,587,629 | 4,317,070 |
| Operating expenses | 8,310,945 | 7,676,528 |
| Net earnings | 4,632,806 | 4,249,472 |
| Net income | 3,018,140 | 2,641,129 |

## NEW PUBLICATIONS.

*Railroad Accidents, Their Cause and Prevention.* By R. C. Richards. 4½x7 in.; 111 pages. Chicago: Published by the Association of Railway Claim Agents, C. L. Young, Secretary, 215 Jackson Boulevard. Price, $1.

This is an exceedingly spicy and readable book on railroad accidents of all kinds, prepared by a veteran claim agent who addresses himself directly to the train men, station men and others who are responsible for most of the accidents on railroads; and he speaks in language of such refreshing simplicity and directness that the lowest track man or freight house laborer though a fool need not err therein. Every preachment is backed up by a paragraph giving the detailed facts, with names and dates, of an actual case. The headings of the chapters include: Injuries to passengers; ejectment of passengers and others from trains; accidents to travelers on the highway; trespassers; locking of turntables; damage by fire to adjacent property; injuries to employees caused by the carelessness of other employees; accidents caused by defective equipment, defective scaffolds, etc.; defective floors and platforms; obstructions; carelessness of enginemen, and several other topics. Readers of the *Railroad Gazette* who may examine this book will at once recall the fact that a good deal of it has been printed in these columns during the past year, and most of those interested will be able to guess the name of the road with which the author of the book is connected; in short, will be able to satisfactorily localize this very instructive and entertaining information which Mr. Richards has given to the railroad world. All of the matter has, we believe, been brought to the attention of the employees of the road on which the accidents cited in the book occurred; and, unlike many things that are written for the instruction of railroad employees, it has been put in such shape as to be useful and instructive to men on other roads. The injunctions to obey the rules and to exercise good judgment, and thereby prevent accidents, are in some cases too much like the heartless paragraphs of the rules themselves, assuming apparently that compliance is easy, under circumstances which every practical man knows to be hard. The author's tone and spirit are, however, so uniformly fair and considerate that no careful reader will accuse him of requiring impossibilities.

# CONTRIBUTIONS

## Early Wooden Railways.

New York, Sept. 12, 1906.

To the Editor of the Railroad Gazette:

Speaking of early railways, I send you a little history from my personal knowledge.

In 1839 I lived in the village of Dexter, Jefferson County, New York, on the Black River, where there was abundant water power and a sawmill, large for those days. It had been the custom for several years to carry sawn boards from the mill by arm, shoulder and back some considerable distance and stack them on the banks of the river below the dam. This was a laborious job, and it occurred to the boss to construct a wooden railway, which was done by grading the ground, laying crossties (similar to those now in use on railways), placing a 6 x 6 scantling lengthwise over the crossties, and on the top of the scantling a wooden strip, 2 x 3, which served as the track. A wooden platform car about eight by twelve feet was constructed and placed on the track, and for many years that system of taking lumber from the mill was used.

I cannot remember by just what means the car was kept from running off the track; but the experiment was successful and was considered to be a wonderful achievement at the time. The railway had a considerable down grade, and the main labor of transporting the lumber was in holding back the car, which was done by hand. When the car was unloaded it was easy work to push it back to the mill for another load.

W. B. LASSCELL.

## Western Interpretations of the Law.

J. C. Stubbs, of the Union and Southern Pacific, and chairman of a committee appointed two months ago by the railroads west of Chicago, to study doubtful points in the new rate law, has made a report answering thirty questions propounded by various companies, concerning passenger transportation. The more important answers are in substance as follows:

There is no authority in law for making lower rates to landseekers and settlers than for other travelers.

The law committee advises that transportation cannot be issued in payment for advertising. It is generally accepted, however, that carriers may carry an open account with publishers and that publishers may carry an open account with carriers for advertising and that these accounts can be balanced periodically. The balance, whatever it may be, must be paid in cash. The transaction must be devoid of previous agreement that the services done by either party for the other is to be paid for in any other way than by cash.

Special reduced rates may be made for Federal and State troops and for officers and employees of the United States geological survey and for reclamation service in the future as in the past.

The words of the law excepting "inmates of hospitals and charitable and eleemosynary institutions and persons engaged in charitable and missionary work," from the free pass prohibition are held not to apply to doctors, nurses and other employees.

Nuns, sisters of charity, missionaries, evangelists, national or State officers of religious organizations, teachers and pupils in Indian schools, officers of the Salvation Army and Volunteers of America, it is held, may be given free transportation.

Special rates for theatrical companies, baseball clubs, etc., are held to be discriminatory.

Special rates for army and navy officers and their families, which always have been made in the past, are held unlawful.

Regarding the interchange of transportation by common carriers for the use of officers and employees and their families, the committee decides such interchange may be made with sleeping car, express and steamship companies, but not with telegraph and telephone companies.

## New Tramways in London.

The London County Council proposes some 32½ miles of new lines for next session, nine miles of which it is proposed to electrify on the overhead trolley system, the remainder on the conduit system. The total estimated cost of the new lines is three-quarters of a million pounds. Perhaps the most interesting proposal is that for getting over the difficulty in Tottenham Court Road. It will be remembered that the Council last year sought to extend the line which at present terminates at the junction of Hampstead and Tottenham Court Roads, down Tottenham Court Road, but that proposal was rejected by Parliament, who considered the lower end of Tottenham Court Road too narrow for a double line. It is now proposed to lay a double line along Tottenham Court Road as far as Francis street, and here to divert one of the lines along Francis street and Gower street to New Oxford street. The Council also proposes to revive the Marble Arch to Cricklewood line which was rejected this year, the only alteration being the proposal to construct a loop line at the Marble Arch, so as to avoid a dead end terminus in Edgware Road. A reduction in the number of these latter, the multitude of which forms an eminently unsatisfactory feature of the present system, is to be welcomed, as is also the proposal of the Council in many cases to avoid expensive street widenings by laying alternative single lines in different streets.

## The History and Organization of Italian Railroads.

BY EDWARD P. NORTH.

Railroad building in Italy was inaugurated in the Two Sicilies in 1839 by the construction of five miles between Naples and Portici. This was followed by roads in Lombardy and Venezia, Tuscany, Piedmont, Parma and Modena, and lastly the States of the Church. The first road connecting Rome with the seacoast at Civita Veccia was finished in 1859. In 1861 Rome was connected with Naples, and in 1866 with both Ancona in the Adriatic and through Florence with the railroads in Northern Italy. In 1866 by the building of some 30 miles between Messina and Syracuse, railroad building on the island of Sicily was begun. In Piedmont, Parma and Modena, and Tuscany, the roads were built by the governments of those countries, and as these countries were consolidated in a united Italy the ownership of the railroads was assumed by the general government. In Lombardy and Venizia the roads were built and owned by an Austrian corporation; in the States of the Church by a company called "Romana," formed in 1862 and backed by French capital. From Bologna to Brindisi the roads were owned by a private company called "Meridional." All the roads in the Two Sicilies were owned by private companies.

Sketch Map of Italian Railroads.

In 1875 the government bought up and began to operate all the roads owned by companies, except those owned by the companies "Romana" and "Meridional." In 1882 the government bought also the roads of the "Romana" company. In 1885 the government roads were divided into through systems, or "nets," the Mediterranean, Adriatic and Sicilian, the "Meridional" roads being incorporated in the Adriatic net. Contracts were then made for 20 years with three companies to operate the three nets. The companies operating the Mediterranean and Adriatic systems were allowed to retain 62½ per cent. of the profits, while the Sicilian company, on account of the poverty of the country and the heavy grades of the railroads, was allowed to retain 84 per cent. At the end of 20 years the contracts might either be renewed or the roads and their equipment be taken over without compensation by the government. In July of the present year the government assumed control of the entire Mediterranean and Sicilian nets and all of the Adriatic net not the property of the Meridional company; the last mentioned company retaining its government guarantee of 5 per cent. on the cost of its lines up to a limit of $6,400 a mile, after which there is a rule for the division of the profits between the company and the government. The Italian government assumed control of these roads partly in consequence of the general unpopularity of the companies' management and partly because of friction which had arisen in regard to the making of renewals and improvements. Nearly all station grounds are inadequate in area and accommodations, so that though radical reductions in passenger rates have been made no reductions in freight rates are at present contemplated, as the stations cannot handle with economy the freight now presented. As a sample of the spirit governing the renewals of rolling stock, two Rogers locomotives, with inclined cylinders, bought in 1862, are still in use at Genoa.

After 1875 many branch lines were authorized by the government. These are built and worked by private companies which receive a yearly subsidy of from $960 to $2,400 a mile for 70 years, after which, with lines and equipment, become the property of the government. These secondary roads yielded in 1902 $4,400,000 in gross earnings.

Italian railroads are under the authority of the Minister of Public Works. The organization consists of a Director General, who is Chairman of the Managing Board, which has six other members. They are specialists respectively in traffic management, construction, maintenance, harbor and hydraulic work connected with railroads, tariffs and promotion of traffic, and one appointed by the Minister of the Treasury to advise on financial matters. The board as executive officers have under them 13 chiefs of departments, who are charged with correspondence, accounts, legal affairs, sanitary interests, personal interests, purchasing, traffic management, time-tables, maintenance of road and buildings, working the rolling stock, repairs of rolling stock, new construction and actuarial matters. All of these have their offices in Rome. The entire railroad system has been divided into eight sections, with from 1,600 to 3,200 miles of line in each. The amount of traffic and number of employees is, however, approximately equal in each section, ranging from 11,000 to 12,000 employees, and yearly traffic receipts of from $8,000,000 to $8,100,000 yearly earnings. The head offices of these sections are at Turin, Milan, Venice, Genoa, Florence, Rome, Naples and Palermo. Two of the sections are divided into sub-sections, i.e., in Milan for railroads worked by electricity, and in Messina for the ferry service which connects Sicily with the rest of Italy. The heads of these sections have considerable independence in matters of discipline, the arrangement of local trains, maintenance of way and rolling stock and liquidation of claims, but they have only an advisory voice in the matter of tariffs, through time-tables and purchases of general supplies. They can neither initiate new work nor make large improvements without the sanction of the Managing Board. In each of these sections there is a chief with an advisory board of four persons chosen from local patrons of the road, who, however, are not in its employ. The chief has as assistants the following officers: Secretary, accountant, lawyer, sanitary officer, traffic manager, superintendent of rolling stock and superintendent maintenance of line and buildings. These chiefs have generally a daily telephonic conference with the Director-General, and once a month they come to Rome for one or two days for a general conference with the Director-General and with each other. This is obligatory. In addition, old employees who, though not equal to continuous service, have valuable knowledge in their specialties from a consulting and inspecting board, reporting only to the Director-General.

The total income of the Italian railroads was for the year 1902 a little over $67,000,000, of which about $26,000,000 came from passengers and about $41,000,000 from freight, including baggage and dogs. Freight is classified as *grand velocity*, which comprises all baggage except hand baggage, newspapers and dogs going by passenger trains (there is no free baggage in Italy), and yields slightly over 1 per cent. of the total freight receipts; *small velocity accelerated* corresponding with our express freights, and yielding about 0.8 per cent. of the total, and *small velocity* which comprises ordinary freight and cattle—the bulk of the freight business.

There are four regular classes for passenger travel. Nearly twice as many passengers are carried at special rates varying from

1½ fares per round trip to military tickets with a discount of 78½ per cent. There has recently been a considerable reduction in passenger rates in the hope that the reduction will lead to more long distance travel and a greater intimacy between the people of north and south Italy.

Large contracts for new rolling stock, rails, etc., have recently been placed, and larger ones will soon be imperative, as the property taken over by the government is much deteriorated. To all suggestions that America presents a fine field for purchases a disposition to have the contracts given to Italian firms is exhibited, but as there has been a limited demand on Italian factories in the past for such material, they are unprepared for the emergency, and it will be necessary to go into foreign markets to meet the necessities of the case.

LAKE MICHIGAN
CHICAGO
SOUTH CHICAGO
INDIANA HARBOR
C. R. I. & P. R.
C. & W. I. R.
C. I. & S. R.
C. G. W. R.
C. M. & St. P. R.
C. & N. W. R.
C. M. & St. P. R.
C. & E. I. R.
C. & E. I. R.
C. G. T. R.
C. R. I. & P. R.
C. & E. I. R.
C. I. & S. R.
C. & E. I. R.
C. M. & St. P. R.
C. & N. W. R.
C. M. & St. P. R.
C. & N. W. R.
C. & N. W

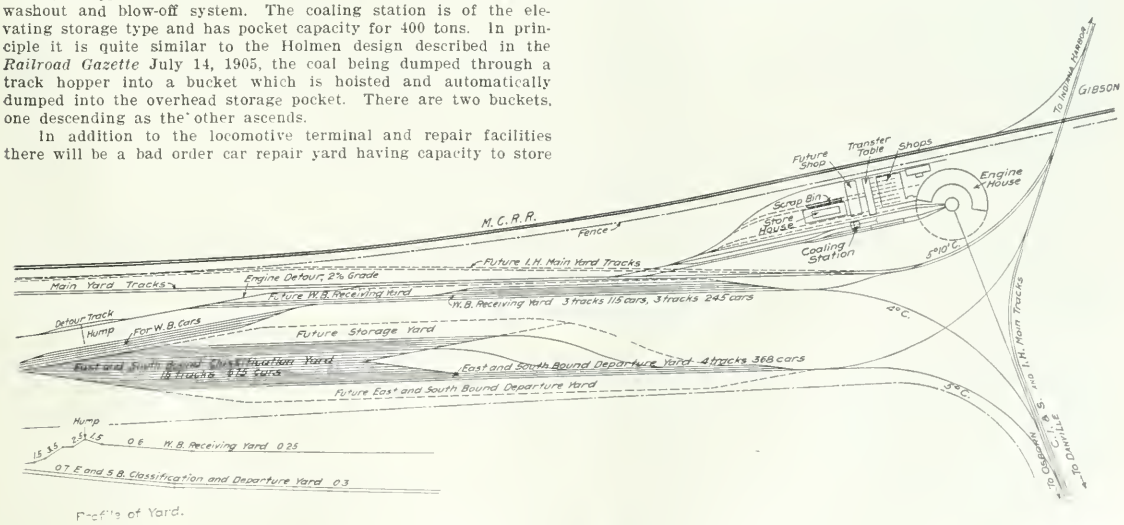
only about 600 ft. from the extreme west end of the receiving yard tracks; also that the receiving yard is on a 0.25 per cent. grade toward the hump, which increases to 0.6 per cent. in the hump approach track. This arrangement is due partly to the conditions controlling the layout of the yard, but its advantage from the operating standpoint was of primary importance in determining its adoption, since it will minimize the pusher engine service by enabling each pusher engine to handle singly the maximum train brought into the receiving yard by the road engine; that is, by raising the level of the receiving yard to such a point as to make the approach grades to the summit of the hump comparatively easy, and the intervening distance being short, the operating expense is minimized and a greater rapidity of car movement secured. The plan involves some additional first cost in the greater quantity of filling required to raise the level of the yard, but this is quickly absorbed in the decreased cost of engine service, which is a continuous expense.

A westward movement through the yard would be as follows: The road engine having drawn its train into the receiving yard—which is composed of three shorter tracks of 115 cars capacity and three longer ones of 245 cars capacity—upon cutting off from the train, will be able ordinarily to back down the north longer track, which will be kept open when possible, to the roundhouse; or it may use the engine detour track to cross over to the main yard tracks. The train is then taken by the pusher engine for breaking up over the hump into the classification yard. Any cars having an eastward or southward destination, however, are diverted onto the tracks so marked, lying south of the westbound classification yard. From here they are drawn into the east-and-southbound receiving yard and "re-humped" over the eastward summit into the east-and-southbound classificaion yard. Road engines from the east-and-southbound receiving yard can either pass over the hump to run to the roundhouse, or back down the central track of the receiving yard to the main yard tracks.

This is to be the principal terminal of the Chicago, Indiana & Southern and the Indiana Harbor and suitable facilities to care for the engines are provided at the east end. These include a 25-stall roundhouse, which can be enlarged to the full circle when necessary, a small shop, power station, storehouse, coaling station and ash pits. These facilities are strictly modern in every respect. The buildings are brick and concrete construction. The shop is to be electrically driven by alternating current motors and will contain a hoist for unwheeling locomotives, also motor driven. It will be served by a Nichols transfer table with a. c. motor, and has capacity for eight locomotives. There is space on the opposite side of the transfer table for another shop building, when needed. The power station will contain two 500 h.p. boilers, two 160 h.p. Erie engines driving two Crocker-Wheeler 100 k.w., two-phase, 240-volt, 60-cycle generators, and a set of Westinghouse a. c. series arc light apparatus. The engine house will contain a heating, washout and blow-off system. The coaling station is of the elevating storage type and has pocket capacity for 400 tons. In principle it is quite similar to the Holmen design described in the *Railroad Gazette* July 14, 1905, the coal being dumped through a track hopper into a bucket which is hoisted and automatically dumped into the overhead storage pocket. There are two buckets, one descending as the other ascends.

In addition to the locomotive terminal and repair facilities there will be a bad order car repair yard having capacity to store 200 and repair 100 bad order cars at one time. This will not only be the principal repair point for bad order cars for this system but will also be used for other of the New York Central Lines, affording some relief to their present Chicago facilities.

The yard plan shows a subway midway between the eastbound and westbound yards. This is for a highway and the tracks will cross it in each case on two 21-ft. reinforced concrete arches having about 13½ ft. headroom. The yard will be lighted by a. c. arc lights, along the sides instead of down the centers. There will be about 25 of these lights. The yardmaster's office, which will be centrally located, will have a tower from which the operation of the entire yard can be watched. Four engines, working double-shift, will do the yard work. All tracks for principal movements are being laid with 80-lb. rail and the body tracks with 67-lb. rail. The work is about 75 per cent. completed, and it is expected to have the yard in operation by the first of December. The work is being done by company forces, except the buildings and coaling station.


GIBSON
To Indiana Harbor
Future Shop
Transfer Table
Shops
Engine House
Scrap Bin
Store House
Coaling Station
M. C. R. R.
Fence
Future I. H. Main Yard Tracks
Engine Detour, 2% Grade
Main Yard Tracks
Future W. B. Receiving Yard
W. B. Receiving Yard 3 tracks 115 cars, 3 tracks 245 cars
Detour Track
Hump
For W. B. Cars
Future Storage Yard
East and South Bound Classification Yard
15 tracks 612 cars
East and South Bound Departure Yard 4 tracks 368 cars
Future East and South Bound Departure Yard
Hump
15 35 25 45 0.6 W. B. Receiving Yard 0.25
0.7 E and S B. Classification and Departure Yard 0.3
To Chicago
To Danville
To I. H. Main Tracks

Profile of Yard.

**Proposed Yard for the Indiana Harbor Railroad near Hammond, Ind. (2)**

## Mexican Railroads and Railroad Traffic.

BY SAMUEL H. BARKER.

Practical lessons in government regulation of railroad rates, a problem now new in the United States and one which is uppermost in the minds of all railroad managers, can be drawn from Mexico. In that country it has been fully demonstrated by the test of actual experience that the system, carried much further than it is by the new Interstate Commerce law, works without serious consequence, and to the general good.

There is a general railroad law in Mexico, but at the same time every railroad company exists under a special concession from the national government. This provides for undertakings on both sides. The government agrees to do certain things advantageous to the railroad, and it in turn is bound to other things. Virtually every railroad in Mexico is limited by its concession to maximum rates for the transportation of freight. This limitation is co-extensive with the life of the concession, which is usually 99 years. What the maximum rates shall be is agreed in advance between the government and the organizers of the company seeking rights. These maximum rates are not the same in all cases, differing and being determined largely by the character, resources and development of the territory through which the line is to run. But every Mexican road is restricted to the same maximum rates for passenger transportation. Following the system prevalent among everywhere except in the United States, Mexican railroads carry passengers in different classes. Maximum fares are 3 cents (silver) for first class, 2 cents for second class and 1½ cent for third class per kilometer.

Applying these rates to miles and reducing them to gold for easier comparison, the maximum passenger charges which Mexican railroads may make are approximately 2.4 cents per mile first class, 1.6 cents second class and 1.2 cents third class. Compared with passenger rates in the United States the average charge is thus low. Last year, for illustration, the average revenue of the National Railroad Company of Mexico per passenger was 1.84 cents Mexican, per kilometer, or a trifle less than 1½ cents of our money per mile. This compares with an average of 2.006 cents per passenger per mile for the railroads of the United States as shown by statistics for the fiscal year ended June 30, 1904. Taking large sections of the United States, as grouped by the Interstate Com-

merce Commission, where travel is more nearly equal in density to that in Mexico, the average revenue figures around 2½ cents per passenger per mile, going as high as 2.371 cents in the Virginias and Carolinas group. The practice of Mexican railroads is to charge up to the legal limit on all passenger business except that handled on through tickets issued in connection with railroads in the United States. But it must be remembered that the very large proportion of passengers carried third and second class materially reduce the average passenger mile revenue of Mexican lines.

Accommodations afforded all classes of passengers are the same in train service, differing only in the equipment provided. Third class passengers are herded into cars with interior finish about as in our baggage cars. Along each side of the car, extending its entire length, are plain wooden benches. Through the center, placed transversely, are other wooden seats, with an aisle on each side. Second class cars are plainly finished and have comfortable wooden seats arranged on each side of a central aisle as in our cars. First class cars are just like the passenger coaches in the United States. Frequently one car is divided by a partition in the middle into first and second class. Only passengers holding first class tickets can ride in Pullman cars.

Freight rates in Mexico average higher than in the United States, as would be expected. For example, the average revenue of the National Railroad Company of Mexico last year was 1.885 cents (silver) per ton per kilometer—more than was the average revenue per passenger per kilometer. Reducing to American money and applying to the mileage basis for comparison, it will be seen that the Mexican line collected slightly over 1½ cents per ton per mile. This is about double the average freight revenue per ton per mile for all railroads in the United States, and one-half higher than the average rate in the less thickly settled parts of this country where traffic is least dense and rates average high.

Extending the comparison further and again taking the National Railroad Company of Mexico as an illustration the following appears: Last year the gross earnings of this company per train mile were $1.7642, and its operating expenses $1.1458, gold. For the fiscal year ended June, 1904, the United States railroads earned an average of $1.9396 gross per train mile, and the operating expenses were $1.3137. Thus the Mexican line had net earnings of 61.84 cents per train mile; a sum not materially different from the 62.59 cents shown as the average for the roads in the United States.

Density of freight traffic, taking the United States as a whole, is far greater in this country, averaging 829,476 ton miles per mile of line. The Mexican road carried 303,899 tons. Density of passenger traffic approaches more nearly. In this country the average was 104,198 passengers carried one mile per mile of line. The Mexican National carried 80,804 passengers per mile of line. Here the average distance traveled by each passenger was 30.64 miles, and the average number of passengers per train was 46. The Mexican line last year carried an average of 53.4 passengers per train an average distance of 49.91 miles. In the United States the average haul per ton of freight on all lines was 244.30 miles, and the average trainload 307.76 tons, while the Mexican line's haul was 164.04 miles and the average trainload 239.56 tons on the standard gage system.

Government regulation of freight rates in Mexico is virtually complete. It is done through a railroad commission consisting of a president and six members, all of them men with private occupations. This commission meets one day each week in the City of Mexico to receive and go over with traffic officers of the railroads any proposals for changes in rates. No freight rate can go into effect except it shall first receive the approval and sanction of the railroad commission. Absolute power rests with this body to decide whether any proposed rate or change of rate is just and reasonable. Thus its powers are essentially initiating, and larger and more direct than those of the Interstate Commerce Commission under the Hepburn law. The fact that a rate once in effect can be changed only by convincing the commission of the advisability from the standpoints of shippers, the public and the government, as well as of the railroad, makes traffic officers exceptionally careful in determining what rates should be made. Yet, as a general thing, American railroad managers are not deterred from making rates which are in a sense experimental and designed to create or move some special traffic because such rates, if found too low in practice, are not easily changed. There have been instances when the commission has rejected proposed rates on the ground that they would be too low, just as there have been cases where the commission has refused to sanction rates which it thought to be too high.

Perhaps the fact that the government of Mexico is the largest stockholder in the National Railroad Company of Mexico, and as such is directly interested in the earnings of the property, even although no dividends are paid, exerts a subconscious influence with the Mexican Railroad Commission, such as would not exist with our Interstate Commerce Commission, to safeguard the interests of the railroad. But while the government thus exercises a supervision almost paternal over the railroads and their acts, the nation is liberal in its policy of fostering railroad development. There are now slightly more than 10,500 miles of railroad in Mexico. With the national area of 767,060 square miles, equal to one-fourth that of the United States, and a population of about 15,000,000 people, this railroad mileage is small in comparison with that of this country.

But railroad development in Mexico is an enterprise of comparatively recent time, and railroad construction is now progressing fast—at the rate of several hundred miles a year. The Mexican Railway Company was chartered in 1864, and most of the railroad building across the border has been done in the last 20 years.

There are now two large railroad systems. In importance, in mileage operated, in traffic and in earnings they rank close together. The Mexican Central Railway has 3,390 miles of line. The National Lines 3,351 miles. Besides these two chief systems, which together comprise two-thirds of the entire railroad mileage, there are only a few companies which have more than 200 miles of line. The most important of these are the Mexican Railway, the old line from Vera Cruz to the City of Mexico, with 321 miles; the Vera Cruz & Pacific Railway, with 265 miles; the Mexican Southern Railway, with 258 miles, and the Tehuantepec National Railway, with 211 miles.

Government assistance has taken direct form, usually in concessions carrying stated subsidies. Thus the Mexican Railway Company, Ltd., was given a subsidy of $560,000 per annum, the government further agreeing not to subsidize any other railroad between the City of Mexico and Vera Cruz. The original concession to the Mexican Central Railway Company, Ltd., carried a subsidy of $15,200 per mile. In 1890 the government paid a lump sum of nearly $15,000,000 for release from all further subsidy claims of the company.

Between the Mexican government and the National Railroad Company of Mexico a closer relationship exists. Since 1903 the government has owned $29,972,700 of the $63,553,600 stock of the company. This, of course, gives the government virtual control of the property, although the power to change the management has not been exercised in any way. The government stock was acquired under a plan proposed and carried out by Speyer & Co., of New York. When the Mexican government took this big share, it turned over to the company controlling securities of the Interoceanic Railway of Mexico, and gave the National exclusive rights to construct lines in its territory. The Mexican International is controlled and included in the system operated as the National Lines.

The original National Railroad was built under a concession giving it about $4,300 per mile. All told, about $6,000,000 was paid in subsidies up to 1895, when a full settlement was made with the old company. No subsidy was given the International, but its concession exempted it from taxation and payment of duties on materials imported. The Matamoras extension from Monterey to the month of the Rio Grande, 205 miles, which was opened last year, cost $3,202,906, and the government subvention was $2,000,000, of which $1,800,000 has been paid, the balance being retained until the line is permanently ballasted and temporary light rails are replaced with heavier ones.

Pooling is legal in Mexico. Rebates, midnight tariffs, rate cutting and other such devices have never risen to special prominence in the situation. Commodity rates move much of the freight tonnage. Low rates have been made on ores and other freight carried to the smelters, these forming an industry, which, like that of iron and steel in our country, is a valuable one to the railroads for its large indirect as well as direct business. Mineral products, particularly ores, coal and coke, comprise a very large part of the traffic of Mexican railroads. Agricultural products rank next in importance, and then general merchandise and lumber. Traffic to and from the United States is large.

Standard Mexican railroads are well maintained and operated. Over the greater part of the 802 miles of railroad between the national border and the City of Mexico a speed of 55 miles per hour can be made without danger or discomfort to passengers. Beginning November 20, a solid Pullman train is to be put in service, running twice a week, between St. Louis and the City of Mexico. This train is to make the trip of 1,877 miles in 59 hours, or at an average speed for the entire distance of 32 miles per hour, including stops. In Mexico it will be operated over the National Lines and on this side of the border over the International & Great Northern, via San Antonio, and the Iron Mountain, via Little Rock.

Compared with the United States, labor is cheap on Mexican railroads, but fuel, cross ties, rails and other supplies are dear. Track laborers, nearly all peons, or Indians, get fom 50 to 75 cents, Mexican, per day. The wages are highest in the north, where most influenced by United States labor, and become less in the center of the country. These wages, equivalent to 25 to 37½ cents per day in gold, cover a work day from sunrise to sunset. There are no labor unions, and such a thing as an eight hour day is unknown to the peon. Generally speaking, he works fast and

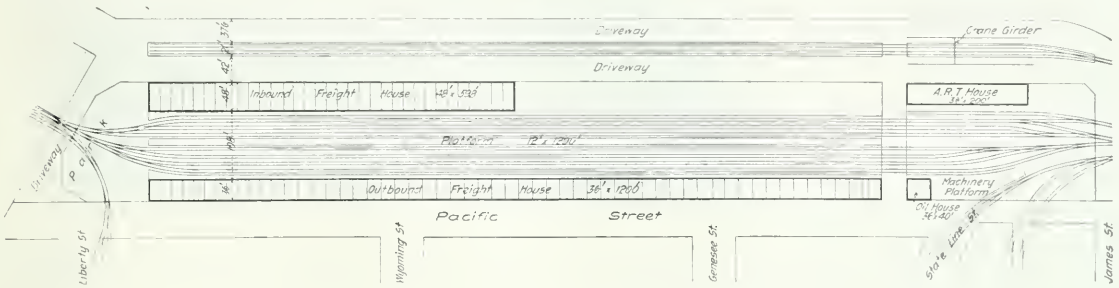
continuously, using his bare hands for much rough work.

Cross ties cost about $1.20 (silver) for Mexican oak and $1.60 for American creosoted pine. Locomotive fuel, much of the coal being imported and coming from the United States largely by rail and from Great Britain by sea, constitutes a heavy charge in operating expenses, often exceeding 25 per cent. of the total cost of operation. The Mexican Central has some oil lands and is using oil as locomotive fuel to some extent.

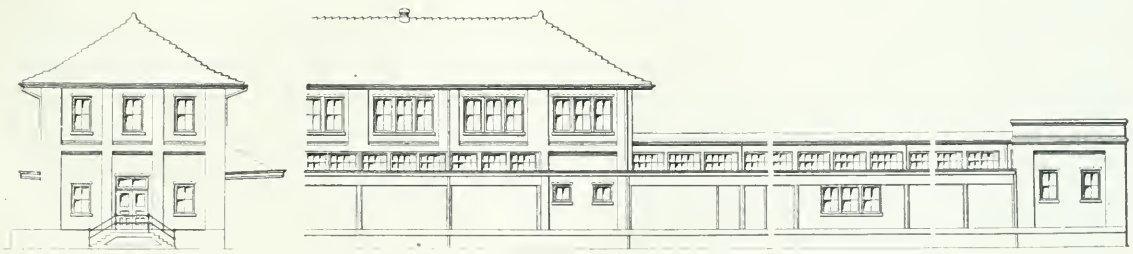
## The New Kansas City Freight Houses of the Missouri Pacific.

The Missouri Pacific for some time has been engaged in enlarging and rearranging its terminal facilities at Kansas City, Mo., on a scale adequate not only for present requirements but that will provide for traffic needs for some time to come. A plan and detailed description of the large new freight yard in East Bottoms, in the northeastern part of the city, was given in these columns May 11, 1906. The principal freight houses are located at State Line yards in West Bottoms, adjacent to the local freight district. These yards derive their name from the fact that the Kansas-Missouri boundary line intersects them and they therefore lie partly in each of the Kansas cities, although wholly on the east side of the Kaw river. There are now under construction at these yards new inbound and outbound freight houses of substantial character and good appearance, drawings of which are shown herewith.

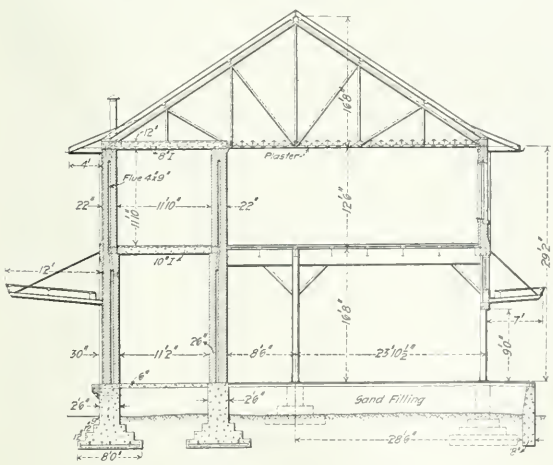
As seen from the general plan, the outbound house is 36 ft. wide and 1,200 ft. long, and the inbound house 48 ft. x 600 ft. A space of 96 ft. intervenes between the platforms of the two houses, midway of which is an island platform 12 ft. wide and 1,200 ft. long, covered by an umbrella shed. There are four tracks between platform and outbound house, and three tracks in the space next the inbound house. The design and construction of the two houses is similar, each having concrete foundation and superstructure of brick and steel, with terra cotta trimmings. The front end of each building is two stories high for a length of 200 ft. These portions will have tile roof covering, and the remainder tar and gravel. Each house has an elevated platform on the track side 6 ft. wide, protected by a canopy 7 ft. wide. On the team side of each the canopy is 12 ft. wide. The character of construction is well shown by the typical elevations and sections exhibited herewith. In the office portion of the outbound house will be located the superintendent, division engineer, roadmaster, yardmaster and the telegraph offices. The local freight offices will be located in the second story of the inbound house, with lockers and rest rooms; also the local telephone exchange of the Missouri Pacific. The outbound house will contain 22 sets of scales and the inbound house seven. There will be coaling and oil rooms, and the buildings will be heated by steam and lighted by electricity.




General Location of Missouri Pacific Freight Houses at Kansas City.

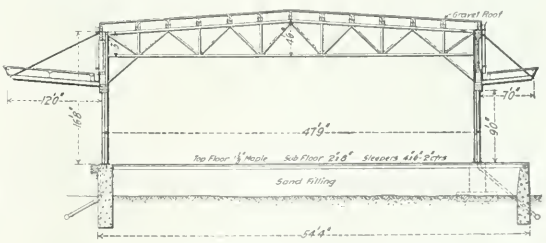


Elevation of Kansas City Freight House, Missouri Pacific.




Cross Section Through Offices.

South of the inbound house are two driveways, one 42 ft. wide and the other 37½ ft., with two tracks between. These driveways are built of 6 in. of concrete as a foundation, overlaid with vitrified brick on edge on a cushion of 1½ in. of sand. At the west or right-hand end of these driveways will be located a gantry crane of 25 tons capacity with a 200-ft. runway, electrically operated, for transferring heavy freight between cars, or from cars to wagons, and vice versa.




Cross Section of Inbound Freight Shed.

We are indebted to Mr. M. L. Byers, Chief Engineer Maintenance of Way of the Missouri Pacific, and Mr. F. B. Scheetz, Engineer Bridges and Buildings, for the foregoing data.

### Strang Gasolene-Electric Car Performance.

The accompanying illustration shows a new gasolene-electric rail motor car built by the J. G. Brill Co. for the Strang Electric Railway Car Co. The experimental car "Ogerita" was described in the *Railroad Gazette* of Feb. 23, 1906, when it had been in use near Philadelphia. Since then, this first car has been sent to Kansas City under its own power, and has run in all about 18,000 miles without costing anything for repairs. In its trip west the average speed most of the way was 45 miles an hour, but snow storms and other delays made the average speed for the whole distance from Philadelphia to Kansas City 33 miles per hour. Runs were then made over various Santa Fe lines in Kansas, and in these tests the car acted particularly well in bucking snowdrifts. On the Burlington branch, which has a maximum grade of 3½ per cent. and a maximum curvature of 16 deg., the car was stopped and started without any trouble on the steepest grades, and the average speed for the round trip of 118 miles was 27 miles per hour. The "Ogerita" is now in operation between Kansas City and Lenexa, Kan., 15 miles, making four round trips a day, and hauling one or two trailers. The "Marguerite" will soon be placed on this line also. This car is 52 ft. 9 in. long over all. The passenger compartment is 27 ft. 5 in. long, the smoking compartment 10 ft. 8 in., and the engine compartment 14 ft. 8 in. The engine is smaller than that of the "Ogerita," being of the four-cylinder vertical type, with cylinders 10 in. by 10 in., while the "Ogerita" has six cylinders.

Strang Electric-Gasolene Car "Marguerite."

### Economic Wastes in Transportation.*

The vast extent of the United States, the necessity of transporting commodities great distances at low cost and the progressiveness of railroad managers has led to an extraordinary development of one phase of rate making. This is the principle of the flat rate, based upon the theory that distance is a quite subordinate if not indeed entirely negligible element in the construction of freight tariffs under circumstances of competition. Albert Fink fully accepted this principle in his classic "Report Upon the Adjustment of Railroad Transportation Rates to the Seaboard" almost 25 years ago. Mr. J. C. Stubbs, Traffic Manager of the Harriman lines, speaking of transcontinental business in 1898, clearly expressed it as "the traditional policy of the American lines as between themselves to recognize and to practice equality of rates as the only reasonable and just rule . . . regardless of the characteristics of their respective lines, whether equal in length or widely different. . . ." Professor H. R. Meyer, formerly of the University of Chicago, both in his testimony before the Elkins Committee and in his "Government Regulation of Railway Rates," is the most prominent academic exponent of this principle. It is the theory upon which the southern basing-point system is founded; and it is the common practice in making rates into and out of New England—being, in fact, vital to the continued prosperity of this out-of-the-way territory. President Tuttle, of the Boston & Maine Railroad, has most ably supported this principle of equality of rates irrespective of distance. "It is a duty of transportation companies," he says, "to so adjust their freight tariffs that, regardless of distance, producers and consumers in every part of this country shall, to the fullest extent possible, have equal access to the markets of all parts of this country and of the world, a result wholly impossible of attainment if freight rates must be constructed upon the scientific principle of tons and miles. . . ."

This is the principle of the blanket rate attacked in the famous Milk Producers' Protective Association case in 1897, and it is the practice which has been so fully discussed of late, as generally applied to lumber rates from the various forest regions of the United States into the treeless tract of the Middle West. The principle, while applied thus generally in the construction of tariffs, is of far greater applicability in the making of special or commodity rates. Under such rates probably three-fourths of the tonnage of American railroads is at present moved. The essential principle of such special rates, constituting exceptions to the classified rates, is that of the flat rate; namely, a rate fixed in accordance with what the traffic will bear, without regard to the element of distance.

Such general acceptance, both in practice and theory, of the principle that distance is a relatively unimportant element in rate making is significant at this time, in connection with the recent amendment of the Act to Regulate Commerce. It is important also because of the marked tendency toward the adoption by various state legislatures of the extreme opposite principle of a rigid distance tariff. The old problem of effecting a compromise between these two extreme theories by some form of long and short haul clause—the original section 4 of the act of 1887 having been emasculated by judicial interpretation—is again brought to the front. For these reasons it may be worth while to consider certain results which inevitably follow the widespread acceptance of this principle of the blanket rate. Its benefits are indeed certain; namely, an enlargement of the field of competition, and an equalization of prices over large areas, and that, too, at the level of the lowest or most efficient production. But these advantages entail certain consequences—of minor importance, perhaps, but none the less deserving of notice.

I.

The subordination of distance to other factors in rate making is a logical derivation from the theory of joint cost. This theory justifies the classification of freight; namely, a wide range of rates nicely adjusted to what the traffic in each particular commodity will bear, while always allowing each to contribute something toward fixed and joint expenses. In the same way it explains a close correlation of the distance charge to what each commodity will bear. It assumes that any rate, however low, which will yield a surplus over expenses directly incidental to the increment of traffic and which thus contributes something toward indivisible joint costs, serves not only the carrier by increasing his gross revenue, but at the same time lightens the burden of fixed expenses upon the balance of the traffic. This principle of joint cost, so clearly set forth by Professor Taussig, is fundamental and comprehensive. It pervades every detail of rate making. But it rests upon two basic assumptions which, while generally valid, are not universally so. In the first place each increment of traffic must be *new* business, not tonnage wrested from another carrier and offset by a loss of other business to that competitor. And secondly, each increment of traffic must be *economically suitable* to the particular carriage in contemplation.

The first of these assumptions fails wherever two carriers mutually invade each other's fields or traffic. Each is accepting business at a virtual loss, all costs including fixed charges on capital being taken into account, in order to secure the increment of business. Each gain is offset by a corresponding loss. It is the familiar case of the rate war. A less familiar aspect of the matter is presented when traffic is disadvantageously carried by two competing roads, each diverting business from its natural course over the other's line. The sum total of traffic is not increased. Each carries only as much as before but transports its quota at an abnormal cost to itself. This may, perhaps, swell gross revenues; but by no process of legerdemain can the two losses in operating cost produce a gain of net revenue to both. And each increase of *unnatural* tonnage, where offset by a loss of natural business, instead of serving to lighten the common fixed charges, becomes a dead weight upon all the remaining traffic. The commonest exemplification of this is found in the circuitous transportation of goods, instances of which will be given later.

The second case in which the principle of joint cost fails to justify charges fixed according to what the traffic will bear may arise in the invasion of two remote markets by one another; or, as it might be more aptly phrased, in the overlapping of two distant markets. A railroad is simultaneously transporting goods of like quality in opposite directions. Chicago is selling standard hardware in New York, while New York is doing the same thing in Chicago. Prices are the same in both markets. Of course if the two grades of hardware are of unequal quality, or if they are like goods produced at different cost, an entirely distinct phase of territorial competition is created. But we are assuming that these are standard goods and that there are no such differences either in quality or efficiency of production. What is the result? Is each increment of business to the railroad a gain to it and to the community? The goods being produced at equal cost in both

*From a paper by W. Z. Ripley, in the *Political Science Quarterly* for September, 1906.

places, the transportation charge must be deducted from profits. For it is obvious that the selling price cannot be much enhanced. The level of what the traffic will bear is determined not, as usual, by the value of the goods but by other considerations. The traffic will bear relatively little, no matter how high its grade.

The result is that the carrier, in order to secure the tonnage, must accept it at a very low rate, despite the length of the haul. This is the familiar case of the special or commodity rate granted to build up business in a distant market. Special rates confessedly form three-fourths of the tonnage of American railroads, as has already been said. The assumption is usually made that such traffic is a gain to the railroads, justified on the principle of joint cost as already explained. But does it really hold good in our hypothetical case? There is a gain of traffic in both directions, to be sure. But must it not be accepted at so low a rate that it falls perilously near the actual operating cost? It is possible that even here it may add something to the carriers' revenue, and thereby lighten the joint costs in other directions. But how about the community and the shipping producers? Are any more goods sold? Perhaps the widened market may stimulate competition, unless that is already keen enough among local producers in each district by itself. The net result would seem to be merely that the railroads' gain is the shippers' loss. There is no addition to, but merely an exchange of, place values. Both producers are doing business at an abnormal distance under mutually disadvantageous circumstances. It may be said, perhaps, that the situation will soon correct itself. If the freight rates reduce profits, each group of producers will tend to draw back from the distant field. This undoubtedly happens in many cases. But the influence of the railroad is antagonistic to such withdrawal. It is the railroad's business to widen, not to restrict, the area of markets. "The more they scatter the better it is for the railroads." "Keep everyone in business everywhere." And if necessary to give a fillip to languishing competition, do so by a concession in rates. Is there not danger that with a host of eager freight solicitors in the field, and equally ambitious traffic managers in command, a good thing may be overdone, to the disadvantage of the railroad, the shippers and the consuming public?

An objection to this chain of reasoning arises at this point. Why need the public or other shippers be concerned about the railroads' policy in this regard? Is not each railroad the best judge for itself of the profitableness of long-distance traffic? Will it not roughly assign limits to its own activities in extending business, refusing to make rates lower than the actual incidental cost of operation? And are not all low long-distance rates, in so far as they contribute something toward joint cost, an aid to the short haul traffic? The answer will in a measure depend upon our choice between two main lines of policy: the one seeking to lower *average* rates, even at the expense of increasing divergence between the intermediate and the long-distance points; the other policy seeking, not so much lower rates and less discriminatory rates between near and distant points. In the constant pressure for reduced rates in order to widen markets it is not unnatural that the intermediate points, less competitive probably, should be made to contribute an undue share to the fixed sum of joint costs. The common complaint to-day is not of high rates but of relative inequalities as between places. It is a truism to assert that it matters less to a shipping point what rate it pays than that its rate, however high, should be the same for all competing places. This immediately forces us to consider the consumer. What is the effect upon the general level of prices of the American policy of making an extended market the touchstone of success, irrespective of the danger of wastes arising from overlapping markets? That the result may be a general tax upon production is a conclusion with which we shall have later to do. Such a tax, if it exists, would go far to offset the profit which unduly low freight rates in general have produced. In short, the problem is to consider the possible net cost to the American people of our highly evolved and most efficient transportation system. Our markets are so wide, and our distances so vast, that the problem is a peculiarly American one.

II.

Having stated the theory of these economic wastes, we may now proceed to consider them as they arise in practice. Concrete illustration of the effect of disregard of distance naturally falls into two distinct groups. Of these the first concerns the circuitous carriage of goods; the second, their transportation for excessive distances. Both alike involve economic wastes, in some degree perhaps inevitable, but none the less deserving of evaluation.

Recent instances of wasteful and circuitous all-rail transportation are abundant. A few typical ones will suffice to show how common the evil is. Former President Ramsey, of the Wabash, has testified as to the round-about competition with the Pennsylvania Railroad between Philadelphia and Pittsburg by which sometimes as much as 57 per cent. of traffic between those two points may be diverted from the direct route. "They haul freight 700 miles around sometimes to meet a point in competition 200 miles away." Chicago and New Orleans are 912 miles apart, and about equally distant—2,500 miles—from San Francisco. The traffic manager of the Illinois Central states that that company "engages in San Francisco business directly via New Orleans from the Chicago territory, and there is a large amount of that business, and we engage in it right along." This case therefore represents a superfluous lateral haul of nearly a thousand miles between two points 2,500 miles apart. The Canadian Pacific used to take business for San Francisco, all-rail, from points as far south as Tennessee and Arkansas, diverting it from the direct way via Kansas City.

Goods moving in the opposite direction from San Francisco have been hauled to Omaha by way of Winnipeg, journeying around three sides of a rectangle by so doing, in order to save 5 or 6 cents per 100 lbs. Between New York and New Orleans nearly 100 all-rail lines may compete for business. The direct route being 1,340 miles, goods may be carried 2,051 miles via Buffalo, New Haven (Ind.), St. Louis and Texarkana. A generation ago conditions were even worse, the various distances by competitive routes between St. Louis and Atlanta ranging from 526 to 1,855 miles. New York business for the West was often carried by boat to the mouth of the Connecticut river, and thence by rail over the Central Vermont to a connection with the Grand Trunk for Chicago. To be moved at the outset due north 200 miles from New York on a journey to a point—Montgomery, Ala.—south of southwest seems wasteful; yet the New York Central is in the field for that business. It is nearly as uneconomical as in the old days when freight was carried from Cincinnati to Atlanta via the Chesapeake & Ohio, thence down by rail to Augusta and back to destination. Even right in the heart of eastern trunk-line territory, such things occur in recent times. The Cincinnati, Hamilton & Dayton prior to its consolidation with the Pére Marquette divided its eastbound tonnage from the rich territory about Cincinnati among the trunk lines naturally tributary. But no sooner was it consolidated with the Michigan road than its eastbound freight was diverted to the north—first hauled to Toledo, Detroit and even up to Port Huron, thence moving east and around Lake Erie to Buffalo.

A common form of wastefulness in transportation arises when freight from a point intermediate between two termini is hauled to either one by way of the other. Such cases are scattered throughout our railroad history. One of the delegates to the Illinois Constitutional Convention of 1870 cites, as an instance of local discrimination, the fact that lumber from Chicago to Springfield, Ill., could be shipped more cheaply by way of St. Louis than by the direct route. And now a generation later, it appears that grain from Cannon Falls, 49 miles south of St. Paul on the direct line to Chicago, destined for Lonisville, Ky., can be hauled up to St. Paul on local rates and thence on a through billing to destination, back over the same rails, considerably cheaper than by sending it as it should properly go. The Hepburn committee reveals shipments from Rochester, N. Y., to St. Louis, Minneapolis or California, all rail, on a combination of local rates to New York and thence to destination. Presumably the freight was hauled 300 miles due east and then retraced the same distance; as New York freight for southern California is to-day hauled to San Francisco by the Southern Pacific and then perhaps 300 miles back over the same rails. Even if the rate must be based on a combination of low through rates and higher local rates, it seems a waste of energy to continue the five or six hundred miles extra haul. Yet the practice is common in the entire western territory. From New York to Salt Lake City by way of San Francisco is another instance in point. Of course a short haul to a terminal to enable through trains to be made up presents an entirely different problem of cost from the abnormal instances above mentioned.

Carriage by water is so much cheaper and as compared with land transportation is subject to such different rate-governing principles, that it deserves separate consideration. Mere distance, as has already been said, being really only one element in the determination of cost, a circuitous water route may in reality be more economical than direct carriage overland. Yet beyond a certain point, regard being paid to the relative cost per mile of the two modes of transport, water-borne traffic may entail economic wastes not incomparable to those arising in land transportation. In international trade, entirely confined to vessel carriage, a few examples will suffice for illustration. Machinery for a stamp mill, it was found, could be shipped from Chicago to San Francisco by way of Shanghai, China, for 15 cents per 100 weight less than by way of the economically proper route. Were the goods ever really sent by so indirect a route? It would appear so, when wheat may profitably be carried from San Francisco to Watertown, Mass., after having been taken to Liverpool, stored there, reshipped to Boston, thereafter even paying the charges of a local haul of nearly 10 miles; or when shipments from Liverpool to New York may be made via Montreal to Chicago, and thence back to destination. I am credibly informed that shipments of the American Tobacco Co. from Louisville, Ky., to Japan used commonly to go via Boston. Denver testimony is to the effect that machinery, made in Colorado, shipped to Sydney, Australia, can be transported via Chicago for one-half the rate for the direct shipment; and that on

similar goods even Kansas City could ship by the carload considerably cheaper by the same round-about route. Conversely straw matting from Yokohama to Denver direct must pay $2.87 per 100 lbs.; while if shipped to the Missouri river, 500 miles east of Denver, and then back, the rate is only $2.05.

The second great class of broken rail and water shipments consists of transcontinental business. Goods from New York to San Francisco commonly go by way of New Orleans or Galveston,* as well as by Canadian ports and routes.† In the opposite direction, goods are carried about 1,000 miles by water to Seattle or Vancouver before commencing the journey east. But more important, as illustrating this point, is the traffic from the Central West which reaches the Pacific coast by way of Atlantic seaports. As far west as the Missouri, the actual competition of the trunk lines on California business has since 1894 brought about the condition of the "blanket" or "postage stamp" rate. The same competitive conditions which open up Denver or Kansas City to New York shippers by way of New Orleans or Galveston enable the Southern Pacific Railroad or Cape Horn routes to solicit California shipments in western territory to be hauled back to New York, and thence by water all or part of the way to destination. How important this potential competition is—that is to say, what proportion of the traffic is interchanged by this route—cannot readily be determined.

Transportation over undue distances—the carriage of coals to Newcastle in exchange for cotton piece goods hauled to Lancashire—as a product of keen commercial competition may involve both a waste of energy and an enhancement of prices in a manner seldom appreciated. The transportation of goods great distances at low rates, while economically justifiable in opening up new channels of business, becomes wasteful the moment such carriage, instead of creating new business, merely brings about an exchange between widely separated markets, or an invasion of fields naturally tributary to other centers.

A sash and blind manufacturer in Detroit was seeking to extend his market in New England. At the same time it appeared that other manufacturers of the same goods located in Vermont were marketing their product in Michigan. The burden of the complaint of the Detroit producer was not directed to this invasion of his home territory; but rather to the fact that the freight rate from Boston to Detroit, probably due to back loading, was only about one-half the rate imposed upon goods in the opposite direction, from Detroit to the seaboard. Is not this an anomalous situation? Two producers presumably of equal efficiency in production are each invading the territory naturally tributary to the other and are enabled to do so by reason of the railroad policy of "keeping everyone in business" everywhere, regardless of distance.

This record implies progressiveness, energy and ambition, on the part of both business men and traffic officers. Nothing is more remarkable in American commerce than its freedom from restraints. Elasticity and quick adaptation to the exigencies of business are peculiarities of American railroad operation. This is due to the progressiveness of our railroad managers in seeking constantly to develop new territory and build up business. The strongest contrast between Europe and the United States lies in this fact. European railroads take business as they find it. Our railroads make it. Far be it from me to minimize the service rendered in American progress. And yet there are reasonable limits to all good things. We ought to reckon the price which must be paid for this freedom of trade.

## III.

The causes of economic waste in transportation are various. Not less than six may be distinguished. These are: (1) Congestion of the direct route; (2) rate cutting by the weak circuitous line; (3) pro-rating practices in division of joint through rates; (4) desire for back-loading of empty cars; (5) strategic considerations concerning interchange of traffic with connections; and (6) attempts to secure or hold shippers in contested markets. These merit consideration separately in some detail.

Congestion of traffic upon the direct line is a rare condition in our American experience. Few of our railroads are over-crowded with business. Their equipment may be overtaxed, but their rails are seldom worked to the utmost. Yet the phenomenal development of trunk-line business since 1897 sometimes makes delivery so slow and uncertain that shippers prefer to patronize railroads less advantageously located, even at the same rates. The congestion on the main stem of the Pennsylvania between Pittsburg and Philadelphia is a case in point.

Special rates or rebates often divert traffic. The weak lines (in that particular business) are persistently in the field and can secure tonnage only by means of concessions from what may be called the standard or normal rate. The differential rate is an outgrowth of this condition. The present controversy over the right of the initial line in transcontinental business to route the freight at will involves such practices. The carriers insist that they can stop the evil only by the exercise of choice in their connections. An interesting recent example is found in the Elkins Committee testimony. It appears that lumber from points in Mississippi destined for Cleveland instead of going by the proper Ohio river gateways was diverted to East St. Louis. The operation was concealed by billing it to obscure points—Jewett, Ill., near East St. Louis, and Rochester, Ohio—and there issuing a new bill of lading to destination. Wherever a large volume of traffic is moving by an unnatural route, the first explanation which arises therefore is that rebates or rate-cutting are taking place.

A third cause of diversion of traffic is akin to the second; and concerns the practices in pro-rating. Much circuitous transportation is due to the existence of independent transverse lines of railroad which may participate in the traffic only on condition that it move by an indirect route. Recently, in a case in Texas, the Interstate Commerce Commission found that two roads thus converging on a common point were each losing to the other traffic which rightfully was tributary to its own line.

This roundabout carriage becomes, of course, increasingly wasteful in proportion to the width of angle between the main lines converging on the common point. And several cases indicate that in extreme instances the two main lines may converge on a common point from exactly opposite directions, while the transverse or secondary road or series of roads forms a wide and round-about detour. The well-known Pittsburg-Youngstown case, cited in the original Louisville & Nashville decision in 1887, serves as illustration. The Pennsylvania was competing from Pittsburg directly eastbound to New York with certain feeders of the New York Central lines which took out traffic bound for the same destination but leaving Pittsburg *westbound*. Other instances of the same phenomenon occur at Chattanooga, where freight for New York may leave either northward or southward, at Kansas City and, in fact, at almost any important inland center.

Another extreme form may even arise in the competition between two parallel trunk lines cut transversely by two independent cross roads. One of these latter may induce traffic to desert the direct route, to cut across to the other trunk line, to move over that some distance and then to be hauled back again to a point on the first main line where it may find a "cut" rate to destination. Grain sometimes used literally to meander to the seaboard in the days of active competition between the trunk lines. Wheat from Iowa and northern Illinois finally reached Portland, Me., by way of Cincinnati in this manner, with a superfluous carriage of from 250 to 350 miles.*

Whenever the cross road is financially embarrassed, the tendency to diversion is increased. For then, of course, having repudiated fixed charges, the cross line can accept almost any rate as better than the loss of the traffic. And that this was in the past almost a chronic condition in western trunk line territory appears from the fact that 18 out of the 22 roads cutting the Illinois Central between Chicago and Cairo have been in the hands of receivers since 1874.

It not infrequently happens that the initial railroad may entirely control a roundabout route, whereas shipments by the most direct line necessitate a division of the joint rate with other companies. In such a case the initial line will naturally favor the indirect route, at the risk of economic loss to the community and even to its own shippers. An interesting illustration is afforded by a complaint of wheat growers at Ritzville in the state of Washington concerning rates to Portland, Ore. By direct line with low grades along the Columbia river the distance was 311 miles. This was composed of several independent but connecting links. The Northern Pacific on the other hand had a line of its own, 480 miles long, which moreover crossed two mountain ranges with heavy grades. It based its charges upon the cost of service by this round-about and expensive line; and insisted upon its right to the traffic despite the wishes of the shippers. The Commission upheld the shippers' contention for the right to have their products carried to market in the most efficient manner. Another instance, on the Illinois Central, is suggestive, concerning shipments from Panola, Ill., to Peoria, a distance of about 40 miles by the shortest line of connecting roads. Yet the Illinois Central having a line of its own via Clinton and Lincoln transported goods round three sides of a rectangle, a distance of 109 miles, presumably in order to avoid a pro-rating division of the through rate. Of course elements of operating cost enter sometimes, as in the case of back-loading; but in the main the pro-rating consideration rules.

A fourth cause of diversion of traffic has to do rather with the operating than the traffic department. An inequality of tonnage

*By water from New York 1,800 miles to New Orleans, with 2,489 miles by rail. Or to Galveston 2,300 miles, with 2,666 miles by rail, a total of 4,966 miles. The direct line, all rail, is about 3,300 miles. Allowing constructive mileage of 3 to 1 for water carriage, they are far from equal.

†Texas cotton bound for Yokohama by way of Seattle.

*Starting within 90 miles of Chicago, though hilled due northeast to Portland, wheat has traveled first 97 miles due southwest to avail of the connection of the Baltimore & Ohio Railroad from Cincinnati, and thence north to Detroit Junction, a total of 716 miles to reach the latter point and save 5 cents in freight. The direct haul through Chicago would have been 340 miles less, or a total of 376 miles only.

in opposite directions may make it expedient to solicit business for the sake of a back load. The Canadian Pacific may engage in San Francisco-Omaha business by way of Winnipeg, because of the scarcity of tonnage eastbound. The traffic to and from the southeastern states is quite uneven in volume. The preponderance of bulky freight is northbound to the New England centers of cotton and other manufacture; while from the western cities, the greater volume of traffic is southbound, consisting of agricultural staples and food stuffs. To equalize this traffic it may often be desirable to secure the most roundabout business. A disturbing element of this sort in the southern field has always to be reckoned with. A good illustration elsewhere occurs in the well-known St. Cloud case. The Northern Pacific accepted tonnage for a most circuitous haul to Duluth, but seems to have done so largely in order to provide lading for a preponderance of "empties." In this case it did not lower the normal rate but accepted it for a much longer haul.

Not unlike the preceding cause, also, is a fifth, the desire to be in position to interchange traffic on terms of equality with powerful connections. Mr. Bowes, Traffic Manager of the Illinois Central, justifying the participation of this road in Chicago-San Francisco business by way of New Orleans, well stated it as follows:

> Of course the Southern Pacific Railroad, as you gentlemen know, originate and control a very large traffic, which they can deliver at various junctions; at New Orleans, where they have their long haul to the Missouri River, and we naturally want some of that business, a long-haul traffic to New Orleans, and in giving it to them we place them under obligations to reciprocate and give us some traffic. That is one of the things that occurs to a railroad man as to increasing the volume and value of his traffic for the benefit of his company.

A sixth and final reason for diversion of traffic from the direct line may be partly sentimental, but none the less significant. It concerns the question of competition at abnormal distances. We may cite two railroad witnesses, who aptly describe the situation. "We can haul traffic in competition, and we frequently do, as I stated, at less than cost, or nearly so, in order to hold the traffic and our patrons in certain territory—Kansas City for instance—but we do not like to do it." Or again, "The Charleston freight is not legitimately ours. . . . We make on these through rates from Chicago to Charleston, for instance, scarcely anything. But it is an outpost. We must maintain that or have our territory further invaded." In other words, the circuitous or over-long distance haul is a natural though regrettable outcome of railroad competition.

## IV.

What are the effects of this American practice of unduly disregarding distance as a factor in transportation? Not less than five deserve separate consideration in some detail. It inordinately swells the volume of ton-mileage; it dilutes the ton-mile revenue; it produces rigidity of industrial conditions; it stimulates centralization both of population and of industry, and it is a tax upon American production.

One cannot fail to be impressed with the phenomenal growth of transportation in the United States, especially in recent years. It appears almost as if its volume increased more nearly as the square of population than in direct proportion to it. Our population from 1889 to 1903 increased slightly less than one-third. The railroad mileage grew in about the same proportion. Yet the freight service of American railroads surpassed this rate of growth almost five times over. While population and mileage increased one-third, the railroads in 1903 hauled the equivalent of two and one-half times the total volume of freight traffic handled in 1889. In other words, the ton mileage—representing the number of tons of freight hauled one mile—increased from 68,700,000,000 to 173,200,000,000. Do these figures represent all that they purport to show? Every ton of freight which moves from Chicago to San Francisco over a line 1,000 miles too long adds 1,000 ton-miles to swell a fictitious total. Every carload of cotton goods hauled up to Chicago to be redistributed thence in the original territory and every ton of groceries or agricultural machinery exchanged between two regions with adequate facilities for production of like standard goods contribute to the same end. How large a proportion of this marvelous growth of ton-mileage these economic wastes contribute can never be determined with certainty. That their aggregate is considerable cannot be questioned.

These practices must considerably dilute the returns per mile for service rendered by American carriers—in ever greater degree than they enhance the apparent volume of transportation. Long-distance rates must always represent a low revenue per ton-mile, owing to the fixed maximum for all distances determined by what the traffic will bear. Furniture made in North Carolina for California consumption cannot be sold there in competition above a certain price. The greater the distance into which the possible margin of profit is divided, the less per mile must be the revenue left for the carrier. Yet this is not all. Such would be true of simply over-long distance carriage. But to this we must add the fact that some of this long-haul tonnage reaches its remote destination over a roundabout line, which increases the already over-long carriage by from 25 to 75 per cent. It is apparent at once that a still greater dilution of the average returns must follow as a result. From 1873 down to 1900 the long and almost uninterrupted decline of rates is an established fact. Has the volume of this economic waste increased or diminished in proportion to the total traffic throughout this period? If it is relatively less to-day, at a time when ton-mile rates are actually rising, it would be of interest to know how far such economies offset the real increases of rates which have been made. Rates might conceivably rise a little, or at all events remain constant, coincidently with a fall in ton-mile revenue produced through savings of this sort.

The third result of undue disregard of distance is a certain inelasticity of industrial conditions. This may occur in either of two ways. The rise of new industries may be hindered, or a well-merited relative decline of old ones under a process of natural selection may be postponed or averted. The first of these is well set forth in the Elkins Committee hearings.

> It is always considered desirable to have a long haul, and the rates on a long haul should be much less, in proportion to distance, than on a short haul. This is a principle of rate-making which has grown up as one of the factors in the evolution of the railroad business in this country, and it has greatly stimulated the movement of freight for long distances, has brought the great manufacturing centers in closer touch with the consumer at a distance and the producer in closer touch with centers of trade. It has been of undoubted benefit to both, though it may oftentimes retard the growth of new industries by a system of rates so preferential as to enable the manufacturer a long distance from the field of production of raw material to ship the raw material to his mills, manufacture it and return the manufactured goods cheaper than the local manufacturer could afford to make it, and thus, while building up the centers of manufacture, have retarded the growth of manufacturing in the centers where the raw material is produced.

The other aspect of industrial rigidity is manifested through the perpetuation of an industry in a district, regardless of the physical disabilities under which it is conducted. Another quotation describes it well.

> Senator Carmack.—Is it the policy of the roads, wherever they find an industry established, to keep it going by advantages in the way of rates regardless of changes in economic conditions?
>
> Mr. Tuttle.—I think in so far as it is possible for them to do so. It has not been possible in all cases. We could not keep iron furnaces running in New England; they are all gone.

One cannot for a moment doubt the advantages of such a policy as a safeguard against violent dislocating shocks to industry. It may render the transition to new and better conditions more gradual and easier to bear. It has been of inestimable value to New England, as exposed to the competition of newer manufactures in the central west. But on the other hand, it is equally true that in the long run the whole country will fare best when each industry is prosecuted in the most favored location—all conditions of marketing as well as of mere production being considered. If Pittsburg is the natural center for iron and steel production, it may not be an unmixed advantage to the country at large, however great its value to New England, to have the carriers perpetuate the barbed wire manufacture at Worcester. Each particular case would have to be decided on its merits. My purpose at present is not to pass judgment on any of them but merely to call attention to the effect of such practices upon the process of industrial selection.

Centralization, or concentration of population, industry and wealth is characteristic of all progressive peoples at the present time. Great economic advantages, through division of labor and cheapened production have resulted; but on the other hand, manifold evils have followed in its train. The results are too well known to need mention in this place. From the preceding paragraph it would appear that American railroad practices operate in some ways to retard this tendency. But much may be adduced in favor of the opposite view. Many staple industries utilizing the raw material at their doors might supply the needs of their several local constituencies were it not that their rise is prevented by low long-distance rates from remote but larger centers of production. Denver, in striving to establish paper mills to utilize its own Colorado wood pulp, is threatened by the low rates from Wisconsin centers. Each locality ambitious to become self-supporting is hindered by the persistency of competition from far away cities. This is particularly true of distributive business. The overweening ambition of the great cities to monopolize the jobbing trade, regardless of distance, has already been discussed. And it follows, of course, that the larger the city, the more forcibly may it press its demands upon the carriers for low rates to the most remote hamlets. The files of the Interstate Commerce Commission are stocked with examples of this kind. The plea of the smaller cities and the agricultural states—Iowa for example—for a right to a share in the distributive trade naturally tributary to them by reason of their location formed no inconsiderable element in the recent popular demand for legislation by the Federal government.

In the fifth place, every waste in transportation service is in the long run a tax upon the productivity of the country. More men may be employed, more wages paid, more capital kept in

circulation; but it still remains true that the coal consumed, the extra wages paid and the rolling stock used up in the carriage of goods either unduly far or by unreasonably roundabout routes constitute an economic loss to the community. In many cases, of course, it may be an inevitable offset for other advantages. In the Savannah Freight Bureau Case the facts showed Valdosta, Ga., to be 158 miles from Savannah, while it was 275 and 413 miles by the shortest and longest lines respectively from Charleston. Valdosta's main resource for fertilizer supplies, other things being equal, would naturally be Savannah, the nearer city. Yet in the year in question it appeared that nine-tenths of the supply was actually drawn from Charleston; and much of it was hauled 413 instead of a possible 158 miles. No wonder the complainants alleged "that somebody in the end must pay for that species of foolishness."

V.

What remedy is possible for these economic wastes? Both the carriers and the public have an interest in their abatement. The more efficient industrial combinations have taken the matter in hand, either by strategic location of plants or, as in the case of the United States Steel Corporation, by the utilization of a Pittsburg base price scheme, with freight rates added. But probably the larger proportion of tonnage is still shipped by independent and competing producers. To this traffic the railroads must apply their own remedies. Either one of two plans might be of service. The right to make valid agreements for a division either of traffic or territory, if conceded to the carriers by law and under proper governmental supervision, would be an effective safeguard. This would mean the repeal of the present prohibition of pooling. Or a reenactment of the long and short haul clause, now emasculated by judicial interpretation, would do much toward accomplishing the same result.

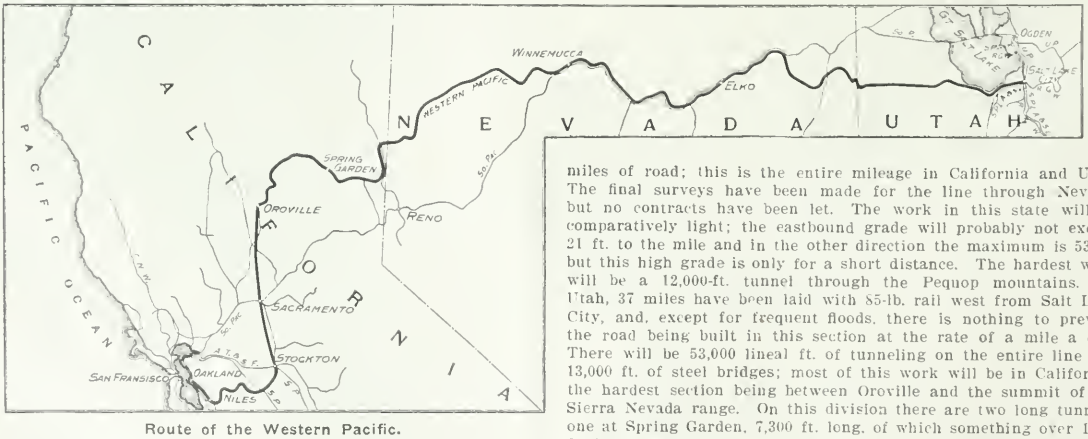
Agreements between carriers previous to 1887 were often employed to obviate unnecessary waste in transportation. The division of territory between the eastern and western lines into the southern states is a case in point. Thirty years ago competition for trade throughout the South was very keen between the great cities in the East and in the Middle West. Direct lines to the Northwest from Atlanta and Nashville opened up a new avenue of communication with ambitious cities like Chicago, St. Louis and Cincinnati. The state of Georgia constructed the Western & Atlantic Railroad in 1851 for the express purpose of developing this trade. As western manufactures developed, a keen rivalry between the routes respectively east and west of the Alleghany Mountains into the South was engendered. A profitable trade in food products by a natural, direct route from the Ohio gateways was, however, jeopardized by ruinous rates made by the warring trunk lines to the northern seaboard. Corn, oats, wheat and pork came down the coast and into the South through the back door, so to speak, by way of Savannah and other seaports. On the other hand the eastern lines into the South were injuriously affected by the retaliatory rates on manufactured goods made by the western lines for shipments from New York and New England. Freight from each direction was being hauled round three sides of a rectangle. Finally in 1878 a reasonable remedy was found in a division of the field and an agreement to stop all absurdly circuitous long hauls into one another's natural territory. A line was drawn through the Northern states from Buffalo to Pittsburg and Wheeling; through the South from Chattanooga by Montgomery, Ala., to Pensacola. Eastern lines were to accept goods for shipment only from their side of this line to points of destination in the South also on the eastern side of the boundary. Western competitors were to do the same. The result was the recognition of natural rights of each to its territory. This agreement has now formed the basis of railroad tariffs into the Southern states for almost a generation. Similar agreements, on a less extensive scale, are commonly used to great advantage. Thus in the "common point" territory formerly tributary to Wilmington, Savannah and Charleston, the first named city insisted upon its right to an equal rate with the other two, no matter how great the disparity of distance. The Southern Railway and Steamship Association arbitrated the matter, fixing a line beyond which Wilmington was to be excluded. Obviously such agreements have no force in law at the present time. The only way to give effect to them is for connecting carriers to refuse to make a joint through rate. This effectually bars the traffic. Moreover entire unanimity of action is essential. Every road must be a party to the compact. Otherwise the traffic will reach its destination by shrunken rates and a more circuitous carriage even than before.

One cannot fail to be impressed in Austria and Germany with the economic advantages of an entirely unified system of operation. No devious routing is permitted. Certain lines are designated for the heavy through traffic, and concentration on them is effected to the exclusion of all others. Between Berlin and Bremen, for example, practically all through traffic is routed by three direct lines. No roundabout circuits occur because of the complete absence of railroad competition. No independent lines have to be placated. The sole problem is to cause the tonnage to be most directly and economically transported. And this end is constantly considered in all pooling or through-traffic arrangements with the railroad systems independently operated.

Suppose a long and short haul clause to be re-enacted, exemption from its provisions to be granted only by the Interstate Commerce Commission, what would be the result? In the vast majority of cases the roads would prefer to withdraw from the unreasonably distant fields. Simultaneously taken by each line such action would put an end to the economic waste. At the same time it would terminate one of the most persistent causes of rebates and personal favoritism. To be sure it would generally operate in favor of the strong, direct lines as against the weak and roundabout ones. Great benefit would accrue to the Pennsylvania, the Illinois Central or the Union Pacific Railroads. The activities of the parasitic roads and the scope of parasitic operations by the substantial roads would inevitably be curtailed. Much justice would be done and much local irritation and popular discontent would be allayed.

## Western Pacific.

It is now expected that the Western Pacific will be completed in about two years. It will be 924 miles long, running from San Francisco, Cal., to Salt Lake City, Utah, where it will connect with the lines of the Denver & Rio Grande system. Contracts have been let for grading, tunneling and trestling on about 480 miles of road; this is the entire mileage in California and Utah. The final surveys have been made for the line through Nevada, but no contracts have been let. The work in this state will be comparatively light; the eastbound grade will probably not exceed 21 ft. to the mile and in the other direction the maximum is 53 ft., but this high grade is only for a short distance. The hardest work will be a 12,000-ft. tunnel through the Pequop mountains. In Utah, 37 miles have been laid with 85-lb. rail west from Salt Lake City, and, except for frequent floods, there is nothing to prevent the road being built in this section at the rate of a mile a day. There will be 53,000 lineal ft. of tunneling on the entire line and 13,000 ft. of steel bridges; most of this work will be in California, the hardest section being between Oroville and the summit of the Sierra Nevada range. On this division there are two long tunnels, one at Spring Garden, 7,300 ft. long, of which something over 1,500 ft. has been pierced, and the other 6,000 ft. long at the summit of the range. Through the Coast range near Niles, Cal., there is a 4,000 ft. tunnel of which the portals have been completed and progress is being made in the tunnel itself. The first track laying in California will be started near Oroville. It has been reported that the Western Pacific has bought the Boca & Loyalton and the Virginia & Truckee, which together would give the company an important feeder line from Virginia City, which is south of Reno, Nev., northerly to a connection with the Western Pacific near the



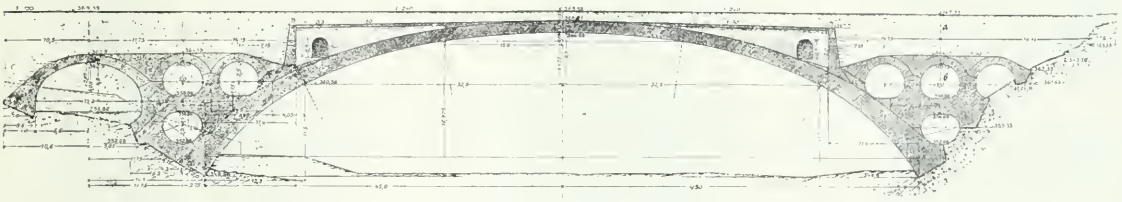

Route of the Western Pacific.

California-Nevada state line, but officials of the company state that nothing in regard to the acquisition of branch lines has been done or will be done until the main line is built. There is at present great difficulty in getting labor; wages in the neighborhood of San Francisco are excessively high and at present the company is advertising in the east for 5,000 men.

## The Syratal Viaduct in Plauen, Bohemia.

BY E. OMMELANGE.

The Syratal Viaduct, which has recently been completed, is situated within the city of Plauen, where it carries a main thoroughfare connecting the city with its suburbs. The arch ring of this engineering work has the largest construction span that has ever been built in stone, in Europe; it is 295 ft. 3 in. long. The first matter for consideration in the construction of such a span was the nature and crushing resistance of the material on either bank, and this, as it happened, was particularly well adapted for the abutments, being a schistic rock having a crushing resistance of 1,830 kilos per square centimeter. It was owing to this fact, which influenced largely the question of the cost of the work, that in the competition of construction designs which were submitted to the municipality of Plauen the result was that structural ironwork was beaten by stone.



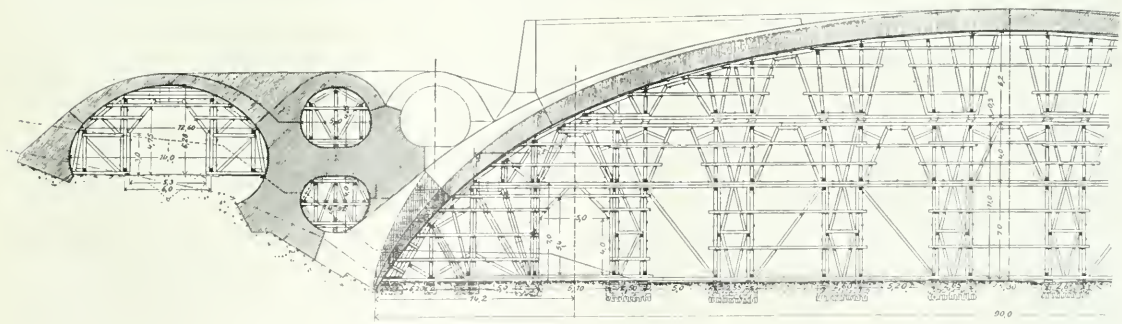
General Elevation, Plauen Viaduct.

The preparation for the foundations consisted principally in filling up a few old mining shafts and tunnels, which were all solidified with cement. In order to arrive at the perfectly sound hard rock, the arch footings had only to be carried down 4 ft. 11 in. to 6 ft. 7 in. below the original surface line. Considering closely the monolithic character of the viaduct, it will be seen that the solid mass of the haunch answers to the conditions of a balanced pier, while the real import of the arch springings is intersected by a chord of 213 ft. 3 in., from which statum the rise is only 21 ft. 3 in.

The stratification of the rock for the abutments varies from nearly perpendicular to an inclination of 45 deg. The banks were cleared for the foundations following the natural conformation of the ground, the form of the foundations resembling a series of steps having the average total angle of about 45 deg. on the right hand bank and of 30 deg. on the left hand bank. The wide opening on the left hand bank is to serve for a street railway. The foundations for the falseworks were of rammed concrete filled into sixteen trenches traversing the line of the viaduct, and designed to offer a maximum resistance under all angles of thrust.

The timber for the arch centers and stagings for the greater part was of spruce. In the main structure all the timbers are squared, and have in general a section of 7.87 x 7.87 in. The temporary arch comprised three stages; the whole of the work was effected by hand haulage, without the use of any derricks or power machines, owing to the facilities offered by the high banks on either shore. Every need of the work was served by a light bridge on either side of the arch, which was raised progressively according to the requirements of the work. The rail track was of 2 ft. gage. The intrados has a composite radius struck from five points. These radii are 344 ft. for the center and 192 ft. and 98 ft. on either side. The rise from the constructive chore is 59 ft. The voussoirs of the arch ring as well as all other facing stones are of phyllitschist, quarried in the neighborhood of Plauen.

The progress of the work was as follows: After loading the temporary bridge with the dead weight which it was ultimately to carry, the intrados and the vertical faces of the arch ring were faced with cement. The voussoirs were then built up to the mortared faces, the whole thus forming one integral mass. The lagging boards of the arch are of pine and were used just as left by the saw; those for the vertical faces of the arch ring were dressed and planted with narrow fillets to mould the cement sheeting in imitation of a triple ring of voussoirs. The cement used for the facings is made of pure quartz sand; and the cement mortar employed for the arch is the Portland "Star" brand from Stettin, mixed in a proportion of one for four of rock sand. The crushing resistance of the arch mortar was 320 kilos per square centimeter after the thirteenth week, and 370 kilos per square centimeter after the twenty-sixth week; the respective tensile strengths on the days mentioned were 15 kilos and 18 kilos per square centimeter. The tests on dried specimens proved its resistance after 24 weeks at over 600 kilos per square centimeter. The thickness of the dressed stones for the arch ring and facings for haunches ranges from $3^{15}/_{16}$ to $4^{3}/_{4}$ in. The thickness of the arch ring is 14 ft. 10 in. at the abutments, 7 ft. $2^{1}/_{2}$ in. at the imposts of the springings and 4 ft. 11 in. at the crown. The whole core of the bridge masonry is ashlar set in the mortar already mentioned. This includes the not cement faced piers of the inner traversing walls. After the arch ring was keyed at the crown, the sections at the haunches were filled and keyed. The key blanks started from the springings of the arch ring just above the footings of the third staging. There were eight such key sections extending through the whole width of the arch and having widths varying from 3 ft. $3^{3}/_{8}$ in. to 8 ft. $2^{7}/_{16}$ in., and kept open by rows of struts or corresponding lengths. When the arch ring was closed, the total inflexion at the center of the falsework was 1 in. The haunches of the construction are lightened transversely by small arches, with inverts forming four on one side of the bridge, and three on the other, each having a maximum diameter of 16 ft. 5 in., and with curves struck from various centers, principally of 8 ft. $2^{7}/_{16}$ in. and 6 ft. $6^{3}/_{4}$ in. radius. The length of the archway at the left hand side, which will be used for the passage of a tramway, as already mentioned, is 45 ft. 11 in., and its height from the roadway is 20 ft. 7 in.; its curves are struck from three centers of 26 ft. 3 in., 13 ft. 1 in. and 7 ft. 6 in. radius. Longitudinally and on a length of 53 ft. 5 in. over the arch springings, there are five internal pier walls or ribs, having a thickness of 1 ft. $3^{3}/_{4}$ in.; these pier walls also lighten the dead weight.



Falsework, Main Span of Plauen Viaduct.

The total length of the viaduct is 492 ft., and over copings the

width of the bridge is 50 ft. The masonry of the work is carried up over the arch springings by the rib walls, so that the depth there of the fillings is only 4 ft. 11 in. The slope at the return or end wall of the ribs is 3 ft. 7 $^{5}/_{16}$. This masonry is backed with cement and then covered with tarred felt of from $^{1}/_{32}$ in. to $^{3}/_{32}$ in. thick, 3 ft. 3$^{5}/_{8}$ in. wide, and laid in lengths of 32 ft. 10 in. to 39 ft. 4 in. The profile of the masonry work in both the longitudinal and cross sections, where in contract with the filling up, is entirely covered with this asphaltum. Drainage of the superincumbent mass of earth is effected at the deepest part of the filling up: i. e., at the arch springings, by means of pipes passing through the felt into the nearest upper traversing archway, and thence into the lower archway, where a side drain carries off the water. At the outer extremities of the masonry work the drainage is effected direct into the foundations. On either side of the bridge there are wide footpaths of 10 ft. breadth. The footpath parapets have ornamental cast iron standards and wrought iron railings.

The total load on the abutments is of about 15,000 tons, and the pressure on the foundations is 24 kilos per square centimeter.

The total cost of the whole structure was only $125,000, owing to the abundance of stone in the vicinity, and to the low cost of German labor.

## Train Accidents in the United States in August.[1]

dn, 3d, Buffalo, Rochester & Pittsburg, Harmony, Pa., a freight train was derailed at a misplaced switch and a number of cars were wrecked. Three trainmen were killed.

eq, 3d, Chicago & North-Western, Elgin, Ill., a car in a passenger train was derailed by a defect in a truck and was overturned. Nine passengers were injured.

unx, 3d, Michigan Central, Hartsdale, Ind., a freight train was derailed and wrecked; conductor killed, four other trainmen injured.

unf, 4th, Delaware, Lackawanna & Western, Syracuse, N. Y., a locomotive was derailed by an accidental obstruction and the engine was overturned. The engineman was badly scalded.

bc, 5th, St. Louis & San Francisco, St. Genevieve, Mo., butting collision between a passenger train and a freight due, it is said, to a misplaced switch. Both engines were wrecked and 20 passengers were injured.

xc, 5th, Cleveland, Akron & Columbus, Silver Lake, Ohio, collision of passenger trains, one of which was entering a side track; one smoking car overturned; 12 passengers injured.

*6th, 11 p.m., Pittsburg, Cincinnati, Chicago & St. Louis, Pittsburg, Pa., an eastbound passenger train was derailed at a switch and the baggage car was overturned and took fire. Two trainmen were killed.

xc, 8th, Western Maryland, Porters, Pa., collision of freight trains; one man killed, one injured.

xc, 8th, Vandalia, Indianapolis, Ind., collision of work trains; one employee killed, five injured.

unx, 8th, Southern Railway, Woodville, Ala., a freight train was derailed and the engine and eight cars were wrecked. A brakeman was killed.

rc, 9th, Baltimore & Ohio, Lodi, Ohio, an empty engine ran into the rear of a preceding passenger train; fireman killed, engineman injured.

unx, 9th, Cincinnati, New Orleans & Texas Pacific, Glenmary, Tenn., the engine and baggage car of passenger train No. 4 were derailed and fell down a bank, and they cleared the tracks so quickly that the rest of the train ran on some distance and was not derailed. The fireman was killed and the engineman injured.

rc, 10th, Baltimore & Ohio, Clarington, W. Va., a passenger train ran into the rear of a preceding freight, making a bad wreck; three trainmen injured.

unx, 10th, 1 a.m., Fort Worth & Denver City, Fruitland, Tex., a passenger train was derailed and two passenger cars fell down a bank. Fifty-five persons were injured.

rc, 11th, Pennsylvania, Franklin, Pa., rear collision of freight trains; one trainman killed and one fatally injured.

dr, 11th, Chicago, Indianapolis & Louisville, Rensselaer, Ind., passenger train No. 30 was derailed by spreading of rails while running at high speed, and the engine and first two cars fell down a bank. Twelve passengers were injured.

†bc, 13th, Chicago, Rock Island & Gulf, Fort Worth, Tex., butting collision of passenger trains, due, it is said, to misunderstanding of orders. Two passengers were killed and 12 injured.

†o, 13th, Atchison, Topeka & Santa Fe, McCook, Ill., an excursion passenger train broke in two and the rear portion, which consisted of one car, was stopped so suddenly that two passengers standing on the front platform of the car were thrown off. One of them was killed and the other badly injured.

xc, 14th, Fort Scott, Kan., a freight train of the St. Louis & San Francisco ran into a northbound passenger train of the Missouri, Kansas & Texas at the crossing of the two roads, overturning a chair car. Seven passengers were injured.

dr, 14th, Southern Railway, South Hill, Va., a passenger train was derailed at a point where the track had been weakened by the washing out of a culvert, and all of the five cars in the train were overturned. Four passengers and two trainmen were injured.

bc, 15th, 9 p.m., Seaboard Air Line, Portsmouth, Va., butting collision in the yard between a train of empty passenger cars and a switching freight train, both trains running backward. Three employees were injured, one of them fatally.

xc, 15th, Long Island road, Port Washington, N. Y., a passenger train, from which the engine had been detached, was run into the station at uncontrollable speed and collided with a parlor car standing at the end of the track. Three passengers were injured.

dr, 15th, Southern Railway, Rocky Mount, Va., the rear car in a passenger train was derailed by bad track and was overturned.

unx, 15th, Southern Railway, Redwood, Va., two cars in a mixed train were derailed and two trainmen and three passengers were injured.

unx, 17th, Texas & Pacific, Forney, Tex., the tender of the engine of a passenger train was derailed on a curve and, with the mail car, fell down a bank. The vestibules of most of the passenger cars were so badly crushed that the passengers had to get out of the cars through the windows. Six passengers were injured, most of them but slightly.

o, 17th, Birmingham Southern, Ensley, Ala., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineman and fireman were killed.

xc, 18th, Oregon Short Line, Dillon, Mont., passenger train No. 10 ran over a misplaced switch and into the rear of a freight train standing on the side track. The conductor of the freight was killed and the engineman and fireman of the passenger were injured.

dn, 18th, 8 p.m., Lake Shore & Michigan Southern, Elyria, Ohio, the Twentieth Century Limited Express eastbound was derailed at the derailing switch at the approach to the crossing of the Baltimore & Ohio, and the engine was ditched. The fireman was seriously injured.

rc, 19th, Pennsylvania road, Sang Hollow, Pa., a work train, occupied by a large gang of workmen, most of them asleep in the caboose, was run into, while standing at a water station, by a following freight train, and the caboose and the car next to it were wrecked. Seven employees were killed and 10 were injured, three of them fatally. It is said that the freight had been ordered to run under control, expecting to find the work train in the block section, but that the engineman had increased his speed in order to take water from a trough; and that a heavy rain falling at the time prevented him from seeing the red lights on the tail end of the work train.

dn, 19th, Mobile & Ohio, Berkeley, Ky., an excursion passenger train was derailed at a misplaced switch and the engine and first three cars were overturned. The fireman was injured.

xc, 20th, Michigan Central, Charlotte, Mich., a locomotive backed into the caboose of a work train while the workmen were inside the car eating, and although the collision was not very serious it caused the death of three laborers and the injury of 17 or more, two of them fatally.

bc, 21st, St. Louis & San Francisco, Knobview, Mo., butting collision between a passenger train and a freight, due, it is said, to misinterpretation of orders by the freight. One passenger, one express messenger and one fireman were injured.

bc, 21st, Baltimore & Ohio Southwestern, Seymour, Ind., westbound passenger train No. 5 ran over a misplaced switch and into the head of a freight train standing on the side track, wrecking both engines. Three trainmen were injured.

bc, 21st, Central New England, Silvernails, N. Y., butting collision between passenger train No. 7 and freight train No. 30, badly damaging both engines; three employees injured.

dn, 21st, Cleveland, Cincinnati, Chicago & St. Louis, Taft, Ind., the engine and first two cars of passenger train No. 5 were derailed at a derailing switch, and the engine was overturned. The engineman and fireman were killed.

xc, 23d, Pennsylvania road, Olean, N. Y., collision between a switching engine and a freight train; one fireman killed and the engineman badly injured.

xc, 23d, New York Central & Hudson River, Syracuse, N. Y., a

[1] Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

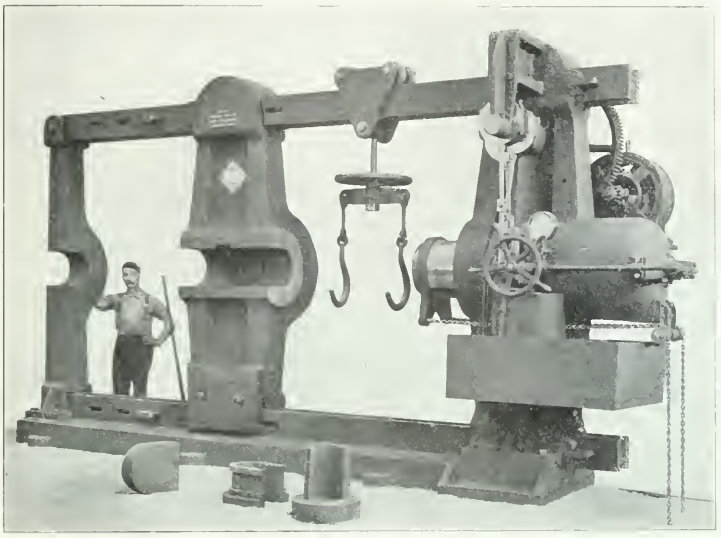
rc Rear collisions.
bc Butting collisions
xc Miscellaneous collisions.
dr Derailments; defects of roadway.
eq Derailments; defects of equipment.
dn Derailments; negligence in operating.
unf Derailments; unforeseen obstruction.
unx Derailments; unexplained.
o Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

switching engine collided with some freight cars and the wreck fell against a dwelling house, partly wrecking it and causing the death of a man sleeping in a bed in the first story of the house, some of the timbers of the second story falling on him.

*rc, 24th, Seaboard Air Line, Kilby, Va., rear collision of freight trains, wrecking several cars, which took fire and were burned up. Three trainmen injured.

unf, 24th, Virginia & Southwestern, Moccasin Gap, Va., a freight train broke through a trestle bridge which had been weakened by a freshet, and the engine and five loaded cars fell into the stream and were wrecked. Two trainmen were killed and a third was injured.



Niles 90-in. 600-ton Capacity Hydraulic Wheel Press.

bc, 25th, Bessemer & Lake Erie, Milltown, Pa., butting collision of freight trains, both running at good speed. Two trainmen were killed and three injured.

unx, 24th, Central of Georgia, Columbus, Ga., a freight train was derailed and two trainmen were injured.

unx, 25th, Central of Georgia, Columbus, Ga., the tender of the locomotive of a passenger train was derailed, and, with the engine and two cars, was ditched, making a bad wreck. Two passengers and two trainmen were injured.

xc, 25th, Maine Central, Pittsfield, Me., collision between a passenger train and two freight cars which had escaped control while being switched on a grade, wrecking both freight cars and badly damaging the engine and first two cars of the passenger train. A traveling engineer on the passenger train was killed and the engineman and two other employees were injured.

†unx, 26th, Great Northern, Swift, Montana, a passenger train was derailed and one car was overturned; two passengers and one trainman were killed and eight passengers were injured.

o, 26th, New York Central & Hudson River, Little Falls, N. Y., the locomotive of a freight train was wrecked by the explosion of its boiler and the engineman and fireman were killed.

xc, 29th, New York Central & Hudson River, Fordham, N. Y., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking several cars. A part of the wreck fell on the adjacent main track and was run into by a passenger train. One brakeman was killed and two other trainmen were injured.

xc, 30th, Pennsylvania, Ebenezer, N. Y., a passenger train drawn by two engines collided while running at full speed with a switching engine, badly damaging all three locomotives. Two enginemen were injured, one of them being severely scalded.

dr, 30th, Buffalo & Susquehanna, Cross Fork, Pa., a freight train consisting of an engine and five loaded cars was derailed at a point where the roadbed had been softened by rain, and the whole train fell to the bottom of the ravine at the side of the road. The engineman was fatally scalded.

unx, 30th, Sandy River, Phillips, Me., a passenger train consisting of an engine and three cars was derailed and overturned. All but a few of the 75 passengers escaped serious injury.

unf, 31st, Atlantic Coast Line, Ivanhoe, N. C., a mixed train was derailed at a washout and eight freight cars were ditched. One brakeman was killed.

## A 600-Ton 90-in. Hydraulic Wheel Press.

The increase in the use of wheels with steel tires has caused several changes to be made in railway repair shop equipment. Until very recently hydraulic wheel presses of more than 400 tons capacity had not been known. Many shops have found difficulty in removing steel tired wheels from their axles, due to the great pressure caused by shrinking on the tires after the usual pressure of 150 tons has been exerted to place the wheel center on the axle. In some instances it has been necessary to remove the tires or drill the hub to start the center.

Realizing the importance of a machine of such capacity as to eliminate these difficulties, the Niles-Bement-Pond Co., New York, has placed on the market a newly designed hydraulic wheel press of 600 tons capacity, which has met with much favor.

The distance between the ram and the resistance post, which is a steel casting, is 8 ft. 3 in. Four tension bars are used instead of two, and the post is arranged so that the weight is entirely removed from the tension bars. The cylinder, which is made of cast steel, has an outside diameter of 27 in. The pump, which has three plungers, is on the side of the machine handy for the operator. A 12½-h.p. motor is used to operate the pump. The height between the tension bars is 90 in., and the machine will take wheels 84 in. in diameter on the tread.

The machine is mounted on a base plate, but no strains are transmitted to it, as all pressure is taken by the tension bars. The cylinder is lined with copper expanded into place and burnished. The piston is packed with best cup leather, is tight, durable, and causes little friction. The ram is counterweighted for quick return when the release valve is open. The safety valve can be set to open at a desired pressure, and is protected from tampering by a lock box. The pressure gage is graduated for tons of pressure and for pounds per sq. in. on the ram. The water tank is bolted under the cylinder, and takes the discharge and supplies the pumps. Several of these machines are now in use.

## American Railroads—A German View.

II.

In the twelfth chapter of the report by the visiting members of the German Railroad Council there is a general review of the situation, part of which we reprint, as follows:

Among laymen one often finds the idea that American railroads excel those of the rest of the world in some extraordinary fashion, by gigantic buildings, by overwhelming traffic, by splendidly equipped cars or incredibly great speed of travel; in short, by performances in the most difficult branches of railroading which put the traffic men of the old world to shame. And when an American member of the railroad fraternity shows us, most obligingly, the structures and traffic arrangement of his roads he often seems to be of the same opinion and looks down upon the visitor in a benevolent manner while he expects that the visitor will betray an attitude of surprise and humility. As a matter of fact, after an earnest study of the American railroad system, without prejudice and with due regard to the excellent performances actually made by American railroads, especially their great merit as developers of the country, we did not find the general condition either better or worse than that existing in Germany.

It must be kept in mind in expressing such an opinion that a stranger cannot always estimate clearly the traffic requirements which have to be met; therefore, we repeat a few figures out of the previous part of our report which shows a comparative synopsis of the extent of railroad traffic in America and in Germany.

The railroads of the United States, with a length of some 205,000 miles (1903)—more than ten times the length of the united Prussian and Hessian state railroads—without question have to handle a remarkable traffic. During the year covered by our report (July 1, 1902, to June 30, 1903) they had to carry 694,891,535 persons, who traveled almost 21 billion passenger-miles. In the Prussian-Hessian railroad system, with a length of only 31,764 miles, the number of persons carried amounted to 608,864,990, and passenger-miles amounted to 9⅓ billions. Thus our traffic, too, was considerable. A traffic 10 per cent. larger in number of persons carried and 2¼ times greater in passenger-miles yielded the American rail-

[illegible] an income 4.6 [illegible] greater than the income derived from the passenger traffic of the Prussian Hessian railroad system.

The difference in freight traffic was more striking. Here the railroads of the United States had to move 579,392,197 tons, amounting to about 171⅛ billions of ton-miles, while in Prussia the movement amounted to 210,958,990 tons, or, say, 15¼ billion ton-miles. Therefore, in America the number of tons moved was, in round numbers 2¾ times greater and ton-miles were 10⅓ times greater than in Prussia. The income of American railroads from their freight traffic was 6.41 times as great as the freight income of the Prussian Hessian railroad system. Roughly speaking, therefore, the American railroads, taken as a whole, had to take care of about as many ton-miles per mile of road as our railroads, while the American passenger traffic, at higher rates, was much lighter in Germany. In both kinds of traffic together America has the additional great advantage that passengers and goods are carried over much greater distances than in Germany. Both these circumstances should tend to facilitate and cheapen the cost of transportation, for it is obvious that a heavy freight traffic is carried more economically in long hauls than in short hauls with considerable branch line movement. The cost of moving freight, including terminal expenses, was naturally lower with the longer distances. Taking this into consideration, we conclude that American railroads, relatively speaking, have by no means to face greater problems than do our railroads. The question is only whether it is possible for them to perform their duties with greater adaptability to the needs of traffic and with greater safety, and whether they can do these things cheaper than our railroads can.

As far as the first two of these demands are concerned—and these are the considerations of highest importance to the public—the claim cannot be made that railroad traffic in the United States is handled more promptly and more safely than it is in Germany. In freight traffic, entirely apart from consideration of discriminations and unfair advantages not as yet eliminated, car shortage not infrequently plays an important part to a much greater extent than in our country whenever traffic increases suddenly and unexpectedly. So long as American railroad management believe in the idea that when their rolling stock is insufficient for temporary requirements they are "working full time," as the expression goes, and that they are "no longer in a position to accept further orders," to quote another industrial phrase, no essential betterment can be looked for. At such times the delays to the whole fabric of train movement are well known, fast passenger train traffic not excepted. As regards safety, the railroads of the United States undoubtedly rank considerably behind those in Germany.

American public opinion has already become aroused on the subject, and yet the real conviction that safety in railroad travel can be kept up only by the most painstaking fidelity to detail has not penetrated the minds of the great masses of American people as it has in our country. It is well known that President Roosevelt has repeatedly recommended measures to do away with the more obvious dangerous practices.

To explain the increased activity and irregularities in service, American railroad officers always speak of the great increases of traffic with which physical improvement of railroads and railroad equipment has not been able to keep pace, while the entire railroad superstructure has been strained by the constant increase in the weight of rolling stock, and employees have been overworked so that they are often in bad physical condition from exhaustion and lack of sleep. We had no chance to ascertain how well founded the complaints were about overworked railroad employees, especially because there seemed to be no fixed rules for duration of the working day and for the length of the rest period. There can be no doubt that American railroad employees as a class make an excellent impression on the visitor, especially on account of their temperate habits. The present-day sobriety of the employees, from the top of the service to the bottom, is surely indispensable to the safe conduct of traffic under such difficulties as have been mentioned. We are disposed to give special credit to the Young Men's Christian Associations for the temperance attitude, and we have recommended the adoption of similar associations in Germany, taking into account the differences in the general practice and circumstances of the two cases. We feel scarcely qualified to pass a final opinion on the general question of the cause of frequent accidents and unpunctuality in the service except to express our belief that these evils are due, in a large measure, to the extraordinarily rapid development of the railroad systems.

In the vast American continent, which until recently never enjoyed even a system of through highways worth mentioning, the railroads, gradually separating northwest and south, have supplied not only the means of handling traffic but have again and again created it. Land did not cost much, even where the state did not give it to the company as a bonus, while considerations of control and public safety were not paramount in the development of the railroad systems. Moreover, the fact that the same language is spoken throughout the length and breadth of this great country facilitated building up traffic, and this traffic was not hindered by customs barriers, and a uniform system of currency and of credit also assisted materially in the development. Under these conditions the Americans showed foresight and genius in recognizing the fundamental importance of a system of railroads as a means of national development, and they succeeded in pushing the work to such an extent that from the very outset they not merely kept pace with the old world, but went ahead of it. They can fairly claim not alone to have developed themselves out of their own resources, but that they have attracted as well many good things from other countries. The Americans were able to draw on the old world for many models of industrial and economic utility; but in the field of railroading they had to stand on their own initiative. The first American railroad—a portion of the present Baltimore & Ohio system—was opened in the year 1830. Locomotives were introduced on the first British railroad in the fall of the same year, while the first German railroad started running five years later.

The haste with which the American railroad system has been built, often under violent competition by rival companies, clearly explains the reason why American railroad buildings and equipment often failed to comply with the careful workmanship necessary for the safe and efficient handling of traffic. Yet, in spite of these drawbacks there has been one gain from this method of operation, and that is that in spite of, perhaps, or on account of the competitive struggles, the general physical appearance of the roads is much more uniform than it is in Germany. One does not find in America any great difference in the locomotives, passenger cars and freight cars in common use; not only are the types generally the same, but, in considerable detail, there is uniformity of practice apparent. This is a great advantage, not only in facilitating cheap buying but in all interchange of traffic and equipment between roads, enabling through connections to be made readily from ocean to ocean.

We, in Europe, have much to learn in this respect, for the difficulties which confront us in the interchange of traffic between different countries are great, and it is difficult to provide through trains, which can run without change of equipment over the great international traffic routes. Even within the German state railroads the lack of uniformity brings up many curious problems; from the old plan of the car down to the arrangement of the least detail, even to the lock on the door, every German management has its own cherished peculiarities; while the American is always ready to drop inconvenient designs as obsolete, even in exchange for other designs which may, in themselves, be less good, but which have more general use. In Europe, every country and principality adheres most steadfastly to its own peculiarity, sometimes in a way which occasions much annoyance. This, of course, tends to hinder the movement of traffic, and also to increase the cost of buying rolling stock and keeping it in repair. If through the introduction of the American unit designs we could change this state of affairs we could, without envy, give full credit to our American compatriots of the railroad fraternity. It is obvious that we could not adopt American unit designs indiscriminately. For example, the adoption of a standard style of freight car would be hardly practicable with us.

The standard American freight car with four axles does not strike us as suitable for universal adoption; the differences in traffic are too great and we are inclined to think that the very heavy cars often seen have their drawbacks even in American practice. But we must frankly admit that these large cars again and again brought to our attention the fact that our old types of freight cars, having a capacity of five tons or less, are altogether too small, while the object lesson of the large American car has served to bring the two-axle car of Germany up to four times its original capacity, while the introduction of the four-axle car for special kinds of traffic is under consideration.

Europe also must acknowledge that America originated its four-axle passenger car, as well as dining and sleeping cars, even if in the adaptation of these models to local circumstances they have lost much of their identity. It is also well known that the introduction of the center coupling prescribed by law in the United States is being tried in Germany after a plan similar to the American, as well as the use of the air brake on freight equipment, already prescribed by law in the United States.

The American railroads have certainly had to pay dear for experience and are doing so to-day. This is especially true as regards the management of train and yard service and the structures in use. In this respect America is not so far advanced as the old world, and especially is inferior to the German roads and to the Prussian-Hessian roads most of all. America can learn from our practice in these matters the same way as we have learned from America in other fields, and stand ready to learn more. But it looks as if the characteristic American self-esteem would hinder the acquisition of helpful ideas from abroad. The American railroad man seems rather inclined to take it for granted that foreign arrangements are inferior, without so much as looking at them.

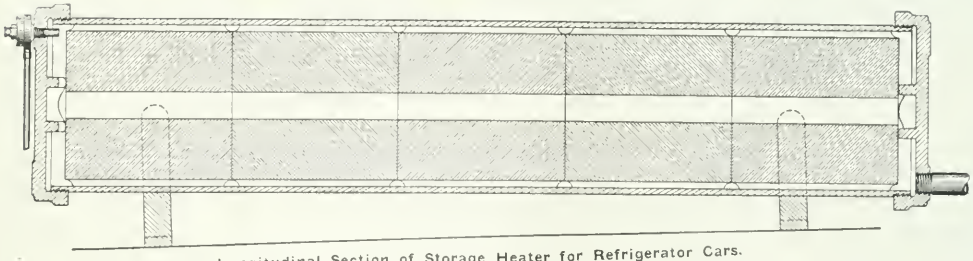
Even after definite standards of excellence have been set, the

practical construction of railroad lines as solidly built as ours throughout the greater part of the United States will offer many difficulties to American railroads. Such construction costs money, much money, and yet one must not fear heavy expenses in creating a railroad plan and personnel equal to traffic needs. We refer, in this, to many station buildings and platforms; also particularly to the replacement of numerous wooden bridges by stone and iron structures; to the removal of railroads from grade especially in city streets and to the construction of second track and additional sidings and station facilities.

## A New Storage System for Heating Refrigerator Cars.

With the large increase in recent years in shipments of perishable freight, particularly fresh fruit and vegetables, during the winter months it has often been difficult for the railroads to provide proper facilities for this traffic. In consequence both railroads and shippers have suffered large losses from damage by freezing, prob-

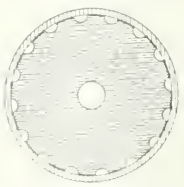
View of Storage Heating System as Applied to Refrigerator Car.



Longitudinal Section of Storage Heater for Refrigerator Cars.

ably as much as several hundred thousand dollars annually. Aside from these direct losses from freezing, the necessity of placing carloads of perishable freight in roundhouses for protection in unusually cold weather has been a source of considerable inconvenience to the roads.

A practical method of heating cars engaged in this service during the winter months has, after three years' trial and development, been worked out by the Gold Car Heating & Lighting Co. The heating is done by two storage heaters in each car, one at each end. The same train pipe, end valves, traps, hose couplers and storage heaters are used as in the company's passenger car heating system. Each storage heater consists of an iron cylinder 12 in. in diameter and about 6 ft. long, as shown by the side and end views reproduced herewith. The insides of the cylinders are made of sections of terra cotta brick corrugated on the surface. Steam is taken from the train pipe to the end of the cylinder and at the other end an automatic valve allows the air to escape through the corrugations on the outside of the terra cotta bricks. The steam then circulates freely inside the cylinder. The surplus heat of the cylinder is immediately heated, the bricks absorbing the hot water of condensation, so that the heating of the car and storage of the heat begin at the same time. Bricks having absorbed the hot water will retain for 24 hours enough heat to keep the car warm. To release surplus condensation an automatic trap is fitted to the train pipe about the center of the car. Under this system heat will continue to be furnished after the cars have been cut off from the steam supply, an important factor in the general handling of refrigerator cars in the winter months. A heater is placed under each ice tank where it is out of the way of freight. As the heaters are located in the drip pans, circulation of warm air is produced which maintains a moderate but sufficient and uniform temperature in the car. The



Cross Section of Storage Heater for Refrigerator Cars.

illustration herewith shows the general arrangement of the system. The thermometer shown on the outside of the car is especially adapted to this service, the mercury bulb being inside but the registering plate outside so that the temperature may be read from the outside without opening the doors.

Cars equipped with this system may, while loading, be heated by steam from a stationary boiler or from a switch engine. While running, they can be heated from any locomotive equipped for steam heat.

## Simplification of Tariffs.

The Interstate Commerce Commission has drafted a tentative code of rules for the simplification of freight tariffs, and will give a hearing at Washington on October 8 to railroads wishing to suggest changes. The principal rules that the Commission proposes to adopt are:

1. Joint tariffs shall in all cases be filed by the initial line, but an initial carrier may authorize a connecting line to file its

tariffs, *provided* that all the joint tariffs of such initial line are filed by the same connecting carrier. In this case the connecting carrier shall be treated as the initial line.

2. The schedules of each initial line shall be printed as an independent document and not together with the schedules of any other initial line.

3. Participating lines may file with the Commission a general authority authorizing the inital line to file on their behalf all tariffs or all joint tariffs of a specified kind, and in such case no other concurrence in the tariffs covered thereby will be required. Where such general authority is not on file concurrences must accompany the tariff itself when presented by the initial line for filing, and such tariff will not be accepted and filed until all such concurrences have been received. The Commission will accept as evidence of concurrence a telegram from the proper officer of the concurring line to the proper officer of the filing line, stating the concurrence of the participating line in the tariff. Such concurrence should give the I. C. C. number of the tariff concurred in.

4. Class rates shall be filed in a tariff by themselves, and commodity rates in one or more tariffs, as the carriers may elect.

5. Each carrier shall file an index showing all commodity rates in effect which have been filed by it, specifying the I. C. C. number of the tariff in which such rate is found. Such index shall be by commodities and shall be made in such detail that each commodity can be easily located. This index shall be reprinted and filed with the Commission every three months, beginning January 1, 1907, provided changes have been made in the meantime; or carriers may file an index consisting of detachable leaves and may print the necessary leaf whenever change is made.

6. Not over five supplements shall be promulgated to any tariff, and not over ten to any classification; to show changes beyond this number the entire tariff or classification shall be reprinted. Each supplement, whether to a classification or a tariff, shall indicate all changes made by that supplement and previous supplements from the original tariff.

7. In the compilation of tariffs a uniform order shall be observed so that a given subject will always be found in a given portion of the tariff. Any fact stated in any other portion of the tariff than that prescribed will be regarded as not mentioned at all.

8. Terminal charges, which must be paid by all shippers at destination, and which are, therefore, really a part of the cost of transportation, must be specified in the tariff of the initial line. Terminal charges which depend upon a contingency, like demurrage, storage, switching, etc., shall be filed by the delivering line and posted in the delivering station.

When any switching or terminal charge either at the point of origin or the point of delivery, is absorbed, or when any service is rendered and the total cost to the shipper from the place where the property is first received to the place where it is finally delivered, is thereby affected, such absorption or such service shall be stated upon the tariff.

After sufficient time has been allowed carriers for the revision of their tariffs no schedule will be filed by the Commission which is not constructed in conformity with the requirements of the statute and the rules prescribed by the Commission, and which does not so state the rates contained that they can be understood by a person of ordinary intelligence.

## Railroad Statistics of the United States for Year Ending June 30, 1905.

The Interstate Commerce Commission has issued an advance abstract of its annual report for the year which ended 15 months ago, from which the principal items are shown below. The preliminary report for the year under review was given in the *Railroad Gazette* December 22, 1905, page 590.

*Railroad Statistics for Years Ending June 30.*

| | 1905. | 1904. | 1903. | 1902. | 1901. |
|---|---|---|---|---|---|
| Miles complete | 218,191 | 213,994 | 207,977 | 202,472 | 197,237 |
| Increase, 12 mos. | 4,197 | 5,927 | 5,505 | 5,234 | 3,892 |
| In hands receivers | 796 | 1,323 | 1,185 | 1,475 | 2,497 |
| Locomotives, No. | 48,857 | 46,743 | 43,871 | 41,228 | 39,584 |
| Cars owned, pass'gr. | 49,713 | 39,752 | 38,140 | 36,991 | 35,969 |
| Cars owned, freight | 1,731,409 | 1,692,194 | 1,653,782 | 1,546,132 | 1,464,328 |
| Cars owned, total | 1,842,871 | 1,798,561 | 1,753,389 | 1,640,226 | 1,550,833 |
| Employees | 1,382,196 | 1,296,121 | 1,312,537 | 1,189,315 | 1,071,169 |
| Per 100 mls road. | 637 | 611 | 639 | 594 | 548 |
| Total stock and funded debt, millions | $13,805.3 | $13,213.1 | $12,600.0 | $12,134.2 | $11,688.2 |
| Stock and debt per mile of road | 65,926.0 | 64,265.0 | 63,186.0 | 62,301.0 | 61,598.0 |
| Gross ernge, millions | 2,082.5 | 1,975.1 | 1,900.1 | 1,726.4 | 1,588.5 |
| Average per mile | 9,598.0 | 9,306.0 | 9,258.0 | 8,625.0 | 8,123.0 |
| Passengers: | | | | | |
| Carried, millions | 738.8 | 715.4 | 694.9 | 649.9 | 607.3 |
| 1 mile, millions | 23,800.1 | 21,923.2 | 20,915.8 | 19,690.0 | 17,353.6 |
| Freight: | | | | | |
| Carried, millions | 1,427.7 | 1,309.9 | 1,304.4 | 1,206.3 | 1,089.2 |
| 1 mile, millions | 186,463.1 | 174,522.1 | 173,221.3 | 157,289.4 | 147,077.1 |
| Average rate per ton per mile, mills | 7.7 | 7.8 | 7.6 | 7.6 | 7.5 |
| Average pass. fare per mile, cts. | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |

Examining the totals for 1905 more in detail the following items will be found of interest:

An increase in mileage of railroad exceeding 100 miles appears for Alabama, Arkansas, California, Georgia, Illinois, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nevada, North Carolina, Pennsylvania, Texas, West Virginia, Wisconsin and Indian Territory.

The operated mileage for which returns were made was 216,973.61 miles, including 7,568.95 miles of line used under trackage rights. This is the total on which the averages of earnings and service are based. The aggregate length of track was 306,796.74 miles, including second track, 17,056.30 miles; third track, 1,609.63 miles; fourth track, 1,215.53 miles, and yard track and sidings, 69,941.67 miles. Yard track and sidings increased 35½ per cent.

The number of corporations reporting was 2,167, of which 1,169 were operating roads. During the year companies owning 3,802 miles of line were reorganized, merged, or consolidated. The corresponding figure for the year 1904 was 5,600 miles. The number of roads in the hands of receivers was 26. The locomotives, excepting 947, were classified as: Passenger, 11,618; freight, 27,869, and switching, 7,923; average number of locomotives per 1,000 miles of line, 223; average cars per 1,000 miles, 8,491. Average ton-miles per freight locomotive, 6,690,709, an increase of 233,854. The report shows the type and tractive power of locomotives and the capacity of freight cars by classes.

Of the capital there existed as stock $6,554,557,051, of which $5,180,933,907 was common, and $1,373,623,144 preferred; funded debt, $7,250,701,070, consisting of mortgage bonds, $6,024,449,023; miscellaneous obligations, $786,241,442; income bonds, $253,707,699; and equipment trust obligations, $186,302,906.

Dividends declared during the year, $237,964,482, equivalent to 5.78 per cent. on dividend-paying stock. For the year ending June 30, 1904, the amount of dividends declared was $221,941,049.

Of the total amount of railroad stock outstanding $2,070,052,108 was owned by railroad corporations, and of railroad bonds, $568,100,021.

The average revenue per passenger per mile, when carried out to three decimal, 1.962 cents. For the preceding year it was 2.006 cents. The ratio of operating expenses to earnings for the year was 66.78 per cent. For 1904 this ratio was 67.79 per cent.

Gross earnings, $2,082,482,406, were $107,308,315 greater than for the year 1904, and for the first time exceed the two billion mark. Operating expenses were $1,390,602,152, or $51,705,899 more than in 1904. The gross earnings in detail were: Passenger revenue, $472,694,732—increase, $28,367,741; mail, $45,426,125—increase, $926,393; express, $45,149,155—increase, $3,273,519; other earnings from passenger service, $11,040,142—increase, $125,396; freight revenue, $1,450,772,838—increase, $71,710,145; other earnings from freight service, $5,080,266—increase, $511,984; other earnings from operation, $52,319,148—increase, $2,333,137.

The operating expenses assigned to the four general classes were: For maintenance of way and structures, $275,046,036; maintenance of equipment, $288,441,273; conducting transportation, $771,228,666; general expenses, $55,319,805; undistributed, $566,372. Operating expenses averaged $6,409 per mile of line, this average showing an increase of $101 per mile in comparison with the year 1904.

Total income from operation (net earnings) was $691,880,254; per mile of line, $3,189. The amount of income attributable to other sources than operation was $231,898,553, as follows: Income from lease of road, $114,473,139; dividends on stocks owned, $56,842,694; interest on bonds owned, $18,786,644, and miscellaneous income, $41,796,076. The total income ($923,778,807)—that is, the net earnings and income from lease, investments, and miscellaneous sources—is the amount from which fixed and other charges against income are taken to ascertain the sum available for dividends. Such deductions aggregated $596,688,420, thus leaving $327,090,387 as the net income for the year ending June 30, 1905, available for dividends or surplus.

The amount of dividends declared during the year under review (including $82,415 representing other earnings to stockholders) was $238,046,897, leaving as the surplus from the operations of the year ending June 30, 1905, $89,043,490. The figures for income and expenditures are compiled from the annual reports of leased roads as well as of operating roads, and thus, necessarily, include duplications in certain items.

The report shows the total taxes and assessments of the railroads by States and Territories and has an analysis showing the basis of assessment.

The total number of casualties to persons was 95,711, of which 9,703 were killed and 86,008 injured. These figures include the casualties to persons trespassing, of whom 4,865 were killed and 5,251 were injured. The total number of casualties to persons other than employees from being struck by trains, locomotives, or cars, was 4,569 killed and 4,163 injured. The casualties to passengers and employees have been reported in the quarterly bulletin.

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 14. FRIDAY, OCTOBER 5, 1906.


Actual beginning of electric operation of steam railroads is near at hand in New York City. Over the New York Central the first electric train, made up of eight Pullman cars and an electric locomotive, was run on September 30th from the initial electric terminal at High Bridge on the main line one mile north of its junction at Mott Haven with the Grand Central Station and Harlem Line through the Park Avenue tunnel and into the Grand Central station. In another column will be found a full description of present progress in the work of electrification on this road. In brief, the third rail and the transmission system are now practically complete on 17 miles of line, as far as King's Bridge, 10 miles out on the Hudson division, and Woodlawn, 13 miles out on the Harlem Line. The electric locomotives and motor cars have been on the ground since early in the summer, so that steam enginemen have had a chance to become familiar with their operation. The Grand Central Palace on Lexington avenue has been converted into a temporary station for local trains, and with the exception of certain small though important details, the initial electric zone is ready for regular electric operation. The only official report of progress on the 21 miles of line to be electrified on the New Haven road between Woodlawn and Stamford, Conn., is in the annual report of the road, just issued. The New Haven is to use the single-phase alternating current system with overhead conductor instead of the direct-current system with third rail adopted by the New York Central. This is to be installed on all four tracks, with provisions for its use on two additional tracks between New Rochelle and Port Chester. The construction consists of trolley wires suspended from transverse bridges at intervals of 300 feet. Operation is by electric locomotives designed to run on either alternating or direct current. The work is now in active progress, and although delayed by slow deliveries of material the line to Stamford should be in readiness for operation before the close of the present year.

The Massachusetts railroad commissioners, as a preliminary to exercising their authority under the Resolve passed by the last legislature authorizing the use of block signals, held a public hearing in Boston on Tuesday of this week; but only 15 men were present, and the only ones prominent among these apparently were the new inventors of old ideas—who, by the way, are always present whenever a railroad officer or railroad editor gives a "hearing" on the signal question. The Commission must, of course, "get in touch with the public" by a public hearing, but in the present situation the only possible use of a hearing is to give the public the opportunity to say whether or not it wants block signals. But the public stays away. This is, no doubt, partly because the public does not know what it wants—does not possess any precise knowledge of the difference between the block system or space interval and the train-despatcher system or time interval—and partly because it has by the legislative action left the whole matter to the Commission. The railroads stay away, very likely, because they know that they ought to put up more block signals but do not care to air the matter. Manufacturers of tried and reliable signals have no occasion to attend such a hearing, because their signals are already well known to the Commissioners, being in use on the principal railroads of Massachusetts. It is now nearly a year since the disastrous collision which was the occasion of this official action. Some lines in Massachusetts are well equipped with block signals, and some others are not equipped at all. Probably the public would like to hear what the Commissioners have to say about this phase of the question—which does not depend on a public hearing.

Periodically the statement is made by high officials of one or other of the three great Canadian railroad companies that there is no warfare between the lines which are competing for the carrying trade of Canada. It is difficult for anyone who carefully watches the eagerness with which the companies are striving to beat each other out in a race for the traffic of new districts to fully accept these assurances. To any careful observer it must be apparent that a great railroad war is now in progress in Canada. It had its beginning when the Grand Trunk interests induced the Dominion government to take up their proposition for a transcontinental railroad. Promptly the Canadian Pacific began an active campaign in Ontario in retaliation for the Grand Trunk invasion of the West Territory in the big province of Ontario, which had been held by the Grand Trunk solely, was invaded by the Canadian Pacific. Grand Trunk tracks are being paralleled by the Canadian Pacific, and future plans which have been made show that the Canadian Pacific plans to compete with its older rival wherever traffic exists. The Canadian Pacific has been dependent on the Grand Trunk for a short line from the west to Toronto. To make itself independent altogether it is building a line from Sudbury to Toronto, thus cutting out the turning over of traffic to the Grand Trunk at North Bay. The latter road, however, is not idle and is itself conducting a strong defensive campaign. In order that it may be in a better position to handle grain from the lakes, the Grand Trunk is to build elevators at Midland and Tiffin, on Georgian Bay, and double track its

line from Midland through to Belleville. This will give it a strong position in handling both through traffic and enable it to care for the new traffic from the West as well as that reaching Georgian Bay ports from Chicago. The campaign between the two powerful companies overclouds to some extent the doings of the rapidly growing youngster, the Canadian Northern. With a main line through the richly endowed agricultural region of the West, this company is extending its feeder lines in many directions and is protecting itself against its strong rivals by a through line to the East. It is securing entry into Toronto from the North and West, via Sudbury, a veritable race with the Canadian Pacific to finish the line first. But the Canadian Northern does not plan to stop at Sudbury. Its northern line is projected on to James Bay, crossing the Canadian Pacific and the Grand Trunk Pacific on the way. Construction is also about to begin on the first section of the Canadian Northern's Lake Superior division in the neighborhood of Nepigon. The road is later to be extended to Port Arthur, where it will join the main line from the coast, and at the same time pushed east to join the line from Toronto. This gap is to be filled within the next two years. So far the Canadian Northern seems to be pursuing the most peaceful career, but if the war continues it can hardly fail before long to be drawn into the great contest between the Grand Trunk and the Canadian Pacific.

The relations to American railroad investment of the funds of an old, great and highly endowed educational institution are, in the present "bond period" of railroad finance, suggestive. The funds of such an institution are not usually under any form of public or state supervision, direct or indirect; they are not, as a rule, subject to taxation; except in some special cases they are not under the statutes of trust investment; and the investing authority, can generally exercise a free hand in investment, subject to the approval of the main governing body and the requirements of reasonable conservatism. An example of this railroad investment relation is furnished by the annual report just published of the Treasurer of Yale University which, for the first time in Yale's history, gives a statement in detail and in one long schedule of the university's stock and bond investments. Examination shows that out of 241 stock and bond investments 148, or about 61 per cent., are in railroads, including in that term street railways. Out of 67 stocks held 31 are railroad. But the most striking exhibit is in the bond list. Here we find that out of 174 investments 117 or, numerically, more than 67 per cent., are in American railroads all over the country. Out of total funds and assets of the university, including real estate and returned as $8,254,492, there is $2,118,384, or more than 25 per cent. in railroad bonds alone; and the holdings of such bonds have during the past fiscal year increased from $1,803,371 to $2,118,384 as stated, or more than 17 per cent. Expressive also is the statement by the treasurer of an adopted policy of "buying of short term notes or bonds of standard railroad companies yielding between 4½ and 5 per cent." Of course a considerable number of railroad stocks and bonds have been received by the university as gifts or legacies from estates, but they have been allowed to remain and that fact only confirms the meaning of a schedule of investments which shows to what extent and in what directions recent great issues of bonds of our railroads are being absorbed at a time when several influences—notably high rates of money—make such bonds low in the market in spite of the high security. In the Yale Treasurer's long schedule of railroad bonds there is a touch of fiscal history when one finds that out of 117 sets of such bonds there are only nine bearing 6 per cent. interest on the par and only two 7 per cent.—remnants of the great volume of old long sixes and sevens put out during the decade of swift railroad construction following the Civil War and now either paid off or refunded and, in both cases, extinct.

The editor of the chief Republican newspaper organ, casting about last Sunday for something to print which would warm the heart of the man whom he delights to honor, and fill up some of the empty columns of the Monday morning issue, compiled a couple of thousand words on the "prosecution of the trusts," with the old and familiar headline:

"*President and Attorney-General in Earnest in Attack on Evils.*"

As news there is nothing in it—as is to be expected on Monday morning; and the impression on the reader is one of languid amusement at the distorted editorial judgment which requires a Washington Sunday date line, and the work that accompanies it, to meet a supposed demand for news when nothing has happened. But on glancing back over the article the railroad man, if not the general reader, may have a more serious thought. After a half column of words to support the above quoted head line, the writer continues with a half column of facts—tells of what results the anti-trust fight has produced already. This consists mainly of two lists of cases. The first is of fines and penalties imposed. Omitting the sums and other details this list is as follows (total fines collected, about $200,000).

CONVICTIONS.

Wells & Price, false billing.
Chicago, Burlington & Quincy, charging less than published rates.
Zorn et al., receiving rebates.
Price & Wells, conspiracy in restraint of trade.
Thomas & Taggart, conspiracy to obtain rebates. Sentenced to jail.
Swift & Co., receiving rebates.
Armour Packing Co., receiving rebates.
Cudahy Packing Co., receiving rebates.
Nelson, Morris & Co., receiving rebates.
Weil et al., conspiracy to obtain rebates.
Chicago, Burlington & Quincy, granting rebates.
Miller (C., B. & Q.).
Bernham (C., B. & Q.).
Atchison, Topeka & Santa Fe, granting rebates.

SUITS PENDING.

Cincinnati, Hamilton & Dayton, temporary injunction granted.
Southern Pacific.
Mobile & Ohio.
Chicago & North-Western, Illinois Central, Michigan Central, Pennsylvania Company, Lake Shore & Michigan Southern, to enjoin departure from published rates; temporary injunction granted.
Faithorn et al., indicted for granting rebates.
Great Northern, indicted for granting rebates.
Campbell, Pennsylvania, indicted for granting rebates.
Lake, Pennsylvania, indicted for granting rebates.
Mutual Transit Company, Pennsylvania, indicted for granting rebates.
Diver, Pennsylvania, indicted three times for granting rebates.
Suffolk & Carolina Railway, granting rebates.
Bosley, Virginia, indicted for granting rebates.
Gay Manufacturing Co., Virginia, indicted for receiving rebates.
New York Central & Hudson River, indicted for granting rebates.
Delaware & Hudson Co., indicted for granting rebates.
American Sugar Refining Co., indicted three times for receiving rebates.
New York Central & Hudson River, indicted five times for granting re
New York Central & H. R., indicted five times for granting rebates.

As we have said, these lists are sobering. We have no comment to make on them. The sobering effect comes by comparing the situation here brought out with that of a few years ago, when convictions, and even prosecutions, had been so few that traffic managers seemed almost justified in believing that law breaking was not law breaking. Many did believe so, and acted accordingly. There was good ground for holding that the anti-pooling law was contrary to public policy, and it was easy to follow this with the assumption that to disobey it was to serve the state; which would lead some to justify themselves in other disobediences. Moreover, it appeared to outsiders, if not to many railroad men also, that the offenders against law, if there were any, were the weak roads; weak and therefore presumably vicious by nature. But all this is changed. Six of the 14 titles in the first list are of railroads or railroad men. In the second list—not actually a list of disgrace, because accusation is not conviction—and yet one that suggests a dark cloud, twenty items are railroads or transportation men, and only two are shippers. And in both lists the railroad names are neither obscure nor disreputable ones. The lists are not very long; perhaps the crimes proved or the crimes charged are not the blackest in the calendar; but the fact that reporters like to print such lists is or should be disquieting to those who are jealous of the reputations of the railroad profession. It is disquieting, too, to think of the indelibility of the lists.

## AN ENCOURAGING BEGINNING.

The Hepburn railroad rate law has been in force little more than a month—not long enough to enable a conclusion to be reached as to its ultimate effect on the business of the country. Any such conclusion can only be based on evidence as to the manner in which the authority to prescribe rates may be used. Thus far there is no evidence on that point, but the law has been in force long enough to direct attention to certain facts as to the attitude toward it and toward each other of the Interstate Commerce Commission and the railroads—an attitude that, if adhered to on both sides, promises well for the future.

The law clothes the Commission with a large measure of dis-

cretion as to several of its most important features; discretion that, if used unwisely, might hamper and restrict the railroads without conferring any corresponding benefits on shippers or travelers. For instance, the Commission is given unrestricted discretion to suspend or modify the general requirement of the law that 30 days' notice must be given before any passenger or freight rate can be either reduced or advanced. Upon a wise and liberal use of this discretion must depend the ability of the roads to meet unforeseen emergencies and to adapt their rates to changing commercial conditions. A rigid insistance on the requirement for 30 days' notice could only result in harassing the roads and inflicting positive injury on commercial interests.

The Commission must make rulings as to the forms and procedure to be observed in the filing and posting of schedules of rates and in amending those already filed and posted. Each ruling so made within the statutory authority of the Commission has the full force of law. In the same way, the law authorizes the Commission to prescribe forms for all the records, accounts and memoranda to be kept by the roads. It is desirable, therefore, that rulings under the law should be made only after mature consideration and with a clear understanding as to their practical effect.

Up to the present time no fault can be found with the way in which the Commission has exercised its discretionary powers. It has been liberal in granting permission to carriers to reduce rates on less than 30 days' notice where such reductions are necessary to meet rates in force on competing lines or where they are necessary to bring through rates down to the sum of the locals. In the matter of rulings affecting the filing of tariffs the Commission has recognized the desirability of having expert advice as to their practical working and has invited suggestions from railroad men and arranged for a hearing of their representatives before putting into effect rulings that have been tentatively agreed upon. Similarly, the statistician of the Commission is seeking expert advice from the auditors and accountants of the roads before undertaking to recommend the forms of records, accounts and memoranda to be prescribed by the Commission.

The railroads, on their part, are showing a disposition to acquiesce in the law frankly and loyally, to obey its requirements, and to assist the Commission in every way possible. It is inevitable that differences of opinion between the members of the Commission and the attorneys of the roads shall arise as to the proper construction of features of the law, and some of these will doubtless have to be fought out in the courts, but if these differences shall be avoided as far as possible by the exercise of a spirit of co-operation on both sides, the result will be to relieve not only the Commission and the railroads, but shippers and travelers as well, of exasperating and expensive friction and litigation.

## CAST IRON WHEELS.

The Master Car Builders' Association has adopted by letter ballot the two recommendations of the committee on cast iron wheels increasing the thickness of the flange one-eighth of an inch and changing the coning of the tread from 1 in 25 to 1 in 20. Increasing the thickness of the flange is not a new suggestion; it was first made several years ago and then dropped because it was considered impossible to run a thicker flange through the frogs and guard rails. The American Railway Association, after an investigation of the limiting conditions of modern track, has approved the change, and there are now no objections on the grounds of safety. How much strength and durability this ⅛ in. of metal will add to cast iron wheels is yet to be determined by laboratory tests and actual service. It is probable, however, that the flange strengths will vary quite as much in the new wheels as they do in the present wheels, where they run from 47,750 lbs. to 116,000 lbs. with an average of over 80,000 lbs. The strength of the flange of a cast iron wheel is frequently assumed to be dependent on the soft metal back of the chilled iron. In the discussion of the M. C. B. committee report last June it was said that: "It has been the opinion of the majority of wheel makers that a larger body of soft iron behind the flange would give a stronger wheel." Whether there is any truth in this assumption we are not prepared to say. Chilled cast iron is brittle and should, therefore, be easily broken, but trying to break a cast iron wheel by pounding on the tread with a sledge hammer gives evidence that there is strength and adhesiveness at that point. Good chilled cast iron is not weak. Few tensile tests of this material have been made owing to the difficulty and expense of preparing the specimens, but in one case where the specimens were carefully taken from the chilled portion of a 33-in. standard wheel a tensile strength of 36,000 lbs. per square inch was obtained. There was no elongation of the material, and careful observation failed to detect the limit of elasticity. It would be a fine grade of soft cast iron that would sustain such a load before fracture. Inasmuch as the chilled face of the flange is in tension under the side stresses set up on curves, and as these stresses are not commonly in the nature of a true impact but are suddenly applied and long sustained static stresses, it would seem, in the light of the tests made, that in a sound and perfect wheel of the existing contour sufficient metal of high tensile strength is already provided at the weak point. Because chilled cast iron is hard and brittle it should not be carelessly concluded that it is any weaker to resist the stresses imposed on it than the soft gray iron back of it which is poured from the same ladle.

The advantage gained by increasing the thickness of the flange on the outside ⅛ in. arises from another cause than inherent structural weakness of the chilled and gray iron. Flange breakages are most common on mountain roads having long grades and sharp curves. It has been satisfactorily proved that the heating of the tread and flange of the wheels by rubbing against the rails and by long continued brake applications produces longitudinal seams in the throat of the flange. These seams have the same effect as nicking a bending test piece: once developed on the surface they go deeper into the chilled metal of high tensile strength and on the first severe stress the flange breaks off. Adding ⅛ in. of metal to the back of the flange increases the effective area of resistance by about 15 per cent., and in a perfect wheel would increase the shearing strength by more than 30 per cent., assuming the section to have uniform strength. The actual gain, however, will probably be much less. The increased thickness will not prevent the formation of longitudinal seams; it can only prolong the time the wheel will run without breaking after the seams appear. Service alone can determine how much it will prolong it.

In discussing the report further it was said: "The cast iron wheel has been such a source of trouble with railways which commonly haul 50-ton capacity cars, that we are going into the pressed steel wheel at an immense increase in the cost." In the first outlay, yes; but in final cost the relative merits of the cast iron and the steel wheel leave room for discussion and honest difference of opinion.

Some recent laboratory experiments developed a number of interesting points. The hardest part of the chill of a cast wheel grinds away on an emery wheel from two to four times as fast as a steel tire or steel wheel, depending upon the quality of the steel wheel, the conditions of testing remaining the same. This rather unexpected result was afterwards checked by skidding cast iron and steel wheels, and it was found that, under similar conditions, the sizes of flat spots developed on the two wheels bore almost the same relation to each other, in the amount of metal worn away, as the rates of wear on the emery wheel. If further investigation corroborates this, it appears that, for a given amount of skidding, the steel wheel is less apt, by from three or four to one, to develop a flat spot than is a cast iron one. The coefficient of friction between a steel wheel and the rail is greater than between a cast wheel and the rail, and it is therefore more difficult to produce skidding. It has also been found that small flat spots will roll themselves out in service on steel wheels but not on cast iron wheels.

Allusion has often been made in these columns to the heavy car wheel loads of current American practice. It has been shown by experiment that a load of 20,000 lbs. makes a permanent depression in the head of the rail, and that this depression is greater with a cast iron than with a steel wheel. A 50-ton car with a 10 per cent. overload has about this weight (20,000 lbs.) on each wheel; it is reasonable then to infer that such a car will wear out the rails more rapidly if equipped with cast iron wheels than if equipped with steel wheels. On the other hand, while the data available is meager, it appears that sharp flanges are more common with steel wheels than with cast iron wheels.

The committee report, in recommending the change in the taper of the tread from 1 in 25 to 1 in 20, says: "The reason for asking for the change in the taper is due to experiments that have recently been made which indicate less flange wear and a longer life to the wheel on this account."

The comments made on taper of wheel treads by Mr. M. N. Forney in his paper on the Relation of the Wheel to the Rail, presented to the Master Car Builders' Association in 1884 are pertinent:

"The relative advantages of coned and cylindrical treads of wheels have been in dispute ever since railroads were first built. Whatever advantage

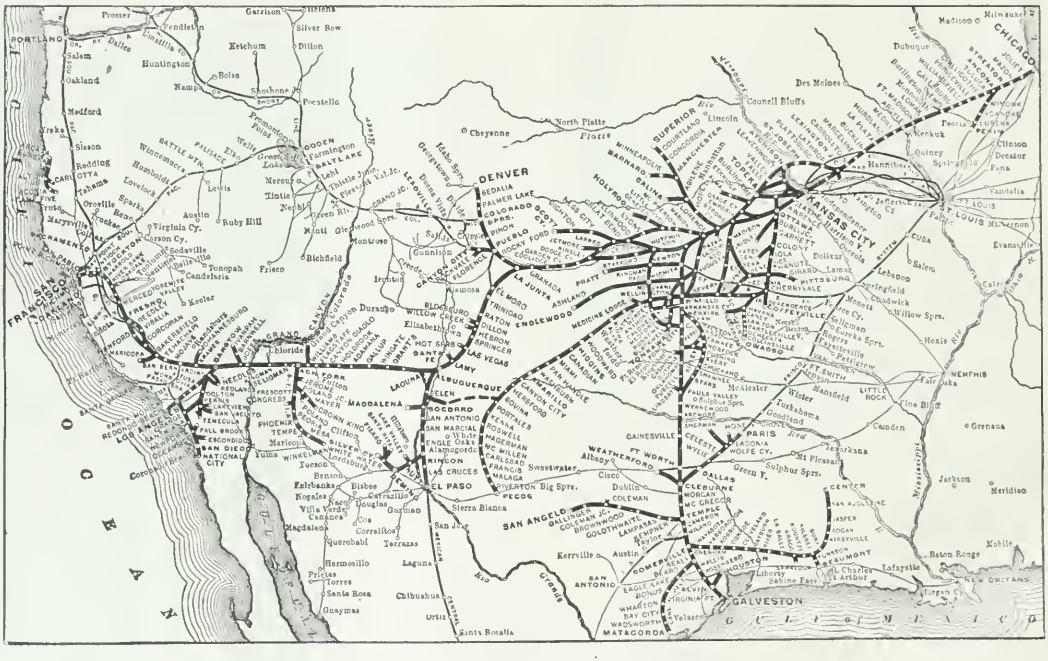
may accrue from the use of coned wheels is soon lost because the cone of the treads is rapidly worn away, and the wheels become either cylindrical in form or approximate thereto."

It may be, however, that the coning has more influence than is usually credited to it. In the topical discussion on the allowable variation in circumferences in mating wheels, it was said that if one wheel is made $\frac{1}{32}$ in. larger in diameter than its mate, such a wheel will not run sharp. It is probable that a pair of new wheels will act on the rails like a barrel rolling on skids; that is, so adjust themselves that they will roll on points of equal diameter, and it is evident that this will be the more easily accomplished the sharper the cone of the tread. Hence if they are brought to bear, when new, on points of equal diameter they have the probable advantage of being liable to wear evenly and thus be of the same diameter when they are worn to the cylindrical tread. The change suggested by the committee is a reasonable one and may do something towards the elimination of sharp flanges, but the change is so small that complete relief cannot be hoped for.

The last accident report issued by the British Board of Trade gives a severe shock to some of our accepted notions concerning English practice and ideas. It is on a rear collision which occurred at Nantmill on the North Wales Narrow Gage Railway, July 31, slightly injuring ten persons. A short mixed train, ascending a grade, broke in two and the rear car, a coal car, ran back into the head of a following passenger train. The runaway car had reached a point where the grade was not steep and the collision was not violent. The inspector, Col. Druitt, lays the whole fault to the neglect of block signal rules, though he says that the buffer hook couplings are not reliable and chain couplings should be put on as an additional precaution. What, to an American, would be looked upon as the primary neglect in the matter—the neglect to have a man on the rear car of a train ascending a grade, with a brake by which he could hold the car in case of a break-in-two, is not even touched upon by the inspector. Possibly he has given scant notice to this case because it is "a little one." Moreover, it is a little railroad, the gage of the track being 1 ft. $11\frac{1}{2}$ in. The queer thing about the block signaling is that a signal man does not report back the arrival of a train "except where special instructions are in force to that effect!" Mr. Hughes, station master at Waenfawr for 29 years, and now 68 years old, sent on the passenger train to Snowden without first assuring himself that the mixed train had cleared the block, and the collision occurred. He "worked to the time-table," instead of to the block rules. The prize for proficiency in the art of running railroads by taking chances may not always remain in America!

## Atchison, Topeka & Santa Fe.

The first full year of the operation of the reorganized Atchison, Topeka & Santa Fe ended on June 30, 1897. At that time, including a little more than 1,000 miles of controlled lines, the average operated mileage was 6,444 miles. The gross earnings on this mileage were $30,621,230, and the net earnings, $7,754,041. After deducting taxes, rentals and fixed charges, there was no net income remaining. The capital obligations of the company at that time amounted to $390,396,280. There has been no more striking feature of recent railroad development than the increase in strength and earning power of the system during the past ten years. With an overage operated mileage on June 30, 1906, of 9,527 miles, an increase of 48 per cent. over 1897, and outstanding capital obligations of $491,681,330, an increase of 26 per cent. over the same year, gross earnings have increased to $81,344,859, and net earnings to $30,777,922 in the year just past, being an increase in gross of 166, and in net earnings of 297 per cent. At the same time, the net income, including the undivided net income of auxiliary lines, after all charges, amounted to $18,259,778, against no net income at all in 1897. A further fact which shows that these increases in earnings have not been largely the result of extensions in mileage is that gross earnings during this time increased from $4,752 per mile in 1897 to $8,538 in 1906, a unit gain of 80




Atchison, Topeka & Santa Fe System.

per cent. It would be hard to point to a more remarkable record. Here is a road which, ten years ago, was just coming out of the crucible of an exceedingly difficult reorganization and to-day stands as one of the strongest and most successful systems. The change has been brought about both by the continued and increasing prosperity of the country and by the successful policy of the management in steadily extending and improving the property.

The present report discusses this last question of policy at some length. The new capital, amounting to an increase of 26 per cent. since 1897, has been required both for the building and buying of new mileage and for additional rolling stock and other facilities necessary for the largely increased business. No small part of the gain in earnings during the ten years was due to the additional mileage, which has not only proved profitable in itself but has largely contributed to the earnings of the rest of the system. As the country served is still growing so rapidly that on top of the large expenditures which have been made out of both capital and income accounts a large amount of new equipment and other facilities must be provided, it will be necessary to continue in the future the same policy of expansion, especially as settlement of new territory will require the building of new feeders. While the policy of devoting part of the surplus income to the improvement of the property is to be continued, the cost of extending and enlarging the system cannot be covered out of earnings, and addi-

tional capital will, therefore, have to be obtained from time to time.

A further statement of the report is of interest in connection with the declaration this week of a larger dividend (at the rate of 5 instead of 4 per cent. annually) common stock. For the last five years (including the extraordinary floods of the year 1905, which affected net earnings to the extent of at least 3 per cent. on the common stock) the net income applicable to common stock dividends has averaged about 9 per cent. However, in the opinion of the board, the whole amount of the net earnings is not properly available for the payment of dividends.

Prudent management requires that part of the surplus income during years of great prosperity should be reserved for improving the property and increasing the stability of the investment of shareholders. Furthermore, every large railroad system in the United States is obliged to expend annually considerable sums for improvements and additions that are not chargeable to ordinary operation and maintenance expenses, but nevertheless ought not to be charged to capital account. Of this class are expenditures for elevating tracks in cities, for additional safety appliances, for better stations and cars and generally for furnishing better service to the public without increasing charges. Although expenditures of this class are not ordinary maintenance expenditures, yet they should be charged to income and not to capital account, except to the extent that they clearly add to the net income by increasing earnings, or by reducing operating expenses. While it is of little practical consequence whether the undivided surplus income be allowed to stand upon the books as surplus, or be written off by direct charges to current income, or by charges to profit and loss, the Directors have deemed it advisable to write off part of the surplus as in previous years, so that the book surplus representing income already expended on the property may not be unduly increased. Accordingly, $4,500,000 was charged to the income of the year on account of betterments, improvements, etc., written off, and certain additional charges were made in the profit and loss account. Betterments and improvements on existing mileage and discount on bonds sold from the organization of the company to June 30, 1906, amounted in the aggregate to $43,060,848. During the same period the undivided surplus net income, after deducting all charges and dividends, amounted to $40,131,788. Of this sum, $20,146,305.28 was charged off in various ways, leaving a balance of $19,985,483 standing to credit of profit and loss as surplus on June 30, 1906.

The past year's earnings' record is the most remarkable in the ten-year period. Both gross and net earnings made new high records. With an increase in the average mileage of 129 miles, gross earnings were over $78,000,000, an increase of nearly $10,000,000 over 1905. Operating expenses increased less than $3,000,000, leaving net earnings of over $29,500,000, an increase of nearly $7,000,000 over the previous year. These results are on an operated mileage of 8,434 miles, including the Atchison, Topeka & Santa Fe proper, the Rio Grande & El Paso, the Gulf, Colorado & Santa Fe, and the Southern Kansas Railway of Texas. It is announced that in the statements hereafter published, the Pecos Valley & Northeastern lines, the Santa Fe, Prescott & Phoenix lines, and the Denver, Enid & Gulf, an aggregate of 740 miles of auxiliary lines now carried in separate accounts, will be included in the system earnings.

After all charges and deductions, the profit and loss surplus for the year was $3,227,314 against $552,489 in 1905 and $2,333,344 in 1904. Besides the $4,500,000 for improvements already mentioned, there was an appropriation of $218,985 to fuel reserve fund, and deductions of $126,978 for expenses in connection with the issue of convertible bonds and of $2,854,345, being a semi-annual dividend of 2½ per cent. on the preferred stock, from income. Dividends are now charged in the year when declared instead of, as heretofore, in the year in which they are paid. This dividend was declared June 7, 1905, and there being, without this, a full year's dividends on the preferred stock declared in the fiscal year 1906, this payment, made in August, 1905, was charged to profit and loss. Thus the total amount deducted from income and used for the benefit of the company, outside of regular fixed charges and dividend payments, was over $7,700,000. In addition to this sum, $366,760, received in cash as the net proceeds of sales of land included in the Santa Fe-Pacific land grant, was directly written off the book value of railroads, franchises and other property, and does not appear in the income account. Here are splendid proofs of the great prosperity of the company.

There was an increase during the year of over $1,000,000 in the cost of maintenance of way and structures; a decrease of $194,824 in maintenance of equipment, and an increase of over $2,000,000 in conducting transportation. Per mile, the cost of maintenance of way was considerably higher than ever before in the history of the road and almost twice as large as in 1902, when this account cost $782 per mile. The charge last year was $1,479 a mile against $1,371 in 1905. Including a proportion of general maintenance of equipment expenses—such as superintendence, shop machinery and tools, stationery and other expenses—maintenance of equipment cost $3,101 per locomotive against $4,165 in 1905, $888 per passenger train car against $1,152 in 1905, and $104 per freight car against $94 in 1905. The 1905 figures include expenses due to the machinists' strike in that year. Including only repairs and renewals, these figures were $2,695 per locomotive, $732 per passenger car, and $90 per freight car in the year just past. In addition to the other improvement expenses out of earnings already shown, there is included in the operating expenses for maintenance of equipment $1,442,163 added to the rolling stock replacement fund, through which fund during the year equipment to the value of more than $2,000,000 was acquired. Besides this, new equipment to the value of $8,985,159 was acquired through new charges to capital account, making a total expenditure of over $11,000,000 during the year for equipment, another figure which will serve to suggest the immense size of the company's business.

To the extent of 8 per cent. of their holdings, the privilege was during the year given holders of the two classes of stock to subscribe for convertible bonds at par. Under this privilege $16,295,000 bonds were subscribed for. The charges to capital account for building and acquisition of new lines and for improvements amounted to $26,228,582. Of this amount the charge of $8,985,000 for new equipment and a total of $8,793,465 for construction and acquisition of new mileage, including acquisition of bonds and stocks of other companies, were the two largest items. Included in this last account are $2,000,000 covering the purchase of the Denver, Enid & Gulf, which runs from Guthrie, Okla., northwest to Kiowa, Kan., 117 miles, and has an extension from Kiowa via Medicine Lodge to Belvidere, Kan., under construction; $1,000,000 for the Texas & Gulf, running from Longview, Tex., south to Watterman, 71 miles, and $3,769,000 for expenditures on the Eastern Railway of New Mexico, the 250-mile cut-off from Texico to Belen, N. Mex., which is nearly completed.

The increase in operated mileage is largely made up of the Cane Belt Railroad, from Sealy, Tex., to Matagorda, 105 miles, leased on July 1, 1905, to the Gulf, Colorado & Santa Fe; and the Western Arizona, which runs from McConnico, Ariz., to Chloride, 22 miles, leased to the A., T. & S. F. from January 11, 1906. Other extensions of subsidiary lines include the Arizona & California, on which track has been laid from Wickenburg, Ariz., north of Phoenix to within 20 miles of the Colorado river; the Jasper & Eastern, which has been opened for traffic to De Ridder, La., and is nearly completed thence to Oakdale; the Sulphur branch, 9½ miles long, under construction from Davis, Ind. T., to Sulphur; the Searchlight Extension, under construction from a point near Barnwell, Cal., on the California Eastern branch, to the mining town of Searchlight, Nev., 23 miles, and a branch now under construction from Canyon City, Tex., to Plainview, 58 miles. It will be necessary to make extensive improvements on the lines east of Texico in order to bring them up to main line standard, so that through service can be operated over the new cut-off. Since the last annual report there have been 161 miles of second track put in operation and 90 miles more are now under construction.

The principal operating results are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 8,434 | 8,305 |
| Freight earnings | $54,598,903 | $47,408,982 |
| Passenger earnings | 18,013,989 | 16,045,380 |
| Gross earnings | 78,044,347 | 68,375,837 |
| Maint. way and structures | 12,475,408 | 11,386,418 |
| Maint. of equipment | 10,720,040 | 10,914,864 |
| Conducting transportation | 23,370,572 | 21,362,860 |
| Operating expenses | 48,497,519 | 45,517,384 |
| Net earnings | 29,546,829 | 22,858,453 |
| Improvements written off | 4,500,000 | ..... |
| Surplus for the year | 3,227,314 | 552,489 |

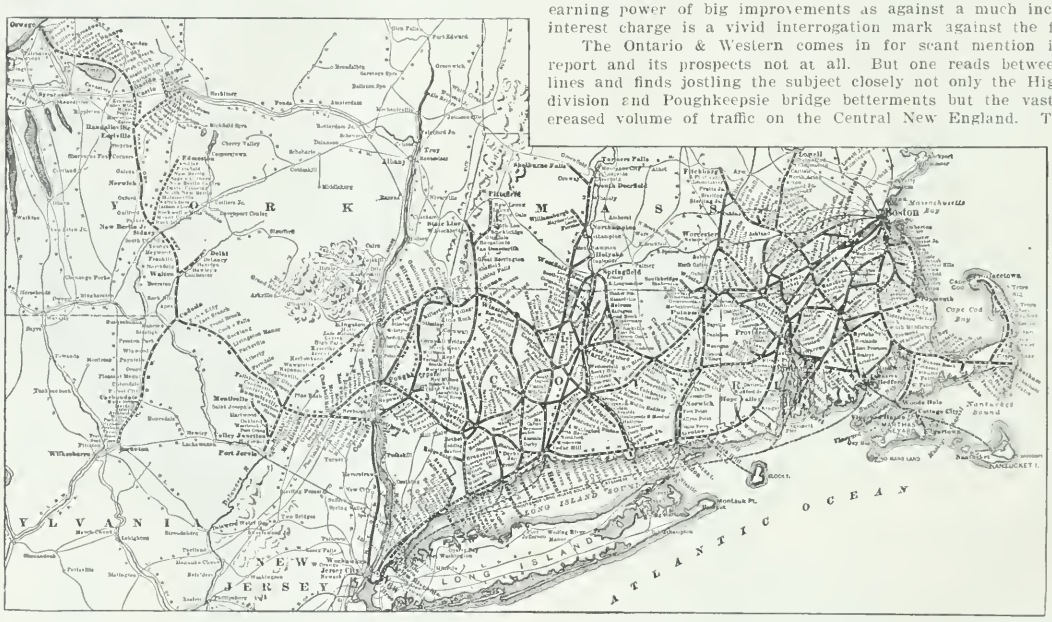
## New York, New Haven & Hartford.

Since President Mellen took charge of the New York, New Haven & Hartford system three years ago his striking development of that unique property has been in four directions, taken here in the order of importance: (1) Extension of electric ownership and operation by purchase of street railways; (2) the application of the Northern Pacific idea of increasing trainload and operating economies by improvement of roadbed, bridges and equipment; (3) the securing of a new protective outlet to the coal fields and, potentially, to the West; and (4) new methods in finance and rate making. Two important details under the last head are to be included, important legislation obtained from the Connecticut General Assembly and passenger fares reduced voluntarily to two cents a mile, differentiated over a period of several months but already covering nine-tenths of the entire system and in a month more to cover it all.

In the thirty-fifth annual report of the company just published, taking up here the foregoing subjects in succession, the returns for the Consolidated Railway Company, the great "holding" corporation for street railways, show striking success as an investment merely, not counting the collateral advantages of its ownership. Its gross earnings rise from $4,567,978 in 1905 to $5,409,438 in 1906, and net from $131,333 to $520,300 during the same time. The original cost was $10,000,000 approximately in the parent com-

pany's 3½ per cent. bonds, and the holding corporation was capitalized at that amount. Over and above the $350,000 fixed charge on the purchase bonds the holding corporation thus earned $170,300, and has, in fact, declared dividends to the New Haven Company of 4 per cent., or $50,000 more than the fixed charge. At least one of the Massachusetts city systems—that at Worcester—does not appear in the report, as it was too recently purchased. As, however, it is regarded as one of the best of President Mellen's "bargains," it is perfectly obvious that his great electric ventures have already at this early stage become profitable in actual money returns. As a pioneer enterprise of a steam railroad in electrics on a large scale such a result is of broad and deep significance. How vast that scale is may be suggested by the fact that the New Haven holdings of street railways represent now about 800 single-track miles, and securities held by the parent corporation and the public worth at market value nearly or quite $50,000,000. Within three years the New Haven's street railway system has come to cover 12 cities of southern New England, and to be as large in fiscal size as was the New Haven Railroad when President Mellen's predecessor next but one, C. P. Clark, assumed office in 1887.

Control of the road's Massachusetts street railways, represented mainly by the Berkshire, the Springfield and the Worcester local systems, has been transferred to a "voluntary" association, itself




New York, New Haven & Hartford.

tied up by notes and by issues of common and preferred shares to a banking house with apparent power of sale. This is the shortest way of describing a transaction, stated in the report with what seems intentional obscurity and intended to protect by a multiplication of interests, each with a different legal status, the three Massachusetts systems from assault. The law of that state prohibits steam railroad ownership of street railways by either direct or indirect means. It will be interesting and instructive to see how the Massachusetts authorities will now attack the new masks of ownership, should they decide to do so either by appeal to the legislature or the courts or to both. Geographically that important corner of the New Haven system represented by Rhode Island is still unprotected by street railway purchase and contains the menace of long distance electric parallels.

The "Northern Pacific idea" is now swiftly developing and a few months more will find it in force. The improvements to expand trainload and shorten time are on a great and costly scale. Some 30 improvements are enumerated in the report, some of them completed. The most noteworthy are the Harlem six-track construction; the many new and strong bridges, notably the structure over the Connecticut river at Lyme; extensive double-tracking on the western part of the Highland division, including the strengthening of the Poughkeepsie bridge; the costly re-alinements of the Naugatuck road and of the Highland division northeast of Waterbury; the four-track improvement at New Haven and the terminal connecting line at Providence; the Attleboro four-tracking; the electric plant and operation between Stamford and Woodlawn; and the prospective "relief" line between Greenwich and Danbury to reduce the strain of traffic on the New York division and shorten time to the Berkshires. All these are expensive enterprises and the system is under physical and fiscal pressure for new construction unprecedented in its history. Most of them, however, signify economies of operation on the one hand and added traffic on the other; and a few months more ought to disclose fruitful and suggestive results. But the price in new debt liabilities is large. As a better index of that cost than the company's many tables of varied assets and liabilities, bonds and leases, securities in its treasury and out of it, we may take the increase of fixed charges for the year plus the 8 per cent. dividend charge on $3,357,100 new stock and then capitalizing the whole at 4 per cent. a fair measure of the company's credit—we obtain approximately $30,000,000 increase, much of which, along with $3,000,000 from surplus net income, must have gone into improvements. Other large sums have liquidated the Ontario & Western purchase and gone toward paying for stocks of subsidiary and merged lines—in these cases the outlay obviously "washing" itself and being substantially the exchange of one form of good security for another. Such increases of fixed charges as those of the Consolidated Railway—rising from $1,264,414 in 1905 to $1,496,222 in 1906—have not here entered into the computation. As in the case of a good many other big American railroads, so with the New Haven. The earning power of big improvements as against a much increased interest charge is a vivid interrogation mark against the future.

The Ontario & Western comes in for scant mention in the report and its prospects not at all. But one reads between the lines and finds jostling the subject closely not only the Highland division and Poughkeepsie bridge betterments but the vastly increased volume of traffic on the Central New England. The returns of the latter to the Connecticut Railroad Commission in 1905 showed gross earnings of $979,439. Under continued New Haven control and patronage the gross earnings are now $1,679,449. Transfers of the net earnings to rebuild the Poughkeepsie bridge running up operating expense to 89.8 per cent. probably give a rich hue of thought to minority stockholders and certainly suggest a large policy of traffic development west of the Hudson not altogether unfulfilled already.

As the first operating President of the New Haven Company Mr. Mellen is reading his title clear. His showing is certainly most remarkable. Operating expenses of 71.69 per cent. last year now drop to 66.48 per cent. Stated absolutely they were $35,833,022 last year and $35,222,586 now; and this while gross earnings have risen from $49,981,947 to $52,981,322, or approximately 6 per cent. A reduction of $661,061 in cost of freight car service alone has emphasized meaning. Nearly or quite all of this must have been in reduced foreign car detention charges due partly, no doubt, to the policy of "hustling back" foreign cars, partly to the company's acquirement of new freight equipment. In this connection an increase of freight cars owned from 12,430 to 15,503, and of box cars alone from 6,175 to 9,069, is to be noted sharply. In general, the reduced operating expense is part of a prompt system by which full reports of the company's business reach the President's desk bringing down the returns to three or four days where the gap of time used to be six weeks. The successful reduction of demurrage charges raised a question tipped with humor. Will President Mellen now go before the next Connecticut legislature with a strenuous and eloquent appeal for change in the Connecticut "four day"

car detention statute? Probably not, and, if he does, not with brilliant prospects of winning against the embattled Connecticut farmers who always thus far defeated such an attempt. As regards new legislation the company is likely to rest content, in the main, with last year's great concessions—partial repeal of the general railroad law of the state and the passage of the "omnibus" charter of the holding street railway company which gives it well nigh limitless privileges.

Other features of the report are noteworthy, especially the results of the voluntary reduction of fares to two cents a mile. While it does not there appear, the official forecasts last March suggested a loss, by the reduction, of about $700,000 a year, the estimate being based on the volume of business last year. Thus far the increased travel stimulated has more than made good the loss in the rate. Another year must go by before the test is conclusive; at the same time it must be remembered that the New Haven's great passenger business is peculiarly responsive to rate concession and that many years ago the two cent a mile fare fixed between New York and Hartford brought instantly a handsome gain in receipts as against the official prophecy of loss. The boat lines of the company, now consolidated under one corporation, show gains both in gross and net in spite of sharp competition. As both they and the street railway system are, for all practical purposes, integral parts of the main company, fuller financial statements would not be amiss. New phases of administration are the auditing of the finances by outside accountants; the establishment of an accident and casualty fund on a basis of 2 per cent. of passenger earnings this year begun with $326,998 paid in; allowances for claims unsettled and for depreciation—thus reducing net income this year but bettering the comparative showing next year; and finally a great enlargement, typographicaly as well as fiscally, of the report itself with many new tables and fresh forms of presentation of the company's financing. In the look ahead the immediate points of significance are now the electric interests of the corporation and the first fruits of the adaptation of the company's lines to heavier locomotives and train loads.

The principal results of the year's operation are annexed below:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,056 | 2,087 |
| Passenger earnings | $25,252,124 | $24,146,454 |
| Freight earnings | 27,247,118 | 25,341,855 |
| Gross earnings | 52,984,322 | 49,981,947 |
| Maint. way and structures | 5,614,978 | 5,168,709 |
| Maint. of equipment | 5,668,524 | 5,087,965 |
| Operating expenses | 35,222,586 | 35,833,586 |
| Net earnings | 17,761,735 | 14,148,925 |
| Net income | 10,185,377 | 6,708,052 |

## Colorado & Southern.

This year's annual report, the seventh of the Colorado & Southern, includes the operations of three of the companies now making up the system—the Colorado & Southern, Fort Worth & Denver City and Colorado Springs & Cripple Creek District Railway—thus for the first time covering in one report the operations of these three roads, which make up a total of 1,663 miles of line, of which the Colorado & Southern has 1,134 miles (747 standard and 388 narrow gage), the Fort Worth & Denver City, 454 miles, and the Colorado Springs & Cripple Creek District, 75 miles. Gross earnings of the system during the fiscal year ended June 30 last were over $11,600,000, an increase of $2,210,000, or 23 per cent. Net earnings were $3,750,000, an increase of $1,200,000, or 48 per cent. The operating ratio was 67.8 per cent., as against 73.2 per cent. in 1905.

The plans for a line to tidewater at Galveston, Tex., are described in considerable detail in the report and are worth repeating at this time in order to get a view not only of the system as it stands to-day, but of its possibilities in the future. This line is shown on the accompanying map, as well as on the map of the Rock Island and Frisco Lines, which also shows the new allied connection to New Orelans to be built by the Colorado Southern, New Orleans & Pacific. Beginning at Fort Worth, Tex., the present southern terminus of the Fort Worth & Denver City, the new line is made up of the following parts: First, trackage rights over 28 miles of the Gulf, Colorado & Santa Fe from Fort Worth to Cleburne, the northern terminus of the Trinity & Brazos Valley, control of which was acquired during the year. The Trinity & Brazos Valley runs from Cleburne southeast to Mexia, 79 miles, and is building the 157-mile extension, which is expected to be completed by November of this year, from Mexia south to Belt Junction, near Houston. Entrance into Houston is to be gained over the Houston Belt & Terminal Railway, in which a one-quarter interest is held, now in process of construction. From Houston to Galveston, 53 miles, further trackage rights over the Gulf, Colorado & Santa Fe have been acquired. This makes a total length of line from Fort Worth to Houston of 264 miles and from Fort Worth to Galveston of 317 miles (the latter the shortest line between Fort Worth and Galveston), as against 287 miles to Houston and 340 miles to Galveston over the Houston & Texas Central, which will be a keen competitor of the new line. In addition to this through line, the Trinity & Brazos Valley is building from a point 14 miles east of Mexia northerly to Waxahachie, 67 miles, and by trackage contract over 31 miles of the Missouri, Kansas & Texas from Waxahachie, will reach Dallas. This line is to be put in operation early in 1907, and will give the Colorado & Southern also the shortest line between Dallas and Galveston. Close business relations with the Rock Island on this new line have been assured by a contract, under which the Rock Island Company, having taken a half-interest, subject to pledge under the Colorado & Southern refunding and extension mortgage, in the securities of the Trinity & Brazos Valley, owned by the Colorado & Southern, assumes one-half the requirements for interest and contracts to pay on May 1, 1935 (the date of maturity of the Colorado & Southern refunding and extension mortgage) for an unencumbered half-interest in the Trinity & Brazos Valley securities, or to join in refinancing them. The success of this new extension, both to the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, which will undoubtedly have traffic arrangements over it, and, in particular, to the Colorado & Southern, hitherto mainly a local system, to which it will give the shortest through line between Colorado and tidewater, will be watched with much interest. In this connection attention is called in the report to the fact that Galveston is almost as far east as Kansas City, and that exports through Galveston already rank next in value to those through New York.

The Colorado Springs & Cripple Creek District, 75 miles, and the Fort Collins (Colorado) Development Railway, 16 miles, as well as control of the Wichita Falls & Oklahoma, running from the Red river (Oklahoma—Texas boundary) to Wichita Falls, Tex., on the Fort Worth & Denver City, 22 miles; the Wichita Valley Railway, running from Wichita Falls to Seymour, 53 miles; the Wichita Valley Railroad, running from Seymour to Stamford, 60 miles; and the Abilene Northern, running from Stamford to Abilene, on the Texas & Pacific, 38 miles—the latter two roads being under construction—were acquired during the year; a total of 173 miles of new mileage already built or under construction. Adding this to the 415 miles of new line included in the Galveston extensions, there will be a total of about 2,250 miles of road operated by the Colorado & Southern, not including its ownership of a half-interest in the 336 miles of the Colorado Midland.

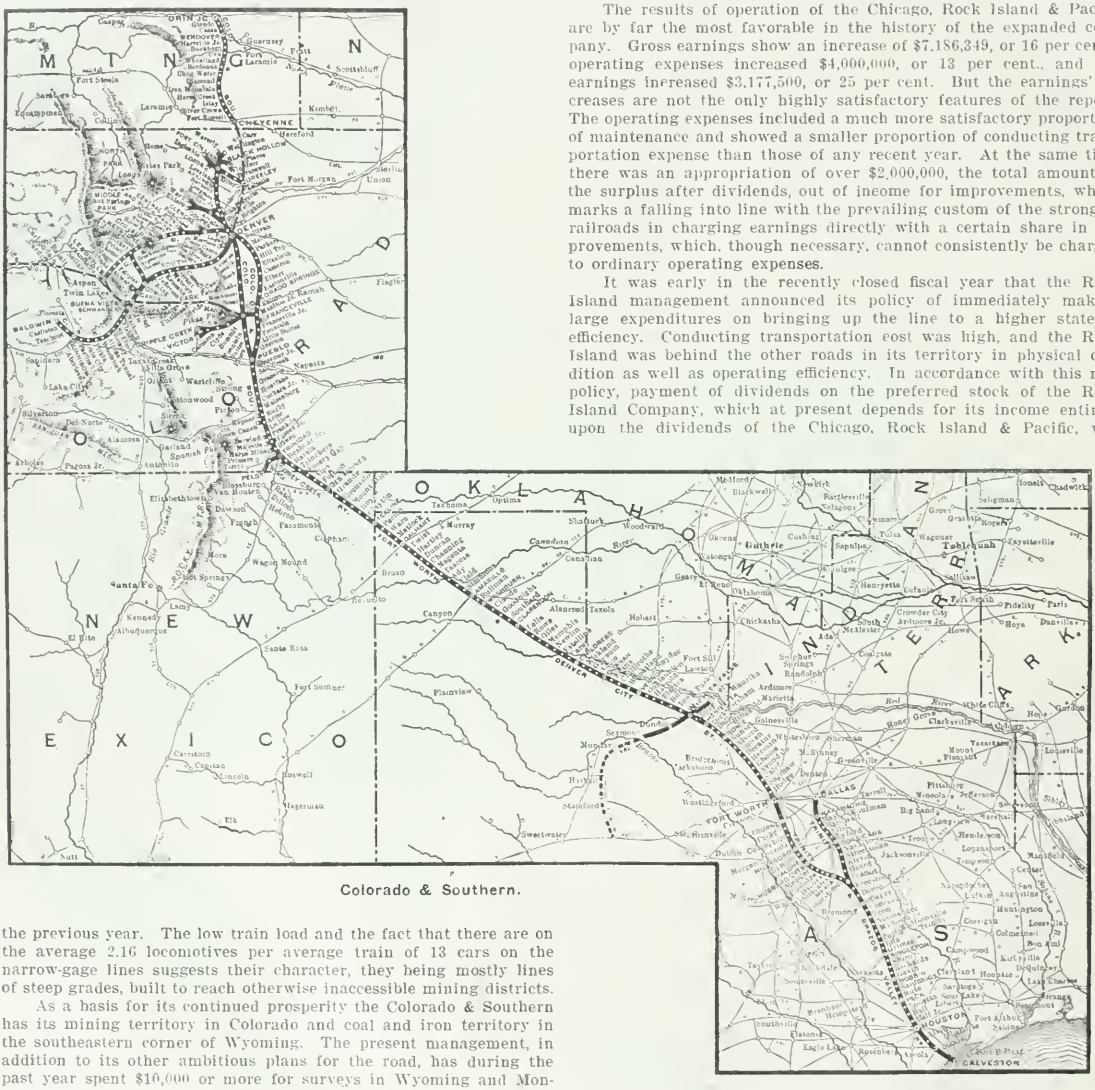
To provide for this expansion of the system, as well as for necessary improvements, a refunding and extension mortgage, limited to $100,000,000, was authorized on June 15, 1905. There were issued of these 4½ per cent. bonds during the year, $11,372,032, of which $8,413,637 were used in the acquisition of securities having a par value of $9,618,536, these securities being pledged under either this mortgage or the first mortgage of the road. Principal among these items are $6,390,983 Fort Worth & Denver City common stock; $1,199,100 Colorado Springs & Cripple Creek District common stock; $2,477,400 preferred and $1,710,100 common stock of the Colorado Midland; $2,922,000 first mortgage bonds of the Trinity & Brazos Valley, and $1,442,977 Colorado & Southern equipment trust notes. New equipment to the value of about $3,000,000 was bought, most of which was paid for out of the proceeds of the sale of these bonds, the rest being covered almost entirely by a cash payment of $157,720 and a lease equipment contract of the Fort Worth & Denver City, amounting to $624,000.

Earnings show a healthy growth and expenses a more economical distribution than in the preceding year. Freight earnings increased from $6,970,000 in 1905 to $8,593,000, a gain of 23 per cent., and passenger earnings from $2,053,000 to $2,604,000, an increase of 27 per cent. Gross earnings per mile of road rose from $5,734 in 1905 to $7,007, and net earnings from $1,537 to $2,256. In spite of the fact that the ton-mile rate increased from 1.072 cents in 1905 to 1.025 cents, freight earnings per freight-train mile rose from $2.66 to $2.79. Similarly, with a decrease in the passenger-mile rate from 2.533 cents in 1905 to 2.415 in 1906, passenger earnings per passenger-train mile rose from 96 cents in 1905 to $1.17 in 1906, these two gains showing an increase in operating efficiency. The expense of maintenance of way and structures increased 4 per cent., of maintenance of equipment 17 per cent., and of conducting transportation 19 per cent. The heaviest increases in the first account were in repairs of roadbed, tracks, tools, etc.; in the second, repairs and renewals of locomotives, and in the third, fuel for locomotives and car mileage charges. The more open winter of last year is reflected in the item under roadway maintenance, "expense of wasbouts and removing snow and ice," which decreased by 50 per cent. Maintenance of way per mile cost $1,178, against $1,148 in 1905. It should be noted, however, that against 181 miles of new 75 to 85-lb. rails laid in that year, there were only 128 miles laid in 1906. Maintenance of locomotives cost $2,509 per locomotive, against $2,054 in 1905; per passenger car, $832, against $633 in 1905, and per freight car, $66, against $62 in 1905.

Besides giving a statement of classified freight tonnage, as most other roads do, the amount of revenue derived from each item of tonnage is included in the table, a practice which might well be widely copied by other roads, for, although it does not disclose the net profitableness, it does give an idea of the rates received on the different classes of traffic. It is interesting to find that bituminous

coal, lignite coal, coke and precious ores, which together make up 59 per cent. of the total tonnage, furnish only 42 per cent. of the gross earnings. On the other hand, lumber, which is 2 per cent. of the tonnage, furnishes 7 per cent. of the revenue, and merchandise, 2 per cent. of the tonnage, furnishes 9 per cent. of the revenue.

Operating statistics are given in detail, both for the standard gage, narrow gage and total mileage. The loaded freight-car mileage is exactly two-thirds (66.66 per cent.) of the total on the system, and almost exactly this figure on both the standard and narrow gage lines. Revenue train load is 246 tons on the standard gage and 46 tons on the narrow gage lines; including company freight these figures are 280 and 57 tons. Neither shows any noticeable increase over




the previous year. The low train load and the fact that there are on the average 2.16 locomotives per average train of 13 cars on the narrow-gage lines suggests their character, they being mostly lines of steep grades, built to reach otherwise inaccessible mining districts.

As a basis for its continued prosperity the Colorado & Southern has its mining territory in Colorado and coal and iron territory in the southeastern corner of Wyoming. The present management, in addition to its other ambitious plans for the road, has during the past year spent $10,000 or more for surveys in Wyoming and Montana, with the idea of extending the Wyoming division (reached by trackage rights over the Union Pacific from the Colorado line) to a connection probably with the Northern Pacific at some point on the Yellowstone river in Montana. To perhaps a greater extent than any other railroad of its size in the country, the Colorado & Southern represents to-day a policy of expansion, which may or may not be successful and on which depends the ultimate success of the property. If the Galveston extensions, as well as the line through Wyoming which may be built, develop a large and profitable through traffic, the road should within eight or ten years take its place among the large and profitable railroad systems of the country.

The principal operating statistics of the consolidated system (not including the Trinity & Brazos Valley, the net earnings on whose 79 miles of road in operation for the whole year are included in income from investment, because the interest on the amount of bonds issued for their acquisition was charged to income account) are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,663 | 1,647 |
| Freight earnings | $8,592,527 | $6,970,000 |
| Passenger earnings | 2,603,691 | 2,052,279 |
| Gross earnings | 11,653,446 | 9,443,426 |
| Maint. way and structures | 1,959,184 | 1,890,851 |
| Maint. of equipment | 1,519,913 | 1,297,488 |
| Conducting transportation | 4,019,782 | 3,353,329 |
| Operating expenses | 7,902,212 | 6,911,216 |
| Net earnings | 3,751,234 | 2,532,210 |

## Chicago, Rock Island & Pacific.

The results of operation of the Chicago, Rock Island & Pacific are by far the most favorable in the history of the expanded company. Gross earnings show an increase of $7,186,349, or 16 per cent.; operating expenses increased $4,000,000, or 13 per cent., and net earnings increased $3,177,500, or 25 per cent. But the earnings' increases are not the only highly satisfactory features of the report. The operating expenses included a much more satisfactory proportion of maintenance and showed a smaller proportion of conducting transportation expense than those of any recent year. At the same time there was an appropriation of over $2,000,000, the total amount of the surplus after dividends, out of income for improvements, which marks a falling into line with the prevailing custom of the strongest railroads in charging earnings directly with a certain share in improvements, which, though necessary, cannot consistently be charged to ordinary operating expenses.

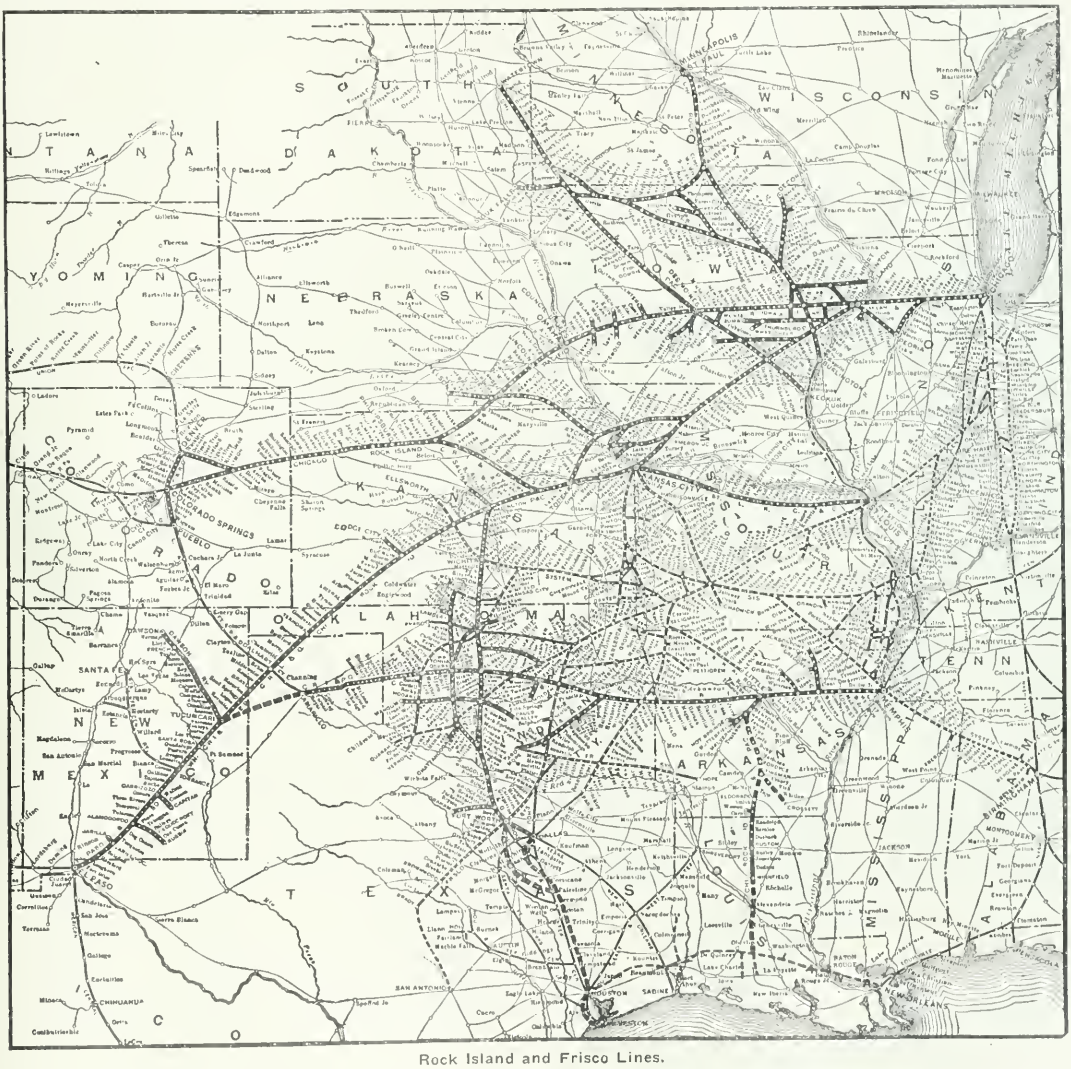
It was early in the recently closed fiscal year that the Rock Island management announced its policy of immediately making large expenditures on bringing up the line to a higher state of efficiency. Conducting transportation cost was high, and the Rock Island was behind the other roads in its territory in physical condition as well as operating efficiency. In accordance with this new policy, payment of dividends on the preferred stock of the Rock Island Company, which at present depends for its income entirely upon the dividends of the Chicago, Rock Island & Pacific, was stopped, making possible a corresponding decrease in the dividend requirements of the railroad company, the amount thus saved being turned back into improvement of the property. Besides its share in the special appropriation of $2,000,000 for improvements, maintenance of way increased $1,480,000, or 25.5 per cent., and per mile of line rose from $823 in 1905 to $1,021 in 1906, an increase of nearly $200 on each of the more than 7,000 miles of line. Costs were heavy in every important department of this account. Renewals of rails increased 230 per cent., the most striking item under this head being the laying of 485 miles of 85-lb. rails to replace rails of lighter section, there having been on June 30, 1905, less than two miles of rails heavier than 80 lbs. on the lines. Besides this, 400 miles of previously unballasted track has been ballasted and heavy expenditures made in replacing light bridges with heavier structures, part of which latter expense has been charged to capital

Altogether, over a mile and a half (8,678 ft.) of bridges have been filled or replaced with better material. It is, of course, evident from these figures that maintenance of way has been to a greater or less extent skimped during recent years, but the present returns show that the management is now going at this problem in the proper spirit, and, provided the present policy is continued, a great change should be brought about in the operating efficiency of the road. This has already to some degree been effected, for conducting transportation, which in 1905 ate up 58 per cent. of the total expenses and 41 per cent. of the entire gross earnings, in 1906 took 56 per cent. of the expenses and 38 per cent. of the gross earnings. These proportions are still rather large, and it will no doubt be possible with the improvement of the property to further reduce them considerably. One reason for believing that this will be done lies in the fact that it appears to be the policy to secure the best operating and administrative talent available, the efforts in this direction already made being reflected, probably, in the increase of $48,000, or 16 per cent., in the salaries of general officers.

Somewhat increased efficiency is shown in a larger revenue train load: 245 tons, against 228 tons in 1905, and, including company freight, 283 tons, against 255 tons in 1905. The number of tons per loaded car, including company freight, also increased from 16 to 17 tons during the year. Considering the large amount of branch line mileage, these figures show good results.

The commodity statistics tell of large increases in various important articles of traffic. Grain tonnage increased 22 per cent.; coke, 217 per cent.; ores, 35 per cent.; other mineral products, 68 per cent.; lumber, 32 per cent.; iron and steel rails, 176 per cent.; other castings and machinery, 47 per cent.; bar and sheet metal, 42 per cent.; agricultural implements, 34 per cent., and wagons, carriages, tools, etc., 70 per cent. The increase of 11 per cent. in tonnage of fruit and vegetables and of 132 per cent. in tonnage of poultry, game and fish seems to point to an increase in the refrigerator traffic of the road, which it is known the management has of late been especially endeavoring to promote.

One important feature of expansion during the year is not mentioned in the report. This is an arrangement under which, jointly with the St. Louis & San Francisco, the Rock Island is to have running rights over a new line from Fort Worth, Tex., to Houston and Galveston, now being built jointly by the Colorado & Southern and the Rock Island Company. This line is shown on the map in heavy dotted lines. At the same time a new company, called the Colorado Southern, New Orleans & Pacific, is engaged in building a through line with branches (see light dotted line on map) from Houston east to New Orleans. With this east and west line the Rock Island proposes to connect through a new company—the Rock Island, Arkansas & Louisiana—formed on October 31, 1905, by the consolidation of the Arkansas Southern, the Arkansas Southern Extension and the Little Rock & Southern, which has been leased to the Chicago, Rock Island & Pacific. On June 1, 1906, the 160 miles of this company already in operation were taken over by the parent company. The new line is to run from a point on the Little Rock—Hot Springs branch of the Choctaw division, south through




Rock Island and Frisco Lines.

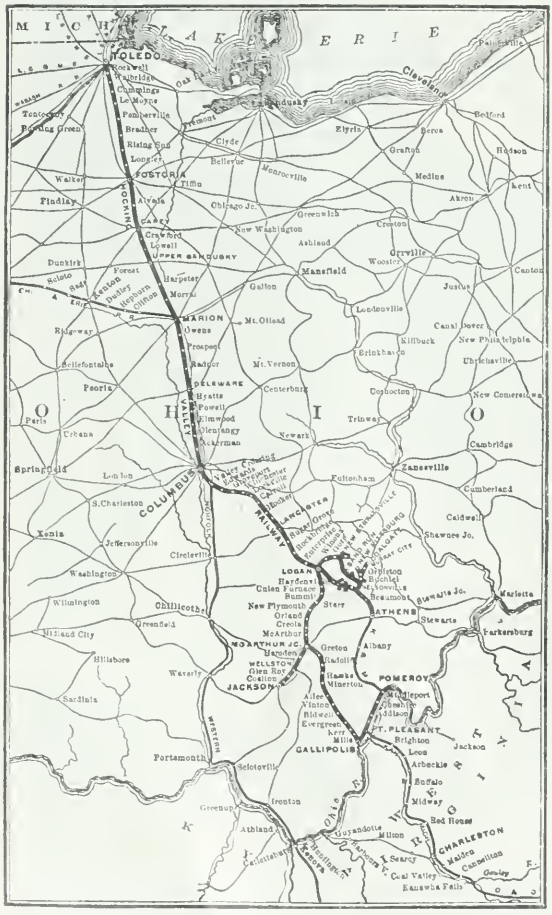
Alexandria, La., to Eunice, on the new Colorado Southern, New Orleans & Pacific line. The uncompleted southern end of the line, from Alexandria to Eunice, has been surveyed this summer and construction is to be pushed as fast as possible. With the completion of this line and of the Colorado Southern, New Orleans & Pacific, the Rock Island will have, though by a rather roundabout route, a connection over its owned or allied lines into New Orleans in addition to a second connection into Houston.

The principal operating results are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 7,218 | 7,232 |
| Freight earnings | $34,695,824 | $29,662,386 |
| Passenger earnings | 13,917,031 | 12,050,781 |
| Gross earnings | 51,237,858 | 44,051,509 |
| Maint. way and structures | 7,302,490 | 5,818,982 |
| Maint. of equipment | 6,661,466 | 5,763,117 |
| Conducting transportation | 19,630,076 | 18,034,073 |
| Operating expenses | 35,067,059 | 31,058,209 |
| Net earnings | 16,170,800 | 12,993,300 |
| Net income | 11,787,832 | 4,733,109 |
| Appropriation, improvements | 2,108,280 | ..... |
| Surplus for the year | ..... | 56,487 |

## Hocking Valley.

The Hocking Valley operates 347 miles of main line between Pomeroy, Ohio, and Toledo. It owns 321 miles, leases 18 miles and has trackage rights over the Lake Shore and Pennsylvania Lines West, by which it gets into Toledo from Rockwell and Walbridge. Over 60 per cent. of its tonnage is bituminous coal, of which about two-




## Hocking Valley.

thirds originates on its own lines. A third of its total tonnage of all kinds of freight comes from other lines. The company is controlled by five other companies, which, together, own two-thirds of its common stock. The Pittsburg, Cincinnati, Chicago & St. Louis owns one-third of this amount, and the Lake Shore & Michigan Southern, the Baltimore & Ohio, the Chesapeake & Ohio and the Erie each own one-sixth.

This company is particularly interesting at the moment, in view of the plans now under way for its reorganization incident to the consolidation with it of the Kanawha & Michigan. The last-named road has for some time been controlled by the Hocking Valley through the ownership of $4,510,000 of its $9,000,000 outstanding capital stock. It connects with the Hocking Valley at Pt. Pleasant, Ohio, and gives it its line into the West Virginia coal fields. Last November the minority stockholders formed a protective committee for the purpose of getting dividends paid on the K. & M. stock, or of exchanging it for Hocking Valley stock. This committee finally came to the following agreement with the controlling company. There is outstanding $15,000,000 Hocking Valley preferred stock and $11,000,000 common stock, on which annual dividends of 4 and 3 per cent., respectively, are now paid. The plan is to form a new company, which will have $30,000,000 general lien 4 per cent. bonds and $13,750,000 capital stock; of the bonds, $17,000,000 are to be issued for use in connection with the consolidation and the remainder reserve dfor betterments and refunding purposes. Hocking Valley preferred stock is to be exchanged for new bonds at the rate of $110 par value for each share of stock, and the $11,000,000 Hocking Valley common is to be exchanged for an equal amount of stock in the new company. The remaining new stock is to be exchanged for the $9,000,000 outstanding stock of the Kanawha & Michigan. During the fiscal year ended June 30, 1906, the company earned $918,115 on its common stock, after deducting all fixed charges and appropriations, which is equal to 6.67 per cent. on $13,750,000, the amount of stock of the proposed new company. The profit and loss, June 30, 1906, was $4,721,991.

In spite of a heavy falling off in the earnings in April and May when the effects of the bituminous strike were most noticeable, the company has had a favorable year. Without any change in main track mileage gross earnings increased from $6,013,215 to $6,439,809, and net earnings from $2,152,776 to $2,467,588, the operating ratio falling from 64.2 per cent. to 61.7 per cent. This saving was well distributed; the greatest decrease in the percentage of total expenses was in the cost of conducting transportation. The total tonnage was 8,601,114, of which 5,227,525 tons originated on the road. The total tonnage in the preceding year was 7,810,545. It is to be noticed that the company has been building up its local freight traffic, due to the growth of industrials in its territory, for the tonnage of manufactures increased from 686,435, in 1905, to 1,041,823 in 1906. The average haul of freight shows a decrease to 116 miles, the figures having remained at about 127 miles during the three preceding years. This shorter haul is a natural consequence of the growth of industries on the line which ship supplies and manufactured products to each other. The average train load has increased during the past year, but has not as yet come up to the points reached in 1902 and 1903, although on the River division the average load has passed all previous records. The average loading last year on the whole line was 608 tons, with 631 tons on the main line and 271 tons on the River division. The highest figure (in 1902) was 678 tons on the entire line, but the largest previous load on the River division was 245 tons.

Maintenance of way charges increased from $1,877 per mile to $1,984 per mile. The cost of repairs and renewals of rolling stock, however, was distinctly lower. Maintenance of locomotives was $2,579 in 1905 and $2,169 in 1906. Freight car maintenance increased from $57 per car to $63, but this figure is based on the number of cars on hand at the end of the year instead of the average in operation throughout the year. The number of cars operated was increased by 196 during the year. Maintenance of passenger cars decreased from $522 to $510 per car.

The principal statistics of operation follow:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 347 | 347 |
| Coal earnings | $2,802,776 | $2,743,866 |
| Freight earnings | 2,238,833 | 1,985,579 |
| Passenger earnings | 766,828 | 744,057 |
| Gross earnings | 6,439,809 | 6,013,215 |
| Maint. way and structures | 688,461 | 651,206 |
| Maint. of equipment | 1,325,449 | 1,293,405 |
| Conducting transportation | 1,831,139 | 1,800,768 |
| Operating expenses | 3,972,222 | 3,860,438 |
| Net earnings | 2,467,588 | 2,152,776 |
| Net income | 1,685,678 | 1,427,851 |

## American Locomotive Company.

Gross earnings for the year ended June 30, 1906, for the first time include the operations of the Rogers and Montreal plants. It is well known, however, that this fact is not alone responsible for the large increase of about $18,400,000 in gross earnings during the past year. Gross earnings, which include the revenue from the manufacture and sale of steam and electric locomotives, extra boilers, tanks, cylinders and other locomotive parts, steam shovels, dredging machinery, trucks for electric service, rotary snow plows, etc., the overhauling and general repair of a large number of old locomotives and sundry items of income from investments and other sources were $42,547,846, against $24,150,201 in 1905. Manufacturing, maintenance and administrative expenses, which also include the customary depreciation charge of 20 per cent. of the book value

of patterns, drawings and templets, iron flasks, formers and dies, together with such adjustment as was necessary, after inventory, in the book values of material and stock on hand, were $36,085,371, against $19,796,533 in 1905, an increase of $16,288,837. This left net earnings of $6,462,506 in 1906 and $4,353,668 in 1905, an increase of $2,108,838. There was expended from earnings during 1906 for additions to, and betterments of plants, $1,001,565, against $1,883,557 in 1905, which latter sum includes the investment in the Montreal plant. A new appropriation in 1906 of $2,000,000 to an extraordinary improvement and betterment fund far more than offsets the decrease in direct expenditure out of earnings for improvements. The net income, after all charges and these expenditures for betterments, was $1,429,129, an increase of $821,205 over 1905. Out of this net income there was paid an initial quarterly dividend of 1¼ per cent. ($312,500) on the common stock, leaving a profit and loss surplus for the year of $1,116,629, against $607,924 in 1905.

There have been important changes in the officers of the company during the year. The President, Mr. Albert J. Pitkin, died on November 16, 1905. His successor, elected on February 5, 1906, was Mr. Waldo H. Marshall, then General Manager of the Lake Shore & Michigan Southern. Since that time Mr. Herman F. Ball, Superintendent of Motive Power of the same road and late President of the American Railway Master Mechanics' Association, has been made Vice-President in charge of operation of the American Locomotive Automobile Company, organized during the past year to manufacture automobiles and motor vehicles.

The company itself has no bonded debt, nor can it mortgage its property, except by purchase money mortgage, without assent of the holders of two-thirds in value of its $25,000,000 preferred stock. The only encumbrances on its property are an outstanding issue of $550,000 6 per cent. consolidated mortgage bonds of the Richmond Locomotive & Machine Works, $562,500 5 per cent. first mortgage bonds of the Dickson Manufacturing Company, $405,000 5 per cent. first mortgage gold bonds of the Rogers Locomotive Works and $1,500,000 first mortgage 4 per cent. bonds of the Locomotive & Machine Company of Montreal, the latter two issues not being carried as a liability on the books of the American Locomotive Company, but shown in the annual report for purposes of information.

So far as can be judged from the not very full information given in the report, the action of the directors in beginning the payment of dividends on the common stock was easily justified by the present and probable future prosperity of the company. With the tremendous demand for railroad equipment which has been, is, and seems likely to be for some time to come, under way, it is probable that an annual dividend of 5 per cent. can be maintained for some years at least, particularly as the income account shows that there has been no skimping of maintenance expenditures during the year.

## NEW PUBLICATIONS.

*Stray Currents from Electric Railways.* By Dr. Carl Michalke. Translated by Otis Allen Kenyon. New York: McGraw Publishing Co. 5½ in. by 8 in.; 101 pages; 34 illustrations. Price, $1.50.

Stray currents from electric railways have been a source of unending annoyance to the producing company, and of even greater annoyance to the gas and water companies. They have been subjected to numberless investigations, and have formed the subject of many reports, while the literature, especially the periodical literature, relating to them is voluminous in the extreme. The book under consideration does not pretend to throw any fresh light on the subject, but is a compilation of the data already made public, arranged topically and in a form convenient for reference. It is shown how, when and where these currents stray from the fold of the rails to which it is intended that they should be confined, and a number of formulæ are given by which their volume in any given instance may be measured and defined. These formulæ are not set forth as a universal solution but rather as an indication of the path that an investigator should pursue in pulling himself out of his own difficulties and applying remedies to his own case; for it is distinctly stated that they are governed solely by local conditions. The book not only states clearly and concisely the various sources of these stray currents, but tells where to look for their immediate cause; adding, that though careful construction and maintenance may serve to lessen them, it cannot be expected that they will be done away with entirely except when alternating current is used, which, though of low frequency, does away with the corrosion resulting from strays entirely—a statement quite in accord with recent claims made in the *Railroad Gazette*. The chapter on preventive measures gives not only this, and the occasional reversal of the current as a remedy, but others that will be valuable suggestions to the operating officers as an alleviation of the trouble. While the book deals, for the most part, with the corrosive action of the stray currents, it touches upon other effects and outlines investigations where they have been detected at distances of from 10 to 11 miles from their sources. The value of the book lies in its suggestiveness, and in this it is strong, for it clearly outlines the common sources of trouble, tells how to find and measure it, and, when found, gives a possible remedy to apply, leaving the application of its principles to the intelligence of the engineer upon whom the responsibility for the proper control of the currents depends.

## A Flood of New Tariffs.

WASHINGTON, Sept. 25.—The reduced freight rates announced in a large number of tariffs filed since August 28, as spoken of recently by Interstate Commerce Commissioner Lane, came largely from territory between the Mississippi and Missouri rivers, and from the Southwest. It appears that several of the Western roads filed revision tariffs to go into effect about the time the Revised Interstate Commerce law became effective. The result of this was to make their rates in many instances lower than rates for the same commodities on competing lines, so that if the requirement for thirty days' notice had been insisted on before the competing lines were permitted to make corresponding reductions, the roads making the original reductions would have been able to secure the lion's share of the traffic for thirty days. The result of this was an avalanche of requests by mail and telegraph from the competing lines for permission to meet the reduced rate by immediate reduction or reductions taking effect within three days. In every case in which it was shown that competing lines had been placed at a disadvantage the Commission authorized immediate reductions. Other reductions without the thirty days' notice have been authorized in order to enable roads to meet emergencies. An instance of this was the authorization of a reduction in the rates on ice to Boston. The Commission has also granted a considerable number of requests for permission to put into effect immediately reduced through rates in cases in which the published through rates have been higher than the sum of the locals.

Applications for permission to make reduction in freight and passenger rates on less than thirty days' notice have been received by the Commission at the rate of a score or more a day. Assistant Secretary Decker has been charged with the special duty of examining these applications and recommending action to the Commission in accordance with general instructions given to him as to the policy to be pursued. Most of the applications are supported by statements showing good reason why they should be granted, and 75 per cent. or more of them have been acted on favorably by the Commission. The others have not all been denied but have been held for further information. Thus far only one application for permission to raise a rate on less than thirty days' notice has been received. This was a case in which a published rate had been made too low by a typographical error. The request was granted.

In view of the large number of cases in which applications to make rates effective in less than thirty days are being made the Commission has adopted and is sending out to the carriers forms for such applications. Three forms are issued, adapted respectively to cases where two or more rates are involved, to cases where a single rate is involved, and third to where a carrier desires to telegraph such application. If the telegraph form is used notice is required to be given that a certified copy follows by mail. In using these blanks the applicant asks to put in force specified rates, to become effective a certain number of days after filing thereof with the Commission, and states the numbers of the old and of the superseding tariffs. An application for change of rates must be signed by an officer of the applicant company and duly verified, and must present special circumstances and conditions justifying the request. J. C. W.

## The Standard Air Brake Hose—Is It the Best?

Whether or not standard air brake hose, as adopted by the Master Car Builders' Association, is the best procurable for all conditions of service, was brought forcibly to my attention on the road where I was employed during a severe winter when ballast trains were employed filling trestles in December, January and February. At this time the delay to trains through hose freezing up, and the damage to air pumps in the attempt to overcome leaks became very serious indeed, and was finally partly overcome by removing the hose frequently and drying them, while a fresh lot were put on in their place. This was well enough so far as it went, but we also had on the road a large number of flat cars engaged in a log train service, and the trouble in this case was even more serious and not so easily overcome. After being loaded, these cars were hauled some nine miles to a large division yard, where they were made up into trains and stood pushed together until the road engine was ready to go on and start them on a 130 mile run to their destination. It was found as soon as cars were moved that 60 per cent. of the hose coupling joints leaked badly on account of the hose being frozen solid in a short circle position, so that when the cars were stretched out the coupling heads lifted and caused leaks, and

the delay in getting these trains started on this account amounted in some cases to six hours. This was bad enough, but it was only the beginning of the trouble, which continued for the greater part of the run, and the record of skidded wheels removed from under these log cars for three months was enough to make the old man's hair gray.

I became convinced that the remedy lay in securing an air hose that would not act as the standard hose was doing, and we took the matter up with the air hose people with the object of securing a hose that would be as light and flexible as possible, with a thin wall, offering the least possible space for lodgment of moisture to freeze, and at the same time that would be strong enough to resist the bursting pressure of the air. It is not necessary to enumerate the difficulties encountered in securing what we wanted, or anything near it, so hard it is to move people out of a rut. Finally we accepted one out of the many samples submitted and applied it to these cars. This hose, while the best offered, was not what we wanted, nor was it anywhere near the best that could be made, but the improvement was so great and so prompt that no sooner was one train equipped with it than the men whose duty it was to look after and handle log trains sent in urgent requests for a further supply, and by the time all these cars were equipped the delay to trains had been cut down to practically nothing, while the number of skidded wheels was reduced to the proportion of one to eight. If anyone thinks it was not worth the small additional cost, just ask the superintendent of motive power, car men and engine drivers.

Finally the supreme test and recommendation came when it was found that the enginemen on other trains stole them off the log cars to use in case of trouble. The next thing to be determined was, did the new hose have the life of the regular standard hose, and to determine this they were left on the cars, though the intention was to remove them in the spring, as while they were 1¼ in. inside all right, they looked like a 1 in. hose from the outside, and car men used to remove them when going on foreign roads and report "wrong hose." But they stood the time test also, and, to my mind, the most satisfactory test made was where one of these special hose was applied to the testing plant in the main yard and used every day under pressure of 110 lbs. for 18 months and then returned to my office and was still soft, pliable and full of life.

Therefore I claim that the M. C. B. standard air hose of to-day is a long way from being the best procurable for the purpose for which it was intended, since we developed, by experiment, a hose that would do all that the standard hose would do, and very much more. This may not be of much interest to railroads in the south, but I think I have proven that it is of very great importance to people who operate roads where the thermometer goes down to 30 and 40 deg. below zero in a moist atmosphere.

STOREKEEPER.

## Three-Position Semi-Automatic Signals on the Baltimore & Ohio.

In a mechanical interlocking plant recently installed on the Baltimore & Ohio at Watersville Junction, Md., 40 miles west of Baltimore, Mr. Patenall has introduced the three-indication idea throughout, so much so, indeed, that he converts the distant signals into stop signals when a train passes them—this, evidently, to give the road all it pays for and a little more. Watersville Junction is where the Mount Airy cutoff joins the main line. This plant was installed by the company's forces. The switches and signals are operated by a 24-level, Style A, Federal Signal Company's machine. The home signals, which are also manual block signals, are all three-position, and each is controlled by two levers through one line of connections. The first lever moved lowers the signal blade to the forty-five degree (caution) position and the second lever moves it from the forty-five degree to the vertical position (clear). The unlatching of the caution lever locks the switches, facing point locks and conflicting signals, and the clear lever locks the caution lever reversed. The two-lever arrangement is made effective by a floating lever between the two signal levers, as shown in Fig. 2. The reversing of the first lever moves the connections one-half the entire throw, and the second lever completes the movement. This application is standard for the road, and is patented.

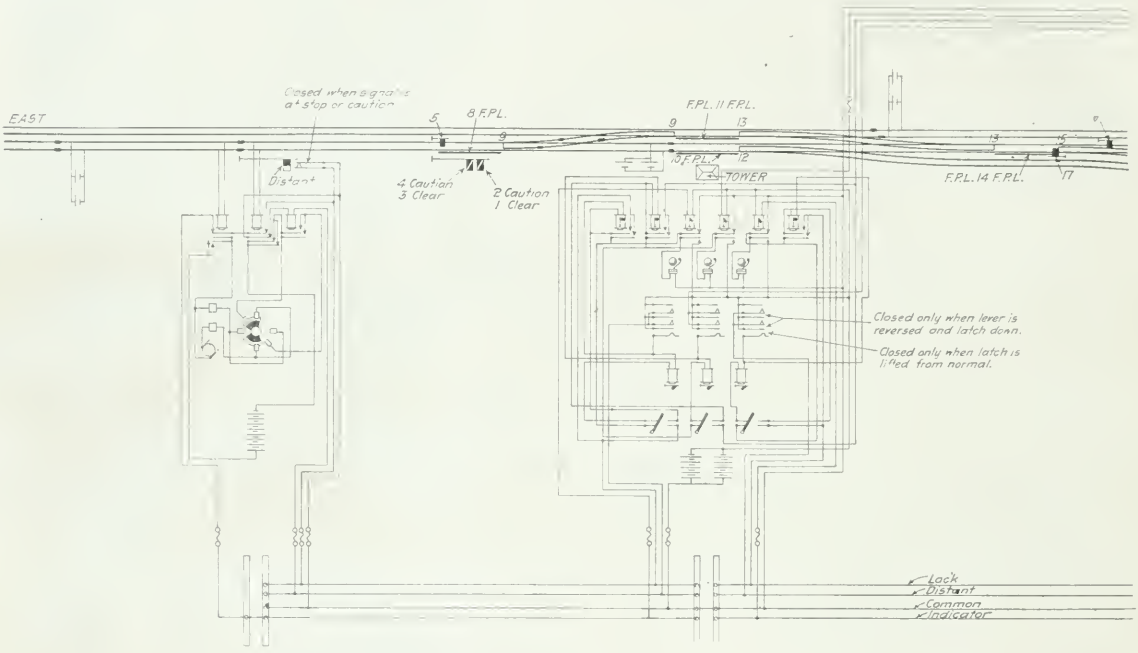



Fig. 1—Interlocking with Three-Position Signals— Watersville, Md., Baltimore & Ohio.—Continued on Next Page.

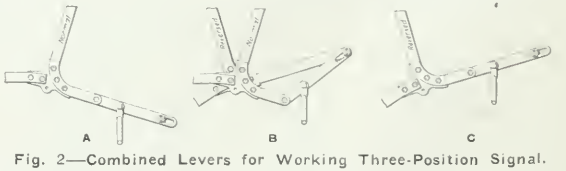


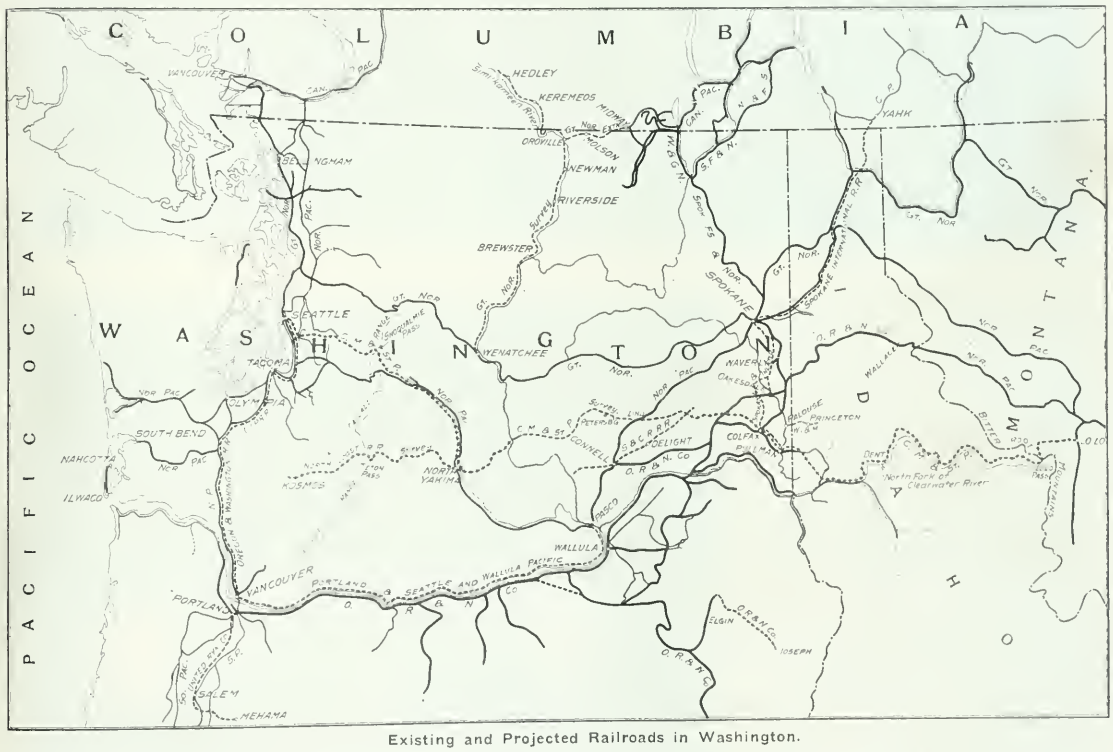

Fig. 2—Combined Levers for Working Three-Position Signal.
A—Both normal. C—Both reversed.

The arrangement of signals shown in Fig. 1 is standard for the road. The highest arm governs main routes, the next lower arm governs diverging routes, and dwarf signals govern reverse movements, or movements from sidings. The distant signals are not mechanical; they have the General Electric Company's electric motors fixed at the top of the post, and are semi-automatic. These signals are fixed 3,000 ft. from the home signals, and are controlled as follows: From stop to caution they move automatically. There is a preliminary track circuit section 2,000 ft. long in the rear of the distant signal. When this section is occupied by a train and the main section (between the distant signal and a point overlapping the home signal about 200 ft.) is unoccupied, the signal moves to caution. It moves from caution to clear when the caution lever operating the home signal is reversed and the lever latch down, thus giving a cau-

## Status of Railroad Building in Washington.

The accompanying map, furnished by the Director of Maintenance and Operation of the Harriman lines, shows the existing and projected railroad lines in the state of Washington and in the northern part of Oregon. The most important work is being done by the Harriman lines, the Hill lines and the Chicago, Milwaukee & St. Paul. The competition between the Hill and Harriman interests has been most spectacular for the last six months, the two parties coming into actual contact along the north bank of the Columbia river between Wallula and Portland. Both the Northern Pacific and Great Northern already run into Seattle, and the Northern Pacific has a north and south line from Seattle through Tacoma to Portland. The Harriman interests have two lines into Portland: the Oregon Railroad & Navigation along the south side of the Columbia river and the Southern Pacific coming in from the south. The Portland & Seattle is being built jointly by the Northern Pacific and the Great Northern from Kennewick, near Paseo, on the Northern Pacific, down the north bank of the Columbia river through Wallula to Vancouver, Wash., from which a short connecting line will be built across the river to Portland. The Wallula Pacific is generally supposed to be a Harriman line, though this has never been officially announced. Its proposed route is from Wallula to Portland along almost the same right of way as the Portland & Seattle. Both companies have been suing for injunctions against each other for several months, each taking the ground that the other is building a line in violation of a Washington statute, which forbids the ownership of parallel and competing lines by the same company. Location and grading is under way on both roads. It is in the contest between these two roads that there have been frequent clashes between the forces in the field. Trestles have been burned and at one time workmen were driven from a cut by dynamite thrown down from above. In the meantime, the Harriman interests have incorporated the Oregon & Washington, which is now under survey from Vancouver, Wash., to Seattle, being evidently a retaliatory move in answer to the new Hill line into Portland. The Great Northern is also building a line from Midway, which is in Canada just across the international boundary, southwesterly to Oroville and thence northwesterly back into Canada and up the Similkameen river through Keremeos, B. C., to Princeton. The section of this line from Midway to Oroville is almost completed and surveys have been made for the rest of the distance. The 49 miles of this line lying in the United States are being built under the name Washington & Great Northern; the Canadian portion by the Vancouver, Victoria & Eastern. Another Great Northern Line, under the name Washington & Great Northern, has been surveyed from Oroville south to a connection with the Great Northern at Wenatchee.

The most extensive project is the St. Paul's Pacific extension from Evarts, S. Dak., to the coast. This was formally authorized in November, 1905, and considerable work has already been done at various points. Four subsidiary companies have been incorporated: the Chicago, Milwaukee & St. Paul Railway of South Dakota; the Chicago, Milwaukee & St. Paul of Montana; the Chicago, Milwaukee & St. Paul of Idaho, and the Chicago, Milwaukee & St. Paul of Washington. Permission has been obtained for entrance into Seattle and construction is under way on various parts of the line. The route through Washington is plainly shown on the accompanying map, that part of the line made up of crossed dashes representing surveys which are definitely known to have been made, and the plain dashes representing reported surveys. The company several months ago acquired the Montana Railroad, which gives it 157 miles of line in Montana, and from time to time there have been reports of its buying different projected roads in Washington, but these have never been confirmed. Among the roads mentioned in this connection is the North Coast, which was incorporated some time ago with a capital of $1,000,000 to build from North Yakima, on the Northern Pacific, west through Tieton Pass to Kosmos; this line has been surveyed and part of its right of way secured.




Existing and Projected Railroads in Washington.

There are several minor projects under way in Washington. The Washington, Idaho & Montana was incorporated to build from Palouse, on the Northern Pacific, west through Princeton, Idaho. Twenty miles have been completed and work is under way on 17 miles more. The Spokane International is building from Spokane to Yahk, B. C., on the Canadian Pacific; it is supposed that this line is being built in the interest of the last named company. Grading has been completed and some track laid. The Spokane & Columbia River is an electric road projected to run from Spokane southwest to Ringold Bar. It has been partly graded between Connel and Delight. The Spokane & Inland is another proposed electric road on which surveys have been completed and some grading done. It is to run from Spokane south to Pullman, on the O. R. R. & N., and ultimately into Idaho. Grading has been completed from Spokane to Waverly, 33 miles, and 12 miles of track have been laid. In Oregon, the United Railways Company has surveyed an electric line from Portland south to Salem, and thence to Mehama.

## Standard Steel Coach for the Harriman Lines.

A description of the standard all-steel 60-ft. postal car of the Harriman Lines was given in our issue of June 22, page 687. It was explained in that article that day coaches and baggage cars would also be built of steel, it being the expectation to make all such equipment of this material in future. The plans were all prepared in the car department of the Southern Pacific and the construction of sample cars undertaken at the Sacramento shops. The first of such cars—a day coach—has lately been completed, photographs of it being shown herewith. The plans for the car, with

Standard Steel Coach for the Harriman Lines.

the exception of the one set of working prints used in the shops during its construction, were destroyed in the San Francisco fire, so we are unable to present any detail drawings. In the general character of the design, however—that is, the undertraming, body framing, roof, etc.—it is quite similar to the standard postal car already described, so that an idea in detail of these features may be had by reference to that article.

The coach is 59 ft. 10 in. over end sills and 9 ft. 8 in. over side sills. The weight of the body is 75,000 lbs., and the total weight is 107,000 lbs. It is at present mounted on the Southern Pacific standard four-wheel wooden truck, but a four-wheel steel truck is to be designed for this equipment. The exterior finish is steel plate, as the photograph plainly shows. The roof, which is elliptical in form, without decks, and the ceiling, are all steel. The floor consists, in order, of 1 in. steel plate, 1 5/16 in. of asbestos, 1½ in. of wood and 1/16 in. of steel plating, over which is laid 1/16 in. of asbestos and 5/16 in. of linoleum. The interior finish is vermilion mahogany polished to a high luster, plain in design, but bearing an appearance of quiet elegance that is at once pleasing and restful. The ceiling is done in a cream tone with a dark-colored edging about the panels. The seats are upholstered in crimson plush. Wide windows and roomy baggage racks are other features enhancing the interior appearance and comfort. In lieu of decks the roof carries 14 Cottier ventilators.

Interior of Standard Steel Coach for the Harriman Lines.

The car has combination gas and electric lighting fixtures and is equipped with the United States (Moskowitz) system of axle lighting. The seating capacity is 70 persons.

As regards cost of production, it is the opinion of the builders of this car that in large lots, say of 100, they will cost not much more than wooden cars of the same class. The car was sent east as far as Chicago for exhibit purposes.

## Foreign Railroad Notes.

A press despatch from London September 28 says that the Board of Trade Inspector has made his report on the disastrous derailment at Salisbury, July 1. He confirms the opinion, already formed by others, that the derailment was due to grossly excessive speed. The only item of news in the press despatch is the statement that the inspector reports an entire absence of evidence to support the rumor—which, as it appeared to us, was a silly one—that excessive speed had been indulged in by the enginemen of the fast trains carrying passengers from the American steamers because of tips or bribes given to the drivers by American passengers.

United States Consul Griffith, of Liverpool, has sent to Washington a brief note concerning an automatic train stop which has been in use at one or more places on the North Staffordshire Railway for two years. The apparatus, devised by Mr. T. E. R. Phillips, of Liverpool, consists of a "tripper" fixed on the sleepers between the rails which, when a signal is in the stop position, actuates a visnal and an audible signal in the locomotive cab. The apparatus is also designed to apply the brakes.

It is reported that an engineer is experimenting with a "balloon railroad" in the mountains near Salzbourg, Austria. The car runs on a monorail, and thus allows the road to be built along the sides of the mountain on a shallower cut than would be necessary for a two-rail line. A captive balloon at a height of about 35 ft. acts as the motive power for pulling the car up to the top. The return journey is by gravity, water tanks in the car being filled from a reservoir on top of the mountain. The car carries ten passengers.

## The New York Central's Terminal Electrification at New York.

On September 30 the first electric train over the New York Central ran into the Grand Central station from High Bridge, 7 miles out on the main line. This train was made up of eight Pullman cars and was hauled by one of the road's electric locomotives. While this was only an experimental run and does not mark the beginning of regular electric service into the Grand Central station, it is interesting as a landmark in the progress of the important improvement work now being carried on by the road in its New York terminal territory. On May 7, 1903, the Legislature of the State of New York passed an act authorizing the change of motive power by the New York Central from steam to electricity. On July 1 of the same year a contract was made with the city of New York covering the change of motive power and agreeing that the work of installing the new system in the terminal territory should be completed within five years, or by July 1, 1908. Work was actually begun on the Grand Central station improvement on August 17, 1903, but it was not until more than a year later, on October 27, 1904, that the first experimental electric locomotive of the type to be used by the New York Central was run. The first electric locomotive to be run within the limits of New York City was on July 20, 1906, since which time, on an experimental track between Morris Heights and Kingsbridge, the electric locomotives have been run for the instruction of enginemen. The running of the first electric train into the Grand Central station marks a point at which the anticipated change in motive power is nearly ready to be made, the expectation now being that regular electric operation will be begun early in November, in which case the date fixed by contract with the city of New York for completion of the improvement will be anticipated by nearly two years. In the *Railroad Gazette* of October 20, November 10, November 17 and November 24, 1905, the improvements within the Electric Zone were described in detail. The purpose of this article is to describe the present status of the work.

The Electric Zone of the New York Central includes the southern end of the two lines running north from the Grand Central station. The initial Electric Zone includes that part of the lines almost ready for electric operation. On the Harlem division this covers the line from the Grand Central station to Wakefield (12.6 miles), the point at which the New York, New Haven & Hartford main line leaves the Harlem tracks. From Wakefield to North White Plains, 12 miles, an extension of electric service is proposed to be installed as soon as the New York State Board of Railroad Commissioners approves the elimination of grade crossings on this section. On the Hudson division the initial Electric Zone extends four miles beyond the junction of this line with the Harlem division at Mott Haven Junction, or to Kingsbridge, 9.6 miles out. From Kingsbridge to Greystone, which is 17.2 miles from the terminal and a mile and a half above the Yonkers power station, an immediate extension is proposed. North of Greystone to South Croton, 32.7 miles from New York is a further proposed extension, dependent, like the Harlem division extension, on the approval of the Railroad Commissioners of certain grade crossing eliminations. There is a further possible extension for which plans are already fairly well matured from South Croton to Peekskill, 40.6 miles from New York, the work on this last section involving at least five important changes of line. The entire Electric Zone, as referred to in this article, includes the lines as far as North White Plains and South Croton.

One of the two power stations is just north of Yonkers on the Hudson division and the other at Port Morris, the terminus of the Port Morris branch, a freight line which joins the Harlem division just north of Mott Haven Junction. There are four sub-stations in the initial, and there are to be eight in the entire Electric Zone. Sub-station No. 1 is at the Grand Central terminal; No. 2 at Mott Haven Junction; No. 3 at Kingsbridge; No. 4 just north of the Yonkers power station, and No. 7 at Bronx Park. The other sub-stations are on the proposed extensions of the electric service; No. 5 at Irvington; No. 6 at Ossining, on the Hudson division, and No. 8 at Scarsdale, on the Harlem division. Power will be transmitted by overhead cable lines north of High Bridge, 7 miles out on the Hudson division and north of Bronx Park, $9\frac{1}{2}$ miles out, on the Harlem division. Conduit lines run from Grand Central station to High Bridge and to Bronx Park, as well as to the Morris Park power station, and to Kingsbridge from the Harlem division line. From the Kingsbridge terminus of these conduits there is an overhead line to Glenwood, just south of Yonkers station, and from Glenwood conduits to the power station and to sub-station No. 4. Cable towers for the overhead lines are located at High Bridge, Spuyten Duyvil and Glenwood. The initial capacity of each of the two power stations is 56,000 h.p. (40,000 k. w.), and the ultimate capacity of each is 84,000 h.p. (60,000 k.w.). The units are 7,000 h.p. (5,000 k.w.) turbo-generators, of which each power station is to have eight at first and an ultimate capacity of 12. In the initial Electric Zone, including on the Hudson division, the line as far as Kingsbridge, there are 17 miles of line to be electrified—13 miles from the Grand Central station to Wakefield on the Harlem division and 4 miles from Mott Haven to Kingsbridge on the Hudson division. In this territory there are 73 miles of main and 12 miles of yard tracks, a total of 85 miles of track. The entire Electric Zone includes 24 miles from the Grand Central station to North White Plains and 28 miles from Mott Haven to South Croton, a total of 52 miles of line, which includes 224 miles of main and 68 miles of yard tracks, a total track mileage of 292 miles. All tracks within this territory are laid with 100-lb. rails. The transmission system in the initial Electric Zone includes 12 miles of conduit territory, 89 miles of cables in conduits, 6 miles of pole line territory, which requires 48 miles of cables on poles, 220 splicing chambers, 9 circuit-breaker houses and one cable tower. The approximate weight of the copper necessary for the transmission wires in this territory is 1,500,000 lbs. In the entire Electric Zone there are to be 16 miles of conduits; 97 miles of cables in conduits, 46 miles of pole lines and 344 miles of cables on poles, with 383 splicing chambers, 26 circuit-breaker houses and 3 cable towers. The copper for the transmission system will weigh, approximately, 3,000,000 lbs.

Working conductors in the initial zone include 75 miles of track equipped with 70-lb. under-contact protected third rail and 3 miles with overhead construction. There are 285 switches equipped with working conductors, 14,000 lineal feet of jumpers and 43,000 running-track bonds in this zone. The whole zone includes 285 miles of track equipped with third rail, 5 miles of overhead construction, 450 switches with working conductors, 37,000 ft. of jumpers and 136,000 running-track bonds. Photographs are shown herewith of the conduit lines, pole lines, third-rail construction, overhead transmission lines and jumper connections.

The rolling stock to be used is of two kinds—electric locomotives and electric motor cars. The electric locomotives are to be used in hauling the through trains on the Hudson division in and out of the Grand Central terminal. In the initial Electric Zone, High Bridge will be the engine terminal for steam locomotives. A large round-house and other terminal arrangements have been built here during the process of the improvements. Later on, when the proposed extension to Croton is made, that will be the point at which the electric locomotives will take the steam trains. The motor cars are to be used for local trains on both the Harlem and Hudson divisions. North of Wakefield and High Bridge they will, until the electrification is pushed further, be hauled by steam locomotives, the same as through trains. A photograph of the outside and inside of one of the motor cars is shown. The road now owns 221 locomotives and cars for this service, 35 of which are electric locomotives, each with a normal capacity of 2,200 h.p. and weighing 100 tons; 125 are all-steel multiple unit motor cars, each with a normal capacity of 400 h.p., weighing complete 53 tons; 55 all-steel multiple unit trailer cars, weighing complete 41 tons, and 6 combined baggage and express motor cars, each of 400 h.p. All of these 186 motor cars are of steel and built to run on the multiple unit system. The total normal horse-power of the electric rolling stock is thus 129,400. The maximum speed of the electric locomotives is from 40 to 80 miles an hour, depending on the weight of trains, which will range from 250 to 900 tons. The maximum speed of the multiple unit suburban trains is 52 miles per hour.

The electrification involves replacing the existing signals and interlockings almost entirely. The manual controlled and electro-pneumatic automatic signals and the low-pressure pneumatic and mechanical interlocking plants now in use are to be replaced with all-electric automatic signals and interlocking plants, involving the use of alternating current track circuits in combination with the direct current propulsion system. In the initial zone there will be 18 interlocking plants with a total of 668 levers and 204 blocks, four miles of four-way signal ducts and 72 miles of pole line wires. On the 84 miles of track mileage there will be 18 signal towers, 13 battery houses, three signal sub-stations, and 31 signal bridges. On the entire zone there are to be 51 interlocking plants with 1,705 levers, 564 blocks, four miles of four-way ducts, and 702 miles of pole line wires. On this 292 miles of track mileage there are to be 51 signal towers, 41 battery houses, eight signal sub-stations and 108 signal bridges. As is well known, owing to the arrangement of the present Grand Central station the Hudson division south of Spuyten Duyvil and the Harlem division for its whole length as far as double-tracked have been operated with left-handed instead of right-handed running. Within a week or two the change has been made to right-handed running all the way on the Hudson division, and with completion of the electrification all trains will turn to the right on all the lines.

Great changes are to be made at the Grand Central station, part of which are well under way. The new Grand Central station, with the track plans of the different floors, was illustrated in detail in the issue of Nov. 24, 1905, already referred to. The plan involves the building of an entirely new station, with tracks at two levels below the street, the upper level for express trains and the lower for suburban trains. Including subways, tracks and streets—the depth from the street level to the lowest part of the terminal being 80 ft.—there will be four levels. At present, the excavation for the east side of the new Grand Central yard is practically completed, and with the beginning of electric operation all trains of the Harlem division, and Yonkers, Croton and Peekskill locals on the Hudson division, will run into this new depressed

Grand Central Station—Looking South in Old Yard.

Signal Bridge at University Heights.

New Station to be Built at One Hundred and Forty-Ninth Street (Mott Haven Junction).

Section No. 1, Grand Central Yard. Looking North from Grand Central Palace (44th Street.)

Feed Wires on Poles near University Heights—Signal Bridge in Distance.

Steel Suburban Motor Car.

Typical Signal Tower.

Steel Suburban Car.

Temporary Structures for Overhead Working Conductors.

King's Bridge Substation and Battery House.

Iron Pipe Conduits for Feed Wires on Parapet of Viaduct.

yard, discharging their passengers into the Grand Central Palace, which has already been converted into a temporary station. A photograph of this yard is given herewith. This shows at the farther end sub-station No. 1 of the power system. The photograph is taken from some point at or near the Grand Central Palace, which fills up the block bounded by Lexington avenue, 43d street, Depew place and 44th street. Another photograph shows the present Grand Central yard, which is west of the new excavation, as it exists to-day before excavation for the improvements has been begun. The new terminal will have an area of 22 acres in the suburban station and 39 acres on the express level, and will include 25 miles of tracks, with a car capacity of 12,000 cars. Counting new subways which are projected there will be three connections for interchange of passengers with underground rapid transit systems. The number of platform tracks will be 41. There are to be eight acres covered by buildings included in the terminal south of 46th street and 16 acres of new street viaducts over the tracks, which will have a total length of 8,700 ft. The new terminal requires 3,000,000 cu. yds. of excavation and the use of 100,000 tons of steel and 260,000 cu. yds. of concrete.

One of the most important other developments of the terminal improvements is a new Bronx station at 149th street (Mott Haven Junction), which is to have connections with two subway systems. A photograph of this station is given showing what a large and important building it is to be. This is among the latest developments of the New York Central plans, being now for the first time announced. Including this new union terminal in the Bronx and the new Grand Central station there will be six new passenger stations in the initial electric zone. In the entire electric zone there will be 23 new passenger stations.

Jumper Connections.

Near Concord Avenue—Port Morris Depression.

Other general improvements include two new permanent shop terminals for repairs of electrical equipment, two temporary engine house terminals for use during the transition from steam to electric power, 33 grade crossings eliminated in the initial zone, including the new overhead streets at the Grand Central terminal, and five track grade crossings eliminated at Spuyten Duyvil and Mott Haven. In the entire electric zone there are 55 grade crossings to be eliminated. This work, as already mentioned, is now being delayed by failure of the railroad commissioners to give their approval. Twenty-two miles of territory are to be increased from two to four tracks, 16 miles from three to four tracks, three miles from three to six tracks, 0.45 of a mile from four to eight tracks, and 0.68 of a mile from four to ten tracks during the course of the improvements. There has been a reduction of 345 deg. of curvature, or nearly a full circle, caused by improvements on the Port Morris branch, the Marble Hill cut-off, Spuyten Duyvil rectification, Riverdale rectification and Irvington rectification. Of these, the Marble Hill cut-off is completed, with the exception of a proposed four-track tunnel at the northern end; the improvements on the Port Morris branch are practically completed, and work on the other improvements has been begun. By changes in the alinement the main line will be shortened 4,013 ft. There will be 126 miles of new track, 75 miles of which is main track, 43 miles yard track, and 18 miles passing track. There will also be 11 new local freight delivery yards, four new assembling freight yards, 1,773 ft. of double-track tunnel, and 1,070 ft. of new four-track tunnel.

The work summed up in these totals of general improvements has been extensive. At Mott Haven Junction the Hudson division, which runs through a deep rock cut, has been widened from two to four tracks, which involved a large amount of difficult rock cutting. A new storage yard for construction material has been built south of High Bridge and a complete new yard and engine terminal at High Bridge. The Marble Hill cut-off saves an exceedingly bad curve and a large amount of distance. It is a new four-track line which required a large amount of rock cutting and concrete work in retaining walls along the Harlem river ship canal and bridges over two small streams. North from Spuyten Duyvil along the shore of the Hudson river the road has been widened from three to in some cases as many as ten tracks, and work on bringing up the number of tracks from three to four has been and is now under way as far north as Croton. This has involved a large amount of filling and extending the right of way line out into the river. At Croton much property has been bought and room for the engine terminal has been cut out of a wide, solid hill of sand. At the same time the excavated material has been used for filling in land for new yards just north and south of this point. On the Harlem division an engine terminal and yard have been built at Wakefield for transfer from steam to electric equipment together with improvements to a number of the stations. The improvement of the Port Morris branch, which did away with a large number of grade crossings and involved the cutting of a new double-track tunnel, is illustrated by a view of the depressed line from one end of the tunnel.

The work, although within the last six weeks it has been carried on with considerable delays to traffic, has, on the whole, been remarkably successful, particularly for an undertaking which is so much of an experiment and which involves working in so congested a territory as that leading into the Grand Central station. There is no more interesting or vital question to be settled regarding the future of railroad operation in this country than the success of electric operation in regular service. The experience of the New York Central on this point, particularly in comparison with that of the New York, New Haven & Hartford, which will use the overhead alternating current system on its line from Wakefield to Stamford, Conn., and expects to have the line ready for operation before the close of the year, will be watched with the greatest interest.

## Stuyvesant Fish.

A man still in the prime of life, of physical and financial weight, several inches over 6 ft. in height, ordinarily slow in his motions, ordinarily of few words and those of simple directness. He has no pride in off-hand inspiration. He loves to revolve a difficult proposition deliberately and to take it with him up to his "farm" and keep it over Sunday—his farm being a great estate opposite West Point. He is directly descended from Colonel Nicholas Fish, the friend of Washington, and another ancestor was the great Dutch-American, Peter Stuyvesant, and his father was Hamilton Fish, Secretary of State under Grant.

His stand for honesty in the insurance investigation raised up powerful enemies bent upon his irretrievable and discrediting defeat. They endeavored to minimize his insurance influence. They tried to destroy him with the Illinois Central Railroad, of which for 20 years he has been president. It was first privately represented to him that if he would go out quietly he might put his own figures on his holdings, but he replied with that calm which is sometimes mistaken for heaviness, that he was not in the habit of considering his own interests apart from those of the stockholders, and that, in short, so long as the stockholders wanted him to, he guessed he would stay. And he did.

It was through his inception that an advanced type of car was built for suburban traffic, with doors opposite every seat. He has inaugurated a pension system for employees and a system by which employees purchase stock of the company. He believes in a stock company for the benefit of the stockholders, and it is this that has made him a tower of strength not only in railroad matters but in insurance. He owns two model plantations in Mississippi—although he personally disclaims the designation "model."

He is a man of many sides. He enjoys the management of great capital, but he does not love Wall Street. Its frequently undigested securities provokes him to say that "Wall Street needs to have its appendix cut out." In the way of recreation he best loves his farm. But he has a splendid house in New York, and he has a mansion at Newport. He belongs to many clubs, but is seldom seen at them. He declares that the evil with corporations

lies in too few men having undertaken to manage too many corporations. . . . Recently he found himself appointed executor of a small estate. It was the case of a family, living near his Hudson river home, who had naively trusted him to help them. He assumed the responsibility, straightened out tangled affairs, advertised an auction of household and farm articles, and on the day of the sale was there in person. The clump of gathered farmers, astonished, watched him as he mounted a wagon and began the sale as auctioneer. He worked with enthusiasm, and secured undreamt of prices. "There was not enough money in it to justify hiring an auctioneer," said this man of many millions.—*Saturday Evening Post.*

## Electro-Pneumatic Block Signals on the Electrified Line of the West Jersey & Seashore.

The line of the West Jersey & Seashore Railroad between Camden, N. J., and Atlantic City, by way of Newfield, which has been fitted by the General Electric Company for electric traction, third rail, has been equipped by the Union Switch & Signal Company with block signal apparatus throughout, and with interlocking for switches and signals, either electro-pneumatic power, or manual, at all important stations on the line which were not already equipped. The automatic signals are controlled by alternating-current track circuits flowing through the running rails, which also convey the return direct current of the propulsion system; and the air compressors, which are at Camden and Newfield, are run by electric motors supplied with current from the third rail.

The carrying out of this contract by the Union Switch & Signal Company has been a remarkable example of efficient use of the resources of an extensive establishment. Work on the material was begun in the shops at Swissvale on March 13, and the last interlocking machine left the shop on August 15. In this period of five months approximately 120 carloads of material was shipped, practically all of it having to traverse the 360 miles between Pittsburg and the line of road where the signals were erected. The weight of this material was about 1,750 tons. Some of the main items were: 26 mechanically operated signal blades, 16 electric signal blades, 292 pneumatic interlocking signal blades, 270 automatic pneumatic signal blades, 38 miles of 2-in. main air pipe, galvanized, 84,000 ft. 1-in. signal pipe (rods) for mechanical interlocking, 44,000 ft. $\frac{3}{4}$-in. galvanized iron air pipe, 575 miles copper wire, 20 miles grooved lumber, 150 A. C. relays, 160 half-kilowatt transformers, 350 inductive rail bonds, 550 horizontal cranks, 150 90° lead-out deflection stands, 275 lazy jack compensators and 150 Union electric locks for levers of mechanical interlocking machines. In connection with these notes of the shop work, the reader will be interested in a view in one of the rooms of the shop, shown in Fig. 9.

The line of the road is shown in the accompanying sketch map, Fig. 1. In this map the power houses and sub-stations are shown by rectangles. The line, formerly single track part of the way, is now double track or three tracks all the way. The branch near Camden is a connection to the Delaware River bridge for freight trains.

From Camden to Newfield, 30 miles, the block signals are automatic, electro-pneumatic, normal clear, with 120 block sections, the sections being about 4,000 ft. long. From Newfield to Pleasantville the telegraph block system is used, with manual home signals and electric-motor distant signals. In this non-automatic section the block stations are at Cedar Swamp, Weymouth, Richland, May's Landing and McKee Place, the blocks being about two miles long. From Pleasantville to Atlantic City, 5.5 miles, the signals are the same as above Newfield. This part of the line is used by electric trains of the Atlantic City and Shore Railway, running from Atlantic City to Somers Point.

At Camden pneumatic power is taken from a compressor already installed at that point to supply the signals on the short line from Camden to Atlantic City. At Newfield a 120 cu. ft. compressor has been put in, run by an electric motor.

Fig. 2 is a sketch of the signals from Camden to beyond Woodbury Heights, showing the junctions at South Camden and Westville. The main inbound signal on the branch at South Camden shows the standard arrangement of signals, indicating speeds, according to the rule now followed on the Pennsylvania Railroad. The upper arm, when cleared, indicates proceed at full speed; the second arm, when cleared, indicates proceed at a limited speed, say 40 miles an hour, as for a No. 20 crossover, and the small arm, 4 ft. above the ground, indicates proceed under control. In the present case the upper arm is fixed in the horizontal position, as there is no track over which trains are allowed to run at unrestricted speed. The second arm is cleared for movements southward on the right-hand main track and the dwarf arm for movements (against the current) on the northbound main track. The second arm, like all signals on automatic block-signaled lines similarly situated, is thrown to "stop" by the opening of the track circuit relays, and is therefore "semi-automatic." Everywhere on the line the automatic signal system is thus made continuous through interlockings.

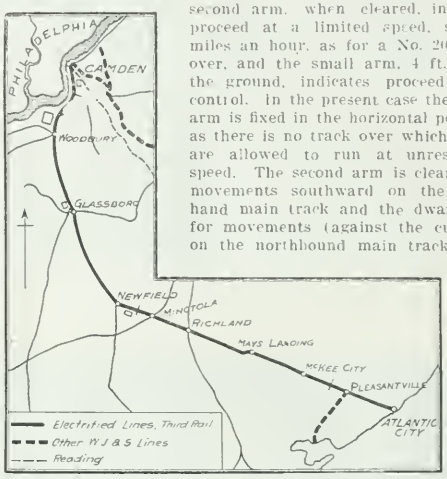



Fig. 1—Electrified Line of the West Jersey & Seashore, Camden to Atlantic City.

Fig. 8 is a diagram of a typical track circuit. In consequence of the difficulty of conveying alternating current through the rails of the track under the conditions existing on a line like this, the track circuit is conveyed from the transformer to the rails in the middle of the block section, as shown. Thus, in a signal section 4,000 ft. long the current has to be forced through only 2,000 ft. of track. The track relay is controlled not only by the track circuit, but also by the current through the line wires, as shown in the lower part of the drawing.

In the "two-rail return" system, used here, both rails of the track are used for the return of the propulsion current at the same time that they are used as parts of the circuits for the signals. This system, as related to signals, was first installed by the Union Switch & Signal Company a year and a half ago, in the East Boston Tunnel of the Boston Elevated Railway Company. During the past year it has been put in use on the Long Island Railroad from the Atlantic avenue terminus throughout the electrified lines some twenty or thirty miles.

This simultaneous use of the rails for the propulsion and the signaling currents necessitates the design of the signaling currents to meet the conditions imposed by the power system as fixed by the railroad company. The power current (n. c.) must pass freely through the rails at the ends of signaling track-circuit sections while the signaling track circuit must, of course, be stopped. For

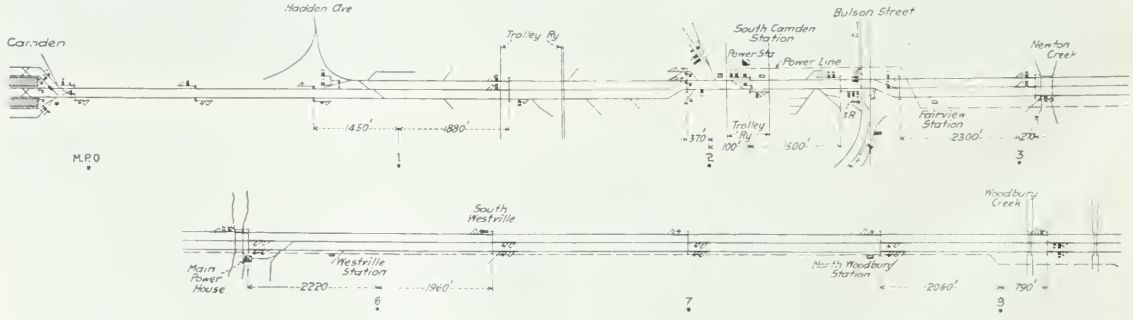



Fig. 2—Tracks and Signals from Camden to Woodbury Heights, West Jersey & Seashore Electrified Line.

Fig. 3—Signal Bridge.

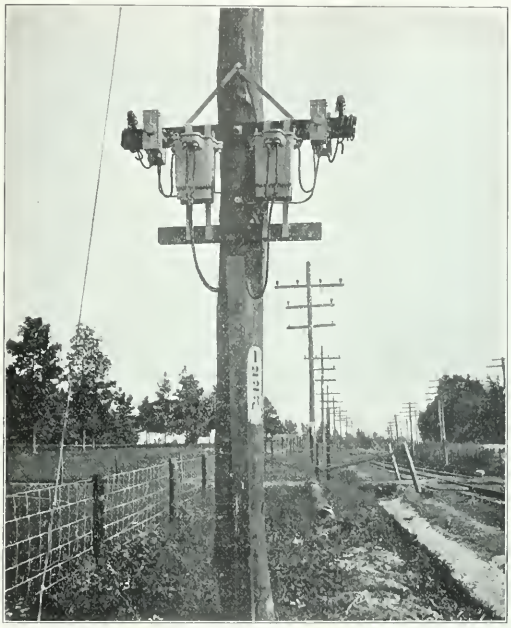
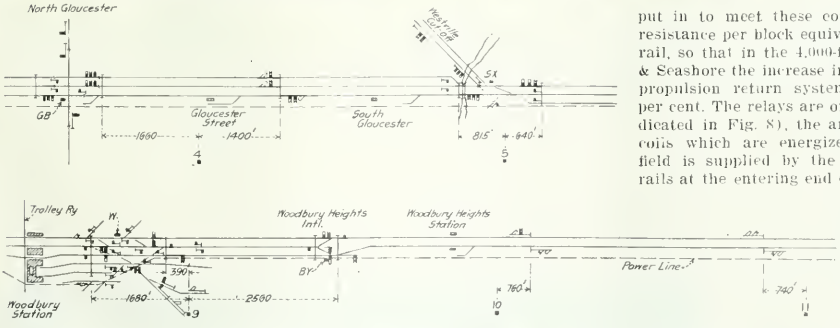


Fig. 5—Transformer.




Continuation of Fig. 2.

*Read across two pages, as indicated by Mile Post Numbers.*

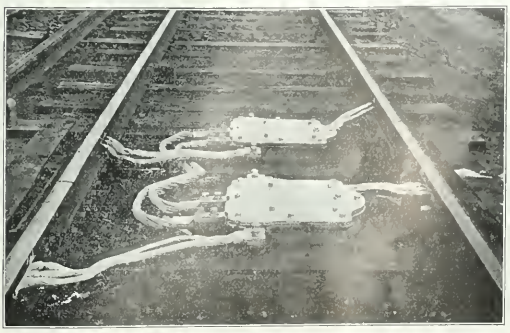


Fig 6—Inductive Bond, with Triple Connections to Each Rail.

the signals an alternating current is therefore used and the inductive bond makes possible the conditions desired. On the West Jersey & Seashore the conditions were as follows: Maximum capacity of each sub-station in amperes, 3,500 to 7,000, ultimate; normal average output of each sub-station in amperes, 1,500; number of amperes to start trains on a level, 500 to 1,200 amperes per car; number of cars per train, probably, six.

The inductive bonds and their connections which have been put in to meet these conditions introduce in each rail a resistance per block equivalent to only about 40 ft. of 100-lb. rail, so that in the 4,000-ft. blocks used on the West Jersey & Seashore the increase in the resistance of that part of the propulsion return system formed by the rails is only 1 per cent. The relays are of the motor type (though not so indicated in Fig. 8), the armature and the field both having coils which are energized when the current flows. The field is supplied by the 25-cycle current taken from the rails at the entering end of the block. The armature is supplied by the current from the leaving end of the block and the signal current, which is taken from the rails at the leaving end, is stepped up for transmission by a 6-watt transformer. (See Fig. 8.) The signal current for each block is supplied to the rails by transformers of special design fixed at the middle of the block. These transformers are not injuriously affected by being short circuited by trains standing opposite them. Their primaries are fed by the 1,100-volt and 25-cycle signal mains running from the sub-stations. At each sub-station there is a switchboard for handling the signaling current, which is stepped down to the signal line voltage from one leg of the propulsion mains. The switchboard is supplied with indicating instruments for showing the voltage of the signal mains and of the current going in either direction. Recording watt-meters are provided to determine what part of the power shall be charged to the signals. The arrangement of oil switches is such that the signal mains can be disconnected on either side of the sub-station, or made continuous and disconnected from the sub-station.

Oil line switches are fixed in the signal mains midway between the sub-stations, so that in case of line trouble a maintainer can, without risk to himself, open the line and limit the trouble to the territory in which it exists.

The location of the five electro-pneumatic machines and their sizes (number of levers) are as follows: Glassboro, 29 spaces; West Haddonfield, 17; Newfield, 17; Starr Station, 11, and Van Hook street, 11. The 17 manual interlocking machines, with the sizes of the frames, are as follows: Camden, 24 spaces; Bulson street, 20; Gloucester, North, 20; Westville, 16; Woodbury "W," 44; Woodbury

Heights, 12; South Glassboro, 28; Minotola, 20; Pleasantville, 32; Meadows, 24; Drawbridge, 16; Baltic avenue, 36; Atlantic City, 52; Winslow Junction, 12; Mount Pleasant, 12; Delair "F S," 16; Delair "X X," 16. The total number of working levers in the power machines is 60 and in the manual machines 331.

At most of the interlocking towers where manual signals are used the distant signals are worked by compressed air and are controlled by circuit-breakers on mechanical levers in the machines; but at Mount Pleasant and Minotola the distant signals are worked by electric motors. At mechanical interlocking towers on the lines block signaled with automatics, the signals are power operated, but the switches are worked mechanically. In lieu of approach locking (checking mistakes of the signalman with the home signal levers by a track-circuit lock controlled by approaching trains while they are still some distance short of the distant signal) which has been put in by the Pennsylvania at many places heretofore, time locks are here used. These are fitted to the levers of all main line high stop-signals in both power and mechanical interlocking. They do not prevent the throwing of the lever back to the normal (stop) position, but do prevent the release of any locking by such movement. The time lock is not the common screw arrangement, but a newly devised "fluid time release."

Fig. 3 shows a signal bridge, the view having been taken before the signals were fitted with blades or put in service. In the foreground may be seen the arrangement for breaking the third rail and conveying the propulsion current underground across a highway. On the right leg of the signal bridge is the cupboard containing the battery and relays. In the left-hand track, under the bridge, may be seen the inductive rail bonds, covered. In the distance both tracks have track tanks for supplying water to moving locomotives.

Fig. 4 shows the cupboard on the leg of the signal bridge and the inductive bonds, those for the track in the foreground being covered. The box on the third rail, with hinged cover, contains the switches for charging, from the third rail, the storage batteries seen in the cupboard. These batteries work the signal-control circuits. Fig. 5 shows transformers fixed to a pole at the side of the road. Fig. 6 shows the inductive bond which bridges the insulation at the ends of the track circuit sections, allowing the direct (propulsion) current to flow through, but impeding the flow of the alternating current used for signaling.

Fig. 4—Battery Enclosure.

Fig. 7—Alternating-Current Relay.

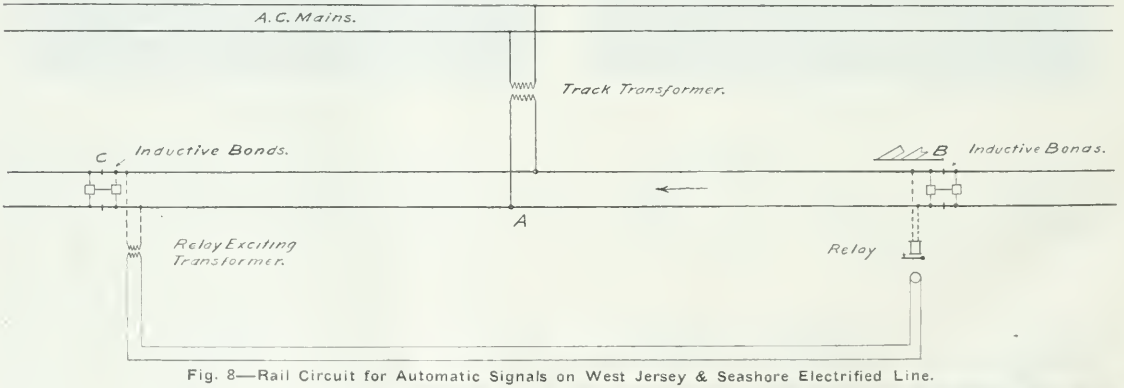



Fig. 8—Rail Circuit for Automatic Signals on West Jersey & Seashore Electrified Line.

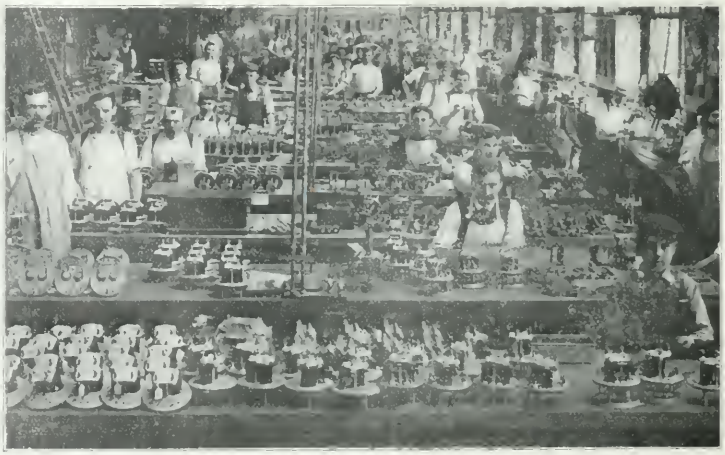


Fig. 9—Relay Department, Shops of Union Switch & Signal Co., Swissvale, Pa.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 15. FRIDAY, OCTOBER 12, 1906.


The Pennsylvania seems to be a pace-maker for the railroads who are not only reducing fares, but also consulting public convenience. It is now announced that on the first of next month a $20 good-for-bearer mileage book will be put on sale throughout the lines west of Pittsburg (except the Vandalia), thus making the rate of two cents a mile universal on the 8,000 miles directly operated, east and west of Pittsburg, for all passengers who can buy $20 worth of transportation at a time—or who can borrow the book of a friend. For some years there have been conservative railroad men who have believed that a general two-cent passenger rate east of Chicago would not be a calamity—or even an occasion for pronounced regret—and this action of the Pennsylvania at least half confirms that belief. And probably the prophets are not far wrong in looking for the reduction of all rates in central territory to two cents. Such a reduction is not necessarily near, for a mileage-book rate of two cents (net) and a single ticket rate a good deal higher have been in effect side by side in several regions for years. But the legislatures and the newspapers will now gird their loins for a fresh endeavor, and will agitate night and day for the two cent rate for single trips. The Pennsylvania's twenty-dollar book will probably force a similar book from its competitors in that thickly junctioned territory, and the people will expect to carry their point by storm. If general business keeps up its present activity, it is quite likely that the railroads will be in a position to make reductions in something—if they don't have to spend too many millions on separation of grades and on new stations—and passenger rates are the easiest to deal with. The question is simple and the people can comprehend it. Freight rates, on the other hand, are hard to deal with. Their interdependence makes changes much more difficult even when the reasonableness of making a cut has been agreed on. One report has it that the Pennsylvania Lines have already decided to reduce single trip fares to the basis of 2½ cents throughout their lines outside of Ohio, where they have already been reduced to two cents, and to make interstate rates to and from Ohio points on the basis of the sum of the locals in the different states.

The announcement elsewhere in this issue that the Chicago & North-Western is to build a new passenger station in Chicago and entirely separate its passenger from its freight terminals means the beginning of a much-needed change in the badly tangled tracks and stations which has long been endured and which the 22 railroads centering there have only aggravated by piecemeal improvements having little relation to the problem as a whole. Early in 1905 Mr. Frederic A. Delano pointed out in these columns the necessity of concerted and harmonious action on the part of all the railroads looking toward a better grouping of the passenger terminal facilities and presented a feasible, if somewhat radical plan, of his own. Millions of dollars are spent each year in carrying passengers, baggage, mail and express to and from the six widely separated stations which are used by the different roads, to count nothing of the delays and inconvenience incurred. The difficulties to be met in such a plan as Mr. Delano proposed are, of course, enormous. His was an ideal plan and the next best thing is an approach to the ideal in the taking of such definite steps toward substantial improvement as the North-Western is to do. The present terminal of that road is inadequate and inaccessible. The new station will overcome these difficulties to a great extent. There are rumors—which cannot now be confirmed—that the Pennsylvania Lines West are to build a new station to cost as much as the North-Western's, and which will face that station on the east side of Clinton street. If true, this would be another needed improvement along the right lines which might induce the other roads to continue the good work already begun.

For a year or more the easiest way to arouse the excitability of the stock market has been to refer to the likelihood of early announcement of the closing of what has come to be known as the Hill ore deal. Time and again this expected transaction between the Great Northern Railway on the one hand and the United States Steel Corporation on the other was trotted out to bolster up or explain an upward market movement. The facts of the case were that there were in the direct or indirect possession of the Great Northern and, to a much smaller extent, of the Northern Pacific, partly as the result of purchase, more particularly as acquired through land grants to underlying companies, large holdings of mineral territory in the Lake Superior region, estimated to contain between 500,000,000 and 700,000,000 tons of valuable iron ore. With the record figures being made by the iron and steel industry, the ore holdings of the United States Steel Corporation, although estimated to include something like 1,250,000,000 tons, were being consumed at a faster and faster rate. Thus the larger grew the prosperity of the steel industry, the greater became the incentive to the dominating corporation to further extend its holdings of mineral land. On Saturday of last week the long expected announcement of the closing of the deal was made in an official statement by the Steel Corporation to the effect that after long negotiations a contract had been signed for acquisition on a royalty basis of the Hill ore properties, the price to be paid being $1.65 a ton for ore delivered

at the upper lake docks, with an increase of 3.1 cents per ton in the price each succeeding year. The minimum amount to be mined is 750,000 tons in 1907 and in succeeding years is to increase at the rate of 750,000 tons a year until (in 1917) it reaches 8,250,000 tons, which thereafter will be the minimum agreed production. The initial price of $1.65 a ton delivered at the docks is made up of two parts: the royalty paid per ton at the mines and the transportation charges for transporting the ore from the mines to lake ports. Eighty cents of the amount is the present transportation charge, leaving 85 cents per ton as the cost of the ore at the mines. This figure of cost at the mines is a standard price for ore containing 59 per cent. of iron. It is to be subject to change according as the percentage of iron in the ore runs above or below this figure. Basing the calculation on this standard price of 85 cents a ton at the mines, the Great Northern will receive in 1907 $1,237,500 for the minimum of 750,000 tons of ore to be mined. In 1917 and in each succeeding year its receipts from this source will be $16,417,500 for the minimum production of 8,250,000 tons of ore. These payments are at the rate of about 0.8 of one per cent. on Great Northern stock in 1907, while in 1917 the proceeds will be nearly 11 per cent. on the now outstanding stock. It must be remembered, however, that one element of the price to be paid is a gross receipt from transportation, and there must be deducted from it the cost of carrying. There should be, however, a large margin of profit on the strictly transportation part of the transaction, as traffic in specified amounts is assured and ore is a commodity which in large quantities can be most economically handled. The price paid at the mines is all profit, as the Steel Corporation will assume the expenses of mining the ore. Following the announcement of the lease, the statement was made by Mr. J. J. Hill that he personally was interested only as a stockholder of the Great Northern. In other words, the profits of the sale of the ore accrue to the benefit of the shareholders of that road. The Steel Corporation is now using ore at the rate of from 20,000,000 to 23,000,000 tons a year. Its annual consumption has increased at the rate of from 2,000,000 to 3,000,000 tons for the past five years. Before the acquisition of the Hill ore properties it already controlled ore enough to last about 60 years. The ore contained in the new acquisition should last another 25 years. With the closing of the contract with the Hill interests, the United States Steel Corporation is put even more and increasingly in control of the country's iron and steel trade. The advantages of the lease to the railroad company are obvious. It not only receives a substantial net profit on every ton of ore mined but is assured at the same time of a large, increasing and profitable traffic.

A simple method of railroad acquisition by the state has been proposed in the Argentine Republic. It is announced that a bill will shortly be introduced providing for establishment of an additional duty on all gross receipts of railroads at present existing or which may be built in that country. The annual sum obtained by the government from this tax is to be devoted exclusively to the purchase of railroad stock, and the sponsor of the scheme calculates that within 60 years enough will be produced in this way to enable the entire stock of the Argentine railroads to be purchased by the state. There are several weak points in this scheme of which the enthusiasm of the promoter has probably caused him to lose sight. One is the great improbability of a government, particularly a South American government, agreeing to allow such a hoard of money to slowly accumulate without drawing on it for some purpose for which it was not originally intended. It is also probable that if it were seriously determined to buy up the railroads, the resulting increase in the value of stock would cause the purchase to be somewhat more costly than was provided for in the original estimates. The coolness of the proposal to make the railroad companies pay for their own extinction is sufficient to make some of our own enthusiasts for government ownership sit up and take notice.

It is only a small minority of the news items which appear in the daily papers that have so much meaning in the first three inches as may be found in the following paragraph, divided by us into six paragraphs, published not long ago:

1. The Washington State Railroad Commission is endeavoring to ascertain the cost of construction and present value of all the railroads in that state.

2. This step is regarded as necessary to equip the commission for dealing with the question of railroad freight rates.

3. The commission welcomes criticism or suggestions from engineers or others competent to speak upon the subject.

4. A corps of engineers has been employed to co-operate with the officials of the Great Northern and Northern Pacific railroads in obtaining data from records by which the work of appraisal may be accomplished more economically than in such states as Wisconsin and Michigan.

5. This appraisement is made in obedience to the new railroad law of 1903.

6. Texas, Michigan, Wisconsin, Minnesota and Washington are the five states which have thus far systematically undertaken to obtain the value of railroad property as a basis of rate regulation.

And the statements are frank and honest, as well as full of meaning. In paragraph 1 the significant word is "endeavoring." That recognition of the possible—it ought to read "probable" or "certain"—failure to accomplish the object aimed at is creditable. Cost of construction is of almost no value when found. "Present value" inevitably recalls the fable of the mountain and the mouse, and even the mouse may be useless next year. Paragraph 2 says that this step is "regarded," etc. This frank writer apparently realized that in actual fact the proposed quest for information is *not* absolutely necessary to an intelligent view of freight rates. Paragraph 3 should call out a dozen forcible and lucid protests from clear-headed publicists in the state; but will it? Would the protests receive as ungracious a welcome as such statements do from state tax boards? Paragraph 4 is decidedly encouraging. Let us hope that the spirit of economy will really prevail, and result in a report of ten pages or less. In paragraph 5 the Commissioners wash their hands of personal responsibility for this use of public money; and paragraph 6 indicates that they are glad to have company in their comprehensive task.

## WHERE ELECTRIFICATION IS UNPROFITABLE BUT NECESSARY.

It now seems to be decided that the Pennsylvania will use in its electrified New York terminal division a system quite like that of the New York Central; that is, a third rail carrying a direct current, with electric locomotives for express trains and motor cars for suburban service. At this same time the New York, New Haven & Hartford is electrifying a portion of its main line using the overhead contact alternating current system, and locomotives equipped with overhead apparatus for use on its own line, and shoes to take the current from the third rail on the New York Central tracks over which it reaches Grand Central Station. The Westinghouse Electric Company has already built ten locomotives and will undoubtedly be able to supply the New Haven road with the full number required by the time that railroad is ready to use them, but we hear nothing definite of the motor car equipment. If this is delayed it will be unfortunate for the New Haven company and its suburban customers and will double-tax the facilities of the new terminal.

It would seem, therefore, that the two systems concerning whose economy of construction, operation, reliability and safety we have long been theorizing will soon have the test of service and some conclusions made possible. But it is safe to predict that these conclusions will not be conclusive as to the whole subject. In great terminals the electric locomotive has an advantage over the steam locomotive only because it gets rid of smoke; it requires the same number of wasteful operations. Mr. Aspinall, General Manager of the Lancashire & Yorkshire (England), details them as follows:

"Every time a locomotive train comes in and goes out, you have four platform operations and eight signal operations: First of all, the train comes in; then a locomotive follows it, that is two; then the train goes out, that is three; then the locomotive which brought it in goes out, that is four platform operations, which means eight signal operations. The electric motor train comes in, that is one; the motorman goes to the other end of the train and the train goes out, that is two. You have only two platform operations and four signal operations. The result is that you double your terminal accommodation" (by using electric motor trains instead of electric locomotives).

There is another view of the subject: It may be said generally that there is as yet nothing to indicate progress toward electrification for main line work. The outcome of the experiments of the past year or so does not justify the prophecies of some electricians and many laymen. In local, suburban, service the gross income is increased, due probably entirely to the possibility of dividing the traffic of long trains in more frequent short trains; but public opinion controls railroad operations and the public expects and gets low fares on electric trains, although, as a general proposition, steam locomotive traction is less costly. Mr. Aspinall, above quoted, says of his electrified Liverpool & Southport line: "We did not enter into electric traction with any idea that we should get economy of working. We did not expect to save money; we expected to make money—two very different things."

So far as we have evidence, no electrification of a profitable steam road has been made, or is making, with the result or ex-

pectation of direct profit. It is not necessary to qualify this statement by excepting the elevated structures in New York and Chicago, which are properly classified as street railroads. The Long Island company has electrified 120 miles of its line and is operating it at a loss, taking account of the interest on cost. The electrification of the longer of the two Pennsylvania's lines between Camden and Atlantic City was not undertaken for direct profit, but to forestall the building of an independent electric line between these points. Such an independent line was not only projected; its capital cost was already provided; it would have been built and probably operated at a loss, with an ensuing receivership and the usual costly disturbance of the traffic of the paralleled solvent road.

The reasons for electrifying the New York Central terminal are well known. On Manhattan Island it became compulsory, and that much electrification would have increased both the capital cost and the operating cost with no increase in income. The extension of the "Electric Zone" to White Plains on the Harlem line, and Croton on the main line, was solely for the purpose of getting some increased revenue to help offset the heavy cost that was forced upon the company. Similarly, when the Pennsylvania decided that it was necessary to have a station on Manhattan Island, and an all-rail connection with the Long Island and the New Haven roads, there was no question as to the motive power—none other than electricity would be permitted by the City of New York.

Work is now in progress on the electrification of the Rochester division of the Erie from Rochester to Mount Morris, N. Y., 31 miles. Alternating current with overhead trolley wire will be used; the current is to be bought from one of the Canadian Niagara power plants, about 70 miles distant. Ordinary passenger cars are to be rebuilt and mounted on motor trucks and an hourly service in each direction is to be established. Freight trains will be hauled by steam locomotives as before. Sharp competition of parallel electric roads is the cause of making the change.

So far, therefore, as the steam roads are concerned, the present situation and prospects are quite clear. The costs of electric installation and operation must be largely reduced by further developments in the science, before electricity is available for main line working, except under some such special conditions as have been mentioned. Meanwhile, the experiments being made with rail motor cars indicate a possibility of additions to public convenience and comfort, together with a reasonable return to the railroads.

## THE PRESENT RESULTS OF THE NEW RATE LAW.

We referred briefly last week to the promising beginning that had been made both by the railroads and by the Interstate Commerce Commission. But the importance of the subject justifies our recurring to it at greater length.

The principal subjects dealt with by the Act seem to be four in number: The abolition of dishonest rates; the readjustment of rates which, though open and honest, are shown to be unreasonable and improper; the regulation and standardization of reports and accounts; and last, the enforcement of through routes and joint rates. To deal with these four subjects seriatim:

It seems a strong thing to say that the mere passage of the law has already effected the first purpose, namely, the abolition of dishonest rates. But such inquiry as we have been able to make tends to show that the statement is not too strong. We have found among railroad officers a consensus of opinion that rebates are dead. "Certainly," say they, "there are none being given on our own road; we do not believe that they are being given by other roads." Further, we find a very general belief that they are not only dead but will stay dead. For this expectation, which is, it may be noted, too optimistic for Wall street to share it, various reasons are given. The main reason is that both railroad men and freighters have shared in the moral awakening that has affected the whole country and have come to see that the giving of secret rebates is a pretty mean form of cheating. But it is further said that railroad men are now realizing for the first time that with the support of law business can be carried on without rebates, and that to grant them is not merely a crime but a blunder. And lastly, it is pointed out that the prospect of fine and imprisonment is a real deterrent. The administration, it is assumed, would like nothing better than to put a prominent railroad man in jail. And if he gives rebates he stands an exceedingly good chance of getting there. For in some cases at least it has been openly declared by railroad officers that if any evidence of the giving of rebates is found it will be promptly passed on to the Interstate Commerce Commission, though in one instance a prominent official admitted that he would probably warn his rival and give him a chance to amend his ways before handing him over to public justice. So far, then, as rebates are concerned we sum up the situation by saying that the railroads are on the side of law and honesty; the would-be law breakers have disappeared; if they reapper their colleagues will, with the help of the drastic powers of investigation possessed by the Commission, suppress them.

The second subject, that of rates which, though open and honest, may yet be held on various grounds to be unreasonable, is a much more difficult one. In the past it cannot be said that all of the decisions of the Commission have been conspicuous for their wisdom. On the other hand, it must be admitted that the railroads have often neglected opportunities to make them wiser. Sometimes the railroad men have adopted an attitude of open hostility; more often an attitude of contemptuous superiority. We have even heard it suggested that the comparative intelligence and authority of the railroad president and the railroad commissioner might be measured in the ratio of their respective salaries. The day for this is, we hope and believe, past. The powers of the Commission have undoubtedly been enlarged; the courts will presumably treat their decisions with more respect than hitherto. Moreover, the Commission seems in its recent actions to be inclined to show the gentleness of conscious strength, modified still further by conscious lack of knowledge. It apparently will endeavor in future to guide the railroads rather than drive them. And the wiser men in the railroad world are, we think, prepared to be guided. Take such a case, for example, as the rates from the East to Colorado and Californian points respectively. Students of the theory of railroad rates know well that a rate to Denver higher than the rate to San Francisco can be abundantly justified on economic grounds. But the man in the street at Denver thinks he knows that it is a cruel and deliberate injury to his city. Now the Commission represents the man in the street. But it also can understand the strength of the railroad case. Is it too much to hope that by concession of some part of what pure economic considerations would justify—a concession that in these days of 10 per cent. dividends on the Union Pacific could well be afforded—the railroads will satisfy the Commission and enlist its authority in support of the essence of the present system as distinguished from its detailed application? Take again such questions as the basing point system in southern territory, or the special import and export rates which are to Boston a matter of life and death. It looks as if frank discussion of these matters with the Commission might, in the present temper of both parties, result in the establishment of a *modus vivendi*, which would on the one hand preserve from a revolutionary disturbance the local interests both of the carriers and the freighters, and on the other hand satisfy the public that the matter had been dealt with from a broader standpoint than that of merely sectional interests.

In the matter of account keeping there is even more positive ground for hope. In its eagerness to stamp out secret rebates Congress has gone so far as to enact that "it shall be unlawful for carriers to keep any other accounts, records or memoranda than those prescribed or approved by the Commission," a provision which, in the hands of an unreasonable body, might have plunged many accounting departments in the country to chaos. The Commission has already notified the roads that it approves in advance all the accounts they are keeping at the present time, and has shown its determination not to make any changes without ample deliberation and full consultation with the officers of the roads themselves. The letter written by Professor Adams, as representing the Commission, to the chief accounting officers of the different roads in its conciliatory and businesslike tone is a model of what such a communication should be. When we learn that officials of some of the leading roads are suggesting that the existing returns should be not only made uniform and more accurate, but also made more full and comprehensive, we see every reason to hope that in this matter at any rate Commission and carriers will work in harmony.

We have left to the last the discussion of what may hereafter prove to be the most important of all the provisions of the new Act, Section 4, which for the first time empowers the Commission to establish through routes and joint rates and prescribe the division of such rates. There is, it is true, a limitation on this sweeping power in the words, "provided no reasonable and satisfactory through route exists." This raises the interesting question, what is a through route? In English law—and English and American railroad law are quite alike, the actual words being often borrowed by the one country from another, a through route is a route over the roads of two separate companies. A route, however long, is

a local route if it belongs to one company. It is a through route, however short, if it belongs to two. From Portland, Oregon, to New Orleans is a local route. From Mount Vernon to 125th street, New York City, is a through route. And such seems to be the meaning of the words "through route" in Section 2 of the Hepburn Act. The Commission appears, therefore, to have power to give a connecting company the right to use, say, the Pennsylvania terminals in Pittsburg, or the New York Central freight stations at Thirtieth street and St. Johns Park in competition with the owning company on terms to be fixed by the Commission at its discretion. In England this power has been actually exercised in cases which to an ordinary railroad man would seem as unreasonable as would be the instances suggested above. What view the Commissioners here will take must remain to be seen when a concrete case comes before them. But it is safe to say that the better the relations between the Commission and the carriers, the less likely they are to adopt a course of action which would offend the sense of justice of all conservative railroad officers.

On the whole we think the outlook for the future is bright, and we hope that the Commission and carriers combined will be able to put a stop to the abuses which have been largely responsible for anti-railroad legislation and anti-railroad sentiment, and may help the railroads to regain the place in public esteem to which the splendid courage and energy with which they have been developed and the admirable efficiency with which they are operated should surely entitle them.

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While the western half of the world has been absorbed in the Harriman dividends and the Hill ore deal, India, it seems, has been rent in twain by a heated controversy which has been waged through the columns of the lay and technical papers of that country. A recent editorial in *Indian Engineering* takes up the question, which is: Shall tonga service to Simla be abolished? If we only were familiar in daily life with a tonga, we might also treat the subject editorially. But in the absence of this necessary basic technical knowledge we can only state the facts in the case as we understand them. A cart road 60 miles long runs from Kalka to Simla, the summer capital. The road was built about 50 years ago and suffers continually from floods; on an average of once in seven years it is completely tied up by landslides. In unavailing efforts to avoid these annoyances it is sometimes bodily shifted across to the opposite side of the valley in which it makes its first steep ascent from Kalka. Through this hospitable country, the Kalka-Simla Railway was built not many years ago. It has now been suggested that the railroad can carry passengers with more regularity than the tongas on the cart road can. The progressive lay papers took up the suggestion enthusiastically, reviewed the disastrous history of the cart road, attacked the weather bureau and charged the tonga management with cutting into the railroad's passenger business. This frenzied competition took a weird turn: the second class fare on the railroad was fixed at 25 per cent. more than the tonga fare; the tonga company saw the railroad and raised them 20 per cent. At this crucial point, it began to be realized that the total daily carrying capacity of the tonga line was six passengers each way and the excitement died away. Sober afterthought is to the effect that perhaps it will be best to suspend judgment on the proposed abandonment of the cart road until the railroad also has been left out in the rain for a few years longer.

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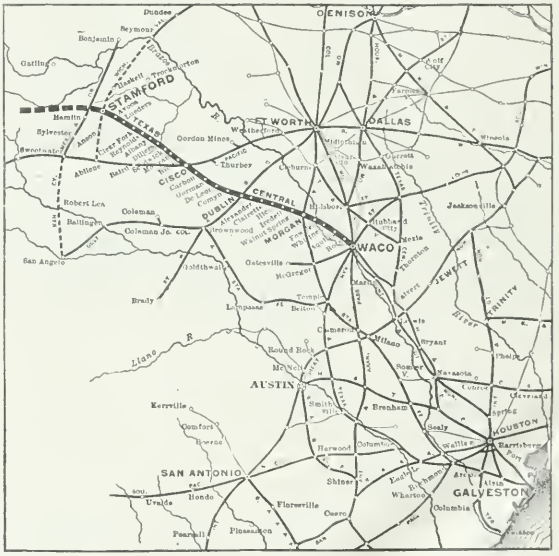
## Texas Central.

The Texas Central was incorporated in 1879, and 230 miles were built, running from Ross, Tex., northwesterly to Albany, 178 miles, with a 52-mile branch from Garrett to Roberts. The company went into the hands of a receiver in 1885 and was sold under foreclosure in 1891, being bought for $750,000 by the interests now in control. In 1893, just after the property was turned over to the reorganized company, the branch line was acquired by the Texas Midland. In 1900, the Texas Central was extended from Albany west to Stamford, 39 miles, and in 1902 the eastern end of the road was extended from Ross to Waco, 11 miles, the last named town having up to that time been reached with trackage rights over the Houston & Texas Central. The road is now being extended from Stamford west 42 miles. The right of way has been secured, material purchased and grading is nearly finished. Track laying began in July, and it is expected that the line will be in operation by the first of December. The Wichita Valley is building a line from Seymour south to a connection with the Texas & Pacific, at Abilene, crossing the Texas Central at Stamford. The Kansas City, Mexico & Orient has built a branch from Sweetwater north, which crosses the extension of the Texas Central a few miles west of Stamford. The new extension is being built to get the traffic which will come over these two new lines and also to build up the country west of Stamford, which is being rapidly settled.

A large proportion of the traffic of the road is in lumber and cotton. The number of tons of these commodities carried during the year ended June 30, 1906, show large increases over 1905. The total tonnage was 237,487, an increase of 26,133 tons.

Both freight and passenger earnings for 1906 show substantial increases. Freight earnings increased from $571,623 to $612,206, or 7 per cent., and passenger earnings from $215,435 to $284,404, or 32.7 per cent. The operating ratio dropped from 64.8 per cent. to 59.3 per cent., operating expenses having increased only 4.6 per cent. The greatest saving was in maintenance charges. Maintenance of way per mile cost $767 during the past year against $804 in 1905, while maintenance of equipment works out as follows: Maintenance of locomotives per locomotive, $2,092; maintenance of passenger cars per car, $461, and maintenance of freight cars per car, $79. The last two items have decreased, but in 1905 new equipment was charged to these accounts. Conducting transportation cost increased 11.7 per cent.

The company has outstanding $2,675,000 common stock, $1,325,000 preferred stock, $1,150,000 first mortgage 5 per cent. bonds, and $150,000 first mortgage 4 per cent. bonds. Five per cent. annual dividends are paid on each class of stock. The balance after dividends and charges on June 30, 1906, was $141,230, from which was deducted $115,269 for new equipment and improvements, and $9,129 for tax on gross receipts. This last sum consists of a tax of 1 per cent. on the gross receipts for the year ended June 30, 1905, plus a penalty of 10 per cent. levied on account of the failure of the company to pay the tax on the prescribed date. This was because




Texas Central.

the law, which was passed in the last session of the Texas Legislature, is still being contested in the courts, and the railroad company finally paid it under protest, pending decision on the constitutionality of the act. The net surplus for the year was $31,357 as compared with $48,312 in 1905, when no appropriation for new equipment and improvements was made out of net earnings.

The principal statistics of operation follow:

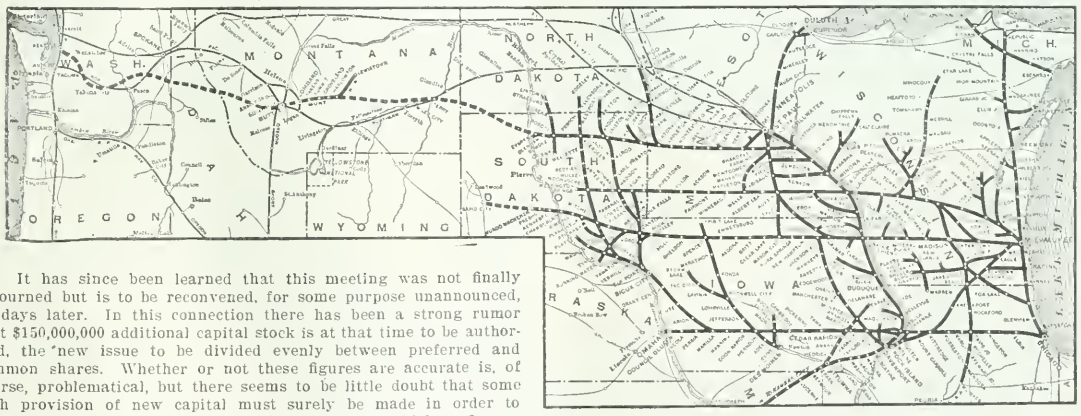
| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 227 | 227 |
| Freight earnings | $616,206 | $571,623 |
| Passenger earnings | 284,404 | 215,435 |
| Gross earnings | 945,241 | 827,380 |
| Maint. way and structures | 174,182 | 182,537 |
| Maint. of equipment | 78,781 | 76,125 |
| Conducting transportation | 274,260 | 245,624 |
| Operating expenses | 560,614 | 535,731 |
| Net earnings | 384,627 | 291,649 |
| Surplus for the year | 31,357 | 48,312 |

## Chicago, Milwaukee & St. Paul.

More striking perhaps than anything which is said in the annual report just issued is the fact that in it no mention whatever is made of the 1,500-mile extension now under construction from the northernmost point in South Dakota at which the St. Paul reaches the Missouri river to the Pacific coast at Seattle. There is an indirect reference to the extension, however, in one of the items on the general balance sheet, where it is noted that the stock of material and fuel on hand, whose value has increased over $2,000,000 above the figure at June 30, 1905, includes about $2,500,000 for material accumulated for the construction and equipment of extensions. The item of cash on hand at the same time has decreased by over $3,000,000. Still another item among the assets

—one which did not appear in 1905—may be traced to the same source. This is the sum of $9,463,816, "advances to other railroad companies," which probably represents sums already invested in the different parts of the new extension. In fact, the impression, due to the failure of the company to allude to this most important extension of its mileage and influence, that the project has been abandoned is entirely a mistaken one. Besides the fact that surveys and construction work are both being carried on on several sections of the new extension, the company has incorporated the new line in South Dakota, Montana, Idaho and Washington, the four states through which, in addition to a few miles in the southwestern corner of North Dakota, it is to run. More than this, an official map of the road, published this month by the passenger department and reproduced herewith, shows the location of the new extension as far as Butte, Mont., including the Montana Railroad, which runs from Lombard, Mont., to Lewiston, 157 miles, which was lately acquired and which is, after necessary improvements, to be used—most of it—as part of the new through line. The probable location of the line from Butte to Seattle is also traced on the map. It was shown more in detail in the map of railroad construction in the state of Washington published in the *Railroad Gazette* of October 5.

The main question which is at the moment of interest in regard to the extension plans is as to the method of obtaining funds to cover its cost. Since the close of the fiscal year it has been announced that the $25,000,000 authorized, but unissued, common stock which has been held in the treasury of the company since 1902, will be issued to stockholders at par. This amount, however, is not sufficient to cover the whole cost of the Pacific extension. The annual meeting of the company was held last week and closed without public announcement of any further provision of new capital. It has since been learned that this meeting was not finally adjourned but is to be reconvened, for some purpose unannounced, 30 days later. In this connection there has been a strong rumor that $150,000,000 additional capital stock is at that time to be authorized, the new issue to be divided evenly between preferred and common shares. Whether or not these figures are accurate is, of course, problematical, but there seems to be little doubt that some such provision of new capital must surely be made in order to provide the road with a comprehensive fund from which to finance the great amount of new work involved in its expansion project. Particularly is this so because while this year has been spent in the more preliminary work of construction, the open months of 1906 should see rapid progress in the actual and more expensive work of grading and track laying.




**Chicago, Milwaukee & St. Paul.**

*Showing probable location of Pacific extension.*

The earnings' record of the present system is a highly satisfactory one. With an increase of 53 miles in the average mileage operated, gross earnings increased from just below $50,000,000 in 1905 to over $55,400,000, a gain of more than $5,500,000. Operating expenses were larger by $4,051,894, leaving net earnings of $20,709,451 against $19,222,406, an increase of $1,487,045. There were at the same time two large charges made to income account for betterments, neither of which the year 1905 can match with similar appropriations. Renewal and improvement account received $1,511,758, and there was $2,540,467 appropriated for replacement of 3,662 old small capacity box cars which were dropped from the equipment inventory at the end of the year, minus cost of certain cars charged to income account in previous years. Against a similar charge of $619,960 in 1905 there was also an appropriation of $712,331 out of earnings for additions to property. Two further charges representing deferred tax payments, postponed pending settlement of litigation, were $450,000 paid the state of Wisconsin for the years 1904 and 1905 and $191,567 paid the state of Michigan for the years 1902 to 1905 inclusive. Even after all these larger appropriations, there was a profit and loss balance for the year of $7,000,000, against one of $8,100,000 in 1905. In 1906 the road earned 14.4 per cent. on its capital stock, as compared with 11.5 in 1905.

With the exception of general expenses, costs of operation were larger in each of the accounts. Maintenance of way cost $5,955,000, an increase of $618,806 over 1905. Maintenance of equipment ($5,598,000) increased $416,460. Conducting transportation cost $19,700,000, an increase of $1,418,923. The principal increases under maintenance of way were in repairs of roadway, $400,000, ralls, $173,000, and ties, $83,000. The expenditures for rails included 46,607 tons of new rails costing $1,328,070, against 31,750 tons laid in 1905 costing $886,752. During the year 46 steel bridges, aggregating 6,297 ft. in length, were built, and over 8,000 ft. of pile bridges were filled with earth. Maintenance of way cost $856 per mile against $773 in 1905, but even this seems only a fair figure. Maintenance of equipment expenses include $694,646 charged to operating expenses to replace equipment destroyed during the year —about the same sum as was charged for this purpose in 1905. The principal increases under conducting transportation were in engine and roundhouse men, $232,000; fuel and other supplies for locomotives, $283,000; train service and supplies, $156,000; switchmen, flagmen and watchmen, $183,000; station service and supplies, $260,000, and use of cars and locomotives, $125,000. This last item shows an increase of something over 100 per cent. over the 1905 figure, an increase which, largely representing as it does the freight car service balance, is rather hard to explain, except on the theory that foreign cars were more extensively used during the notable car shortage which prevailed in granger territory while the crops were moving last season. The average cost of repairs and renewals was $1,454 per locomotive against $1,538 in 1905; of passenger cars, $663, against $592 in 1905, and of freight cars, $46, against $42 in 1905. The increase in the freight car figure brings payments under this head to a more satisfactory level.

The principal increases in tonnage carried were in the following commodities: Flour and other mill products, 200,000 tons; wheat, 153,000 tons; barley, 105,000 tons; oats, 163,000 tons; corn, 65,000 tons; dressed meats, 135,000 tons; bituminous coal, 370,000 tons; coke, 168,000 tons; iron and other ores, 157,000 tons; sand, stone, etc., 175,000 tons; lumber, lath and shingles, 143,000 tons, and iron and steel, 306,000 tons. There was a total increase in tonnage of 2,898,000 tons, or 12 per cent. The principal decrease, suggestive of the Chicago packing house investigation, is in packing house and animal products other than dressed meats, which decreased 118,435 tons, or 28 per cent. The revenue train load was 282 tons against 265 tons in 1905, an increase of 6.5 per cent. Including company freight, the train load was 320 tons against 296 tons in 1905. There was an increase of 4 per cent. in the number of tons of revenue freight carried per loaded car. Both ton mile and passenger mile rates show slight decreases from 1905.

During the year over $2,500,000 was charged to capital against the construction of new lines (not including any part of the Pacific extension). On the extension from Chamberlain, S. Dak., on the Missouri river, west to Rapid City, 219 miles, 75 miles to Murdo Mackenzie have recently been put in operation. Another line in the nature of a cut-off, in South Dakota, from Madison to Renner, just north of Sioux Falls, 34 miles, is nearly completed, more than 20 miles being already in operation. There were opened during the year the extension of the Armour branch from Armour, S. Dak., to Stickney, 21 miles, and a six-mile extension of the Gleason branch, in Wisconsin. The mileage was also added to by purchase of a line of road extending from Oglesby, Ill., to Granville, 11 miles. The principal roadway improvements include second main track now under construction on the La Crosse division from Watertown Junction, Wis., just west of Milwaukee, to Portage, 47 miles, and on the River division from River Junction, Minn., where the Milwaukee line strikes the Mississippi river, to Richmond, 10 miles, and from Lake City, Minn., to Wabasha, 12½ miles, these three pieces of double-track work being on the main line from Chicago to St. Paul and Minneapolis. Extensive reduction of grades and

improvements in alinement are being carried on at various points on the main line to Omaha in Iowa, the Chicago-Milwaukee division and the River division. Against such improvements there has been charged to renewal and improvement account $644,743. Elevation of the tracks used jointly with the Pittsburg, Cincinnati, Chicago & St. Louis from Western avenue, Chicago, to Elizabeth street, and of the road's own tracks from Western avenue to Grand avenue—is just about completed. Renewal and improvement account was charged with $501,678 during the year to cover these expenditures, as well as with $521,700 for an additional ore dock 1,140 ft long at Escanaba, Mich. There have also been important improvements to the company's shops, at an aggregate cost of $414,661, most of which was charged to capital account.

The principal results of the year's operation are summed up in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 6,961 | 6,908 |
| Freight earnings | $40,187,710 | $35,968,946 |
| Passenger earnings | 11,123,545 | 10,126,958 |
| Gross earnings | 55,423,053 | 49,884,114 |
| Maint. way and structures | 5,955,432 | 5,336,626 |
| Maint. of equipment | 5,598,046 | 5,981,586 |
| Conducting transportation | 19,699,381 | 18,280,458 |
| Operating expenses | 34,713,602 | 30,661,708 |
| Net earnings | 20,709,451 | 19,222,406 |
| Net income | 13,323,231 | 11,858,826 |
| Surplus for the year | 7,009,896 | 8,114,970 |

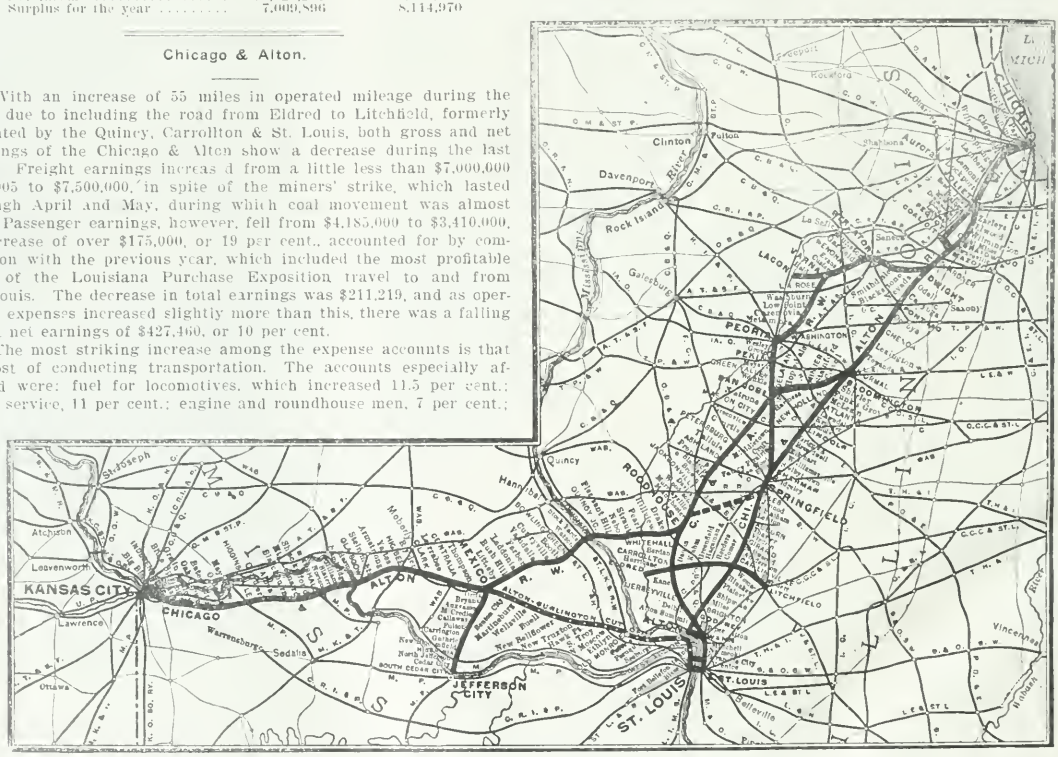
## Chicago & Alton.

With an increase of 55 miles in operated mileage during the year, due to including the road from Eldred to Litchfield, formerly operated by the Quincy, Carrollton & St. Louis, both gross and net earnings of the Chicago & Alton show a decrease during the last year. Freight earnings increased from a little less than $7,000,000 in 1905 to $7,500,000, in spite of the miners' strike, which lasted through April and May, during which coal movement was almost nil. Passenger earnings, however, fell from $4,185,000 to $3,410,000, a decrease of over $775,000, or 19 per cent., accounted for by comparison with the previous year, which included the most profitable part of the Louisiana Purchase Exposition travel to and from St. Louis. The decrease in total earnings was $211,219, and as operating expenses increased slightly more than this, there was a falling off in net earnings of $427,460, or 10 per cent.

The most striking increase among the expense accounts is that in cost of conducting transportation. The accounts especially affected were: fuel for locomotives, which increased 11.5 per cent.; train service, 11 per cent.; engine and roundhouse men, 7 per cent.; switchmen, flagmen and watchmen, 9 per cent., and train supplies and expenses, 10.4 per cent. At the same time there was a decrease of 21 per cent. in cost of advertising and 20 per cent. in switching charges. The increases reflect higher rates of wages, a condition now affecting most railroads. Maintenance of way and structures shows a small decrease for the year. The principal decreases were in the items of renewals of rails, ties and ballast, which decreased respectively 45 per cent., 15 per cent. and 28 per cent. from the 1905 figures. The cost of the first item includes the relaying of 85 miles of track, mostly with new rail. The most important increases under roadway maintenance were in cost of spikes and fastenings, bridges and culverts, and buildings and fixtures, which respectively increased 88 per cent., 34 per cent. and 12 per cent. Per mile of road maintenance of way cost $1,472 against $1,599 in 1905. Figures are presented showing that during the last seven years main track renewals of ties covered 77 per cent. of the mileage, of rails 70 per cent., of ballast 57 per cent., of joints 87 per cent., of switches 108 per cent., and of frogs 136 per cent. There are of the road's mileage 747 miles of main track laid with 80-lb. rails and 631 miles ballasted with stone.

Maintenance of equipment, which increased 5 per cent. over the previous year, cost $3,234 per locomotive against $3,199 in 1905; $671 per passenger car against $632 in 1905, and $48 per freight car against $46 in 1905. There were bought during the year 38 locomotives (five Atlantic, 20 consolidation and 13 switching), and 16 passenger train cars. It is not clear whether they were charged to earnings or capital account. Through car trusts, 100 box cars of 80,000 lbs. capacity, 200 refrigerator cars of 60,000 lbs. capacity, and 300 stock cars were added to the equipment. There are now on order 1,300 box cars and 300 flat cars, both of 80,000 lbs. capacity, and 300 stock cars and 100 furniture cars, both of 60,000 lbs. capacity.

The most important feature of the year's progress is the large amount of improvement work done on the line. Second main track on the Coal City loop was put in operation, thus giving, including this line, a double track between Chicago and Bloomington, Ill., 127 miles. Preparatory to laying second track from Bloomington to Sherman, 51 miles, and at the same time reducing the maximum northbound gradient to 0.3 per cent., 870,900 cu. yds. of earth excavation have been put in place for new roadbed and 1,381 cu. yds. of concrete have been used in extension, replacement and repairs of old culverts and bridges. All track and switch material is distributed on the ground for 33 miles of new main track, 10.4 miles of which are already ready for traffic. The steel superstructure for a new double-track bridge over Walnut creek, south of Lincoln, is on the ground and nine 64½-ft. spans have been erected on the southbound track ready for service. The material for Kickapoo creek bridge, north of Lawndale, three 70-ft. spans, is also on the ground. Work on the Sangamon river bridge for the northbound track north of Springfield, consisting of eight deck plate girder spans on concrete abutments to replace the old pile trestle and old river span, is in progress. Four concrete arches have been substituted for wooden trestles between Sherman and Grove, and the trestle approaches at Mackinaw river bridge, north of Green Valley, have been renewed for 1,155 ft. with treated timber. Double-track has been laid through Springfield south to Iles, 1.8 miles, making the double track continuous from Sherman to Iles, 9.8 miles. Thus, on completion of the section from Sherman north to Bloomington the double-track, with 0.3 per cent. maximum northbound grade, will be continuous from Chicago to Iles, 187 miles. Iles is at the center of the coal mining industry and is the northern terminus of an air line cut-off now under construction to a point near Murrayville, on the Kansas City division, which is to be put in operation by the end of the year. Surveys have also been made through the coal district between Springfield and Nilwood for double-track and with a view to reducing northbound grades to the same maximum. It is expected that with the exception of 23 miles from Lawndale north




Chicago & Alton.

to Bloomington by December 1 of this year the double-track and grade reduction will be continuous from Iles to Chicago. Completion of the cut-off from Springfield to Roodhouse (Iles-Murrayville) should bring the Kansas City line into closer and easier connection with the main line of the system.

On March 14 of this year the old Chicago & Alton Railroad Company was consolidated with the Chicago & Alton Railway Company, the then operating company, under the name Chicago & Alton Railroad Company. When the Railway Company was organized it acquired a large block of stock of the Railroad Company for the purpose of consolidating the two. By the consolidation agreement the stockholders of the Railway Company exchanged their stock, share for share, for the preferred and common stock of the consolidated company. The stockholders of the old Railroad Company have the privilege of exchanging their stock for cumulative 4 per cent. prior lien and participating stock (total issue, $889,300) of the new company, on a basis which, according to the statement in the report, will yield them higher returns than they have received or are likely to receive if they retain their old certificates—a rather broad hint of the desirability of such a course. The advantages of the consolidation are the saving in unnecessary administration expenses and the unifying of the financial affairs of the railroad, which were complicated by being divided between two different companies. One result of the consolidation is shown in the profit and loss account of March 13, 1906, the day before the consolidation was made, which shows that the total ($2,500,000) profit and loss surplus of the two companies on that date was written off against unfunded discounts of each of the two companies and old accounts.

The report states that freight tonnage increased 16 per cent. and increased revenue from this account would have amounted at the 1905 rate to $1,134,703. On account of the decrease of one-half of a mill (0.05 cents), or 7 per cent. in the average ton-mile rate the increase in revenue was only $542,154. Freight receipts per train mile, however, increased from $2.39 in 1905 to $2.45 last year, a gain of 2.5 per cent. The passenger mile rate, owing to the low rates given on Exposition travel, rose 18½ per cent., from 1.73 cents in 1905 to 2.05 cents in 1906. Passenger train receipts per train mile, however, decreased 20 per cent., from 1.48 cents in 1905 to 1.18 cents last year. The freight density increased 107,542 tons, or 10 per cent., and the passenger density decreased by 93,276 passengers one mile per mile of road, or 35 per cent. The average number of passengers per train mile showed exactly the same decrease of 35 per cent., or from 75 in 1905 to 49 last year. In spite of the increase of 16 per cent. in revenue ton mileage, freight train mileage increased only 5 per cent. The average revenue train load was 381 tons against 347 in 1905, and, including company freight, 418 tons against 374 tons in 1905, increases of 10 and 11 per cent., respectively, which show already the result of the betterment of grades on the line between the coal producing region and the principal market for the Alton's coal at Chicago.

The principal results of the year's operation are summed up in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 970 | 915 |
| Freight earnings | $7,501,081 | $6,958,927 |
| Passenger earnings | 3,410,443 | 4,185,561 |
| Gross earnings | 11,586,095 | 11,797,314 |
| Maint. way and structures | 1,427,875 | 1,403,689 |
| Maint. of equipment | 1,407,675 | 1,536,211 |
| Conducting transportation | 4,654,977 | 4,469,846 |
| Operating expenses | 7,818,904 | 7,602,663 |
| Net earnings | 3,767,191 | 4,195,651 |
| Net income | 1,009,980 | 933,167 |

## The New Allegheny Engine Terminal of the P., F. W. & C.

In connection with track depression work at Allegheny, Pa., which has been in progress for some time past, the Northwest System of the Pennsylvania Lines West of Pittsburg has lately finished some complete engine terminal facilities, including a 41-stall engine house, and a large coaling plant of the Robins conveying type. The accompanying interesting view of the roundhouse was taken from this coaling plant, which is quite close to the roundhouse. The coaling plant can serve engines on four tracks at once. It will be observed that these four tracks reduce to two as they approach the turntable, and that the latter is accessible from three separate tracks. The turntable is motor-driven. The view also shows the water cranes between the pairs of coaling tracks, and the ash hoist in the foreground on the left. The photograph was sent us by Mr. R. Trimble, Chief Engineer Maintenance of Way.

New Allegheny Engine Terminal of the Pennsylvania Lines West, North-West System.

## Railroad Decisions in September.

*Connecting lines operated as a single system.*—Where numerous lines are operated as a single system by one railroad, though the general management of each road is retained by its owners, the relation between the subordinate companies and the operating company is that of principal and agent with respect to traffic originating on the constituent lines, and the operating company is directly liable for an injury to one employe in unloading one of its own cars on the tracks of one of the constituent lines through the negligence of the employes of the latter. Lehigh Valley vs. Delachesa, 145 Fed. Rep. 617.

*Inspection of bumpers.*—A railroad company owes to brakemen in its employ the duty of inspecting the bumpers of freight cars where it is aware that the bumpers are used as steps by brakemen while coupling cars. Lyle vs. Alabama Great Southern, Fed. Rep. 611.

*Speed of trains on dry and windy days.*—A railroad is under no obligation to diminish the customary speed of its passenger trains on dry and windy days in order to decrease the likelihood of starting fires through sparks thrown from locomotives, at least in the absence of some evidence of danger of fire due to the speed of the train. Woodward vs. Chicago, Milwaukee & St. Paul, Fed. Rep. 577.

*Automatic couplers.*—The automatic coupler act applies to all cars regularly used on any railroad engaged in interstate commerce not only while actually being used in such commerce but at all times when in use. United States vs. Great Northern, 145 Fed. Rep. 438.

*Criminal liability for accepting rebate.*—A person accepting a rebate in violation of the Elkins act cannot escape criminal liability therefor on the ground that he received no benefit from it but turned it over to another without consideration. But the mere fact that a defendant in a prosecution under the act was a stockholder in a corporation accepting a rebate does not render him subject to the penalty imposed by the statute. United States vs. Wood, 145 Fed. Rep. 405.

*Damages to abutting property as preference in insolvency.*—A claim for damages to abutting property resulting from construction of a railroad has priority over a mortgage of the road and is entitled to preference in the distribution of proceeds of the property when sold in foreclosure proceedings. Fordyce vs. Kansas City & Northern Connecting Co., 145 Fed. Rep. 566.

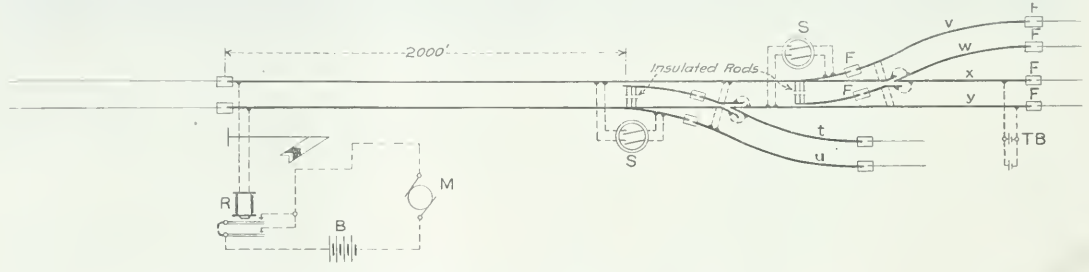
*Preferential claims.*—A general creditor of an insolvent railroad company is not entitled to preference over a mortgage which covered not only the corpus of the railroad property of every kind and description, but also the net income after deducting current operating expenses, unless the debt was contracted upon the faith of being paid from the current income and not created for construction or ordinary equipment. And even when so contracted as a general rule these creditors are not entitled to preferential payment over the mortgage from the proceeds of the property at foreclosure sale where less than the mortgage debt is realized, unless there has been a diversion of net income to the benefit of mortgagee which the claimant must show to be a fact. Fordyce vs. Omaha, Kansas City & Eastern, 145 Fed. Rep. 544.

## Distant Switch Signals on the Union and Southern Pacific.

The determination of the officers of the Union Pacific, the Southern Pacific and the other lines controlled by these to fully equip their lines with signals to protect facing point switches which have no connection with interlocking, has already been noticed in these columns. The plans for this work have been so far carried out that 185 signals have already been set up, and more than 600 others will be installed before the first of next January, making something like 800 switches protected. These signals are, of course, not on the lines over 800 miles in extent, which are equipped with automatic block signals.

The diagram shown herewith illustrates the standard arrangement. The connection from the switch to the distant signal is by track circuit, and the apparatus and fixtures now installed will be available for and become a part of the automatic block system whenever such system is extended to the lines in question.

On some parts of the Southern Pacific the use of ordinary mechanical wire connections between switch and distant signals was found troublesome by reason of the heavy snowfalls in the winter,




Standard Arrangement of Electric Circuits for Distant Switch Signals on the Harriman Lines.

and for this reason it was decided to make all connections by means of the track circuit.

In the example shown in the drawing there are two switches, but the arrangement, in principle, is precisely the same as for one switch or any number of switches. The switch instruments (s) have double wire connections and the control of the signal motor (m) by the track relay (r) is also safeguarded by the use of two armatures on the relay. The rails of the side tracks (t, u, v, w) are included in the circuit as far as the fouling pints (F) as usual. Rails w and x are connected together in the usual way; v and y are connected with each other, but insulated from w and x. Those parts of the track not bonded for the electric current are shown in light lines.

## Taxation of Railroad and Canal Property in New Jersey.*

An act passed by the legislature of New Jersey early this year is intended to alter radically the rate of taxation on railroads and canals in that state. Prior to the enactment of this act the tax rate upon the greater part of such property was by law limited to one half of 1 per cent. on the dollar of valuation. Hereafter the greater part of all railroad and canal property is to be taxed at the "average rate of taxation" imposed upon general property.

The previous limitation of the tax rate upon the greater part of railroad and canal property to one-half of 1 per cent. of their "true value" dates from 1884, when a State Board of Assessors was created. This board was required to assess the property of railroads and canals. For purposes of assessment the property of such companies was, and continues to be, divided into four classes: (1) main stem or water-way; (2) other real estate; (3) tangible personal property; (4) franchises. The "main stem" of a railroad is defined as covering the roadbed not exceeding 100 ft. in width, including rails, sleepers and passenger stations. The act of February 26, 1906, changes the definition of "main stem" so as to exclude passenger stations and freight buildings. In the case of canals the "waterway" includes the towing-path and bermebank. "Other real estate" includes roadbed (namely, roadbed other than main stem), waterways, reservoirs, tracks (sidings), buildings, water-tanks, waterworks, riparian rights, docks, wharves and piers Tangible personal property includes rolling stock, canal and ferry boats, tools and machinery necessary for and used in state commerce. Franchises include intangible values, and are estimated by the State Board of Assessors presumably at 60 per cent. of the excess, if any, of the value of the securities (bonds and stocks) over the assessed value of main stem, other real estate, and tangible personalty. Stocks and bonds are, by law, practically exempt. With the exception of "other real estate" commonly spoken of as "property of the second class," the tax rate on the dollar of assessed value as determined by the State Board of Assessors was by the act of 1884 fixed and limited at one-half of 1 per cent. The revenue so raised went into the state treasury for state expenses. On property of the second class—namely, "other real estate"—there was also levied a state tax of one-half of 1 per cent. But in addition this property of the second class was liable to a tax for local purposes not to exceed 1 per cent. upon the dollar of valuation as determined by the State Board of Assessors. Beginning in 1897, the entire tax derived from property of the second class was paid over to the various taxing districts traversed by a railroad or canal, each district receiving the tax raised on the State Board of Assessors' valuation of that segment of railroad or canal located within the local taxing district concerned. In 1905 property of the second class was subjected to taxation at the *prevailing tax rate in the local taxing district.* The assessment of this class of property (real estate other than main stem) continued to be made by the state board; but the previous maximum limit on the local tax rate (1 per cent.) was done away with.

In 1904, complaint had grown acute with respect to what was claimed to be the unfair privilege enjoyed by railroads in the matter of taxation. It was argued that the average rate of taxation on general property in the state was about $22 per $1,000 of valuation, while railroads and canals paid at the rate of $6.80 per $1,000 of valuation. Certain localities, like Jersey City, were especially aggrieved, alleging that extensive terminals within their limits were taxed at a much lower rate than surrounding real estate. The transportation interests replied that the disparity in tax rates was more apparent than real, owing to the more complete disclosure of their property and its more rigorous assessment by the state board than was customary in the case of local assessors. The issue of "equal taxation" was shown, however, to have great popular strength behind it, and the present law aims at the assimilation of railroad property to other property, so far as the rate of taxation is concerned.

The act of April 5, 1906, continues the assessment of the main stem, tangible personalty and franchise by the State Board of Assessors. The assessment of railroad property of the second class (real estate other than main stem) is hereafter to be made by local assessors. The local assessors in every taxing district of the state are now required on or before October 1 of each year to forward to the State Board of Assessors a certified statement of the total valuation of property assessed by them, each in his own taxing district, and also the rate of taxation in the district. The aggregate value of all property thus returned shall be deemed "the aggregate value of the general property in the State." The law also requires that the tax rate in each district shall be multiplied into the total property assessed therein, and the several products thus obtained shall be added, and the aggregate so ascertained shall be deemed "the aggregate taxes of the state." The "aggregate taxes of the state" thus defined shall be divided by "the aggregate value of the general property in the state," and the quotient is to constitute the "average rate of taxation" for the year. At this rate the State Board of Assessors are required to compute the tax on main stem, tangible personality and franchise.

The probable results of the act cannot be accurately forecast.

*Abstract of a paper published in the *Quarterly Journal of Economics*, for August, 1906, by Winthrop M. Daniels.

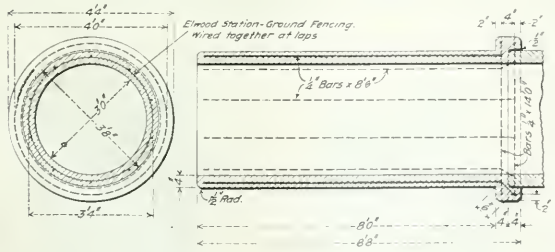
The transportation interests will probably assail its constitutionality, although the decision in the case of *Central Railroad Co. v. State Board of Assessors*, 19 Vroom, would seem to indicate that it will stand the judicial test. The railroads are said to be urging local assessors to make a higher valuation of general property in local tax districts, inasmuch as this will reduce "the average rate of taxation," and the railroad taxes in consequence. In case the law stands, it ought largely to augment the receipts of the state treasury, but just to what degree experiment alone can determine.

## Reinforced Concrete Culvert Pipe on the Burlington.

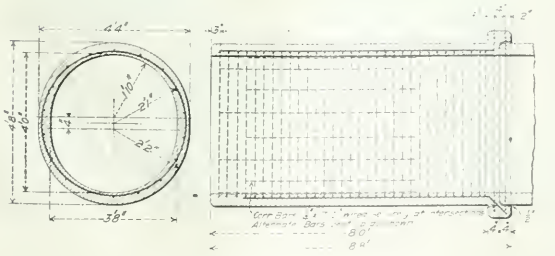
In all wooden trestle elimination work that has been done recently on the Burlington Lines East of the Missouri River, instead of the usual cast-iron pipe culverts, reinforced concrete pipe has been used, at a considerable saving in expense. There has been laid to date about 6,000 ft. of this pipe in three sizes—48 in., 36 in. and 24 in. It is made in 8-ft. sections, of which the foregoing amount includes 250 sections of the 48-in., 320 of the 36-in. and 180 of the 24-in. A photograph of two finished sections of the pipe is shown, and detailed drawings of both pipe and forms.

Reinforced Concrete Culvert Pipe, C., B. & Q.

The largest size—48 in.—is reinforced with ¼-in. corrugated steel bars. The circular reinforcing bars are formed into individual hoops with the ends lapped 1 ft., the hoops being spaced 3 in. centers. The longitudinal bars, 18 in number, are spaced, approximately, 8⅝ in., and alternate bars have their ends bent up at the bell end of the pipe to reinforce it at that point, as shown on the drawing. As appears from the cross-section, the pipe is made slightly elliptical, the horizontal diameter being 4 in. less than the vertical diameter. This is to enable the reinforcing hoops to occupy the position shown relative to the inner and outer surfaces at the top and bottom and the sides, respectively, properly to take care of the stresses. The increased vertical diameter is obtained by inserting a 4-in. wooden wedge strip between the halves of the form on each side. The pipe must be laid




Reinforcement of 36-in. Pipe.



Reinforcement of 48-in. Pipe.

in this position, of course, and the top is suitably marked by metal letters attached inside the form.

The two smaller sizes are made circular and are reinforced circumferentially by steel wire fencing, ¼-in. corrugated bars being used longitudinally, however. The disposition of bars and fencing is clearly shown in the accompanying sections of the 36-in. pipe. Two pieces of the fencing are used, one being 58 in. wide and the other 34 in., wired together at the laps. The length over all of each of the sizes is 8 ft. 8 in.

A 1:4½ mixture of gravel concrete is used. It is applied very wet, in small quantities at a time, and spaded. The forms are lined with galvanized steel, which is oiled with a heavy oil before applying the concrete. The resulting pipe has a surface of great smoothness. The 48-in. sections weigh about 5,500 lbs., the 36-in. about 4,825 lbs. and the 24-in. about 3,470 lbs., the quantities of concrete being 38, 32 and 23 cu. yds., respectively.

At the present time the pipe is being made at two points—at Hannibal for the Missouri district, and at Montgomery, Ill., near Aurora, for the Illinois and Iowa lines. At the former point the work is being done by company forces and at the latter by contract. The present cost per foot of the pipe laid is, approximately, $3.25 for the 48-in., $2.75 for the 36-in. and $2.25 for the 24-in. As the cost of the corresponding sizes of cast-iron pipe laid is about $10, $6 and $3.50, respectively, the great saving is obvious.

The designs were prepared under the direction of the Bridge Engineer, Mr. C. H. Cartlidge, to whom we are indebted for the data. These plans are regarded only as experimental and will be modified as occasion arises. Thus far none of the pipe in service has given indication of weakness of any sort.

## Railroads in Belgium.

BY EMILE GUARINI.

Railroads in Belgium have an importance quite out of proportion to the limited area of the territory which they serve. The reason for this is that Belgium is highly developed industrially. Ownership of the railroads is, with the exception of a few branch lines, divided between the State, a few private companies and the Société Nationale des Chemins de Fer Vicinaux. The lines controlled by this latter company are railroads, so far as their construction and equipment are concerned, but they are really tramways, inasmuch as they have no signals and run along the public roads instead of on an enclosed right of way. These "vicinal" lines have been developed widely in Belgium. Strangely enough, in spite of the fact that they run on public roads without adequate protection, they have a lower average of accidents than the regular railroads.

The total length of the railroad mileage of Belgium is 4,431, of which the State controls 2,530 miles, private companies 367 miles, and 1,535 miles are vicinal lines. There are .384 miles of railroad for each square mile, on the average, of the country's area, this figure being much higher in the industrial provinces and much lower in the mountainous districts in the eastern part of the country and in the low-lying hilly regions. The profits of the State from operation of its lines are small. The total capital of the tramways is $31,181,400 and the gross earnings per mile are from $1,000 to $10,400. Annual receipts are about $2,500,000.

The vicinal lines enjoy numerous privileges. They are free from taxes and from postal duties, and their capital is, for the most part, furnished by the State, the provinces, and the communities through which they run. Of these lines, 80 are used for transportation of agricultural products, 174 for industrial products and one for military purposes. There are in service on these lines 470 locomotives, varying from 12 to 30 tons in weight. They have platforms in front and behind, with starting gear, brakes and warning signals at each end. The warning signals are horns, operated by small pneumatic hand pumps. The platforms are provided with glazed, movable frames, which protect the engineer from wind and dust. On these tramways all the staff, excepting the enginemen, co-operate in working the switches and in loading and unloading the freight.

On the State railroads freight trains must not be made up of more than 60 cars. In passenger service the average speed is about 38 miles an hour. Some of the express trains run at a rate of over 60 miles an hour.

The State railroads are all standard gage, but 1,511 miles of the other lines are narrow gage, mostly 3 ft. 3 in; maximum gradients are 3 per cent. and maximums of curvature, 17 degrees. Rails on the more important lines are of the Vignoles section, weighing from 76 lbs. to 105 lbs. per yard. Of the State lines, 747 miles use the block system, though automatic signals are never used. The system most in use is that developed by an engineer named Flamache, which costs $700 per post. At present Siemens & Halske electric signals are being installed at the large stations. There are large installations at the Antwerp, Brussels and Ghent terminals which are just about to be finished. The most powerful locomotives, of which 123 are now in use on the State lines, have eight drivers. Six coupled locomotives with 60-in. drivers have recently been introduced and are used chiefly for hauling ordinary passenger trains and express freight trains. The use of these engines in passenger service has done away with double heading in many cases. Careful experiments have shown that it is advantageous to use, in the average deep locomotive firebox, at places where it is specially difficult to haul trains, a new type of briquettes as an auxiliary fuel. By their use the production of steam is increased and the fire given greater stability on the grate. The price of these briquettes is nearly 50 per cent. higher than the small coal generally used, but trials have shown that it pays to use them on steep grades. Enginemen of engines which have deep fireboxes are provided with a stock of briquettes equal to 20 per cent. of the total coal consumption.

The passenger and freight cars in use in Belgium are of many kinds. Improvements have of late been made in the passenger cars on the State lines by the introduction of corridor cars. Each compartment has six windows fitted with spring blinds. The cars are heated by steam, and there is a regulator provided to enable passengers to regulate the heat. The cars are lighted by electricity, and each compartment has an alarm signal connected with the locomotive. The Stone system of electric lighting is widely used and found most satisfactory. In winter the ordinary cars are heated by hot water pans, or foot warmers, of which some 50,000 are in use. This method of heating is costly and unsatisfactory. Experiments were made last winter in heating a few of these cars with steam, but complaints were unanimous; the couches nearest the engine were scarcely heated at all, while the others were entirely cold. Some of the less important trains are heated by portable stoves, and this while primitive, is as yet the most satisfactory method. Great care is taken to thoroughly disinfect all the cars and stations.

## Rail-Motor-Car Traffic in England.*

In this paper the authors propose to deal as far as possible with the question of rail motor cars, and it must be understood that they are seeking to give facts as to the best means of dealing with local and branch line passenger traffic, as being a commercial question as well as an engineering one. The best method of conveying passengers is clearly that one which yields the best results in the balance sheet, and at the same time gives satisfaction in other ways. The opinion held by most locomotive engineers, and by a large number of electrical engineers, on the broad and general question of railroad electrification, is that for dense suburban traffic only is it justifiable. It is suggested and maintained that the electrification of branch and main line traffic will, as a general rule, result in a loss to the railroad company, as the load-factor at the power station will be a very poor one, owing to the intermittent traffic. On the other hand, suburban traffic, especially if in thickly populated areas, calls for a more frequent service and a greater acceleration of speed than is attainable with ordinary passenger trains. It is not only desirble but is quickly becoming a necessity that, if the suburban railroad system is to hold its own with municipal tramway competition, a frequent service with high acceleration must be established in suburban districts. It was to meet this competition that one or two attempts were made to produce self-contained cars on various lines in the early part of the last century. While these cars were more or less a success, the requirements were not then great enough to encourage continuation.

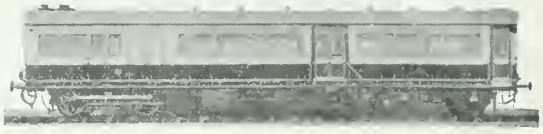
It may not be out of place to mention here that in 1873 or 1874 a Mr. Rowan designed and built self-contained steam cars for which he could find no sale in England. His cars were, however, taken up to a certain extent abroad, notably, in Austria and Switzerland. In 1902, however, the competition of street cars in the suburban districts, especially around London, became more acute, and caused the railroad companies to give serious thought to the matter, and railroad motors were introduced by the London & South Western as an experiment. This proved so far successful that the Great Western and the Taff Vale Companies followed by building cars for trial upon their lines to fulfil the requirements of a more frequent service upon sections in certain districts where traffic was light. It was obviously impossible to run such a frequent service with ordinary trains as being too expensive, the running expenses and the capital outlay involved being too great in proportion to the passengers carried. It was then seen that the solution of the difficulty lay in self-contained cars, and the question of what motive power to use then arose; steam or electricity, and if electricity, which of the many methods of application would be employed.

The first company to move in the direction of self-contained car traffic was the London & South Western, which placed a steam car on its line between Fratton and Southsea in 1903. This car, which was equipped with small cylinders and a vertical boiler, was fairly successful, and encouraged the idea that progress in this direction promised a solution of the problem. Next, the Great Western adopted the four-wheel coupled type, the boiler being vertical and the engine being placed under the car. This car, which had to contend with heavier gradients than the car of the London & South Western, was necessarily more powerful.

The Taff Vale Railway has a certain branch, which, owing to the paucity of passengers as a general rule, was not as profitable to work as was desired, and it was to this branch that attention was first drawn for any better and cheaper method of working. To be sure of getting the best results, careful comparisons were taken of the cost, both capital and running, of steam and electricity, the latter of which was subdivided as follows:

1. Self contained cars, that is, worked with secondary batteries.
2. Third-rail system.
3. Overhead system, (a) with bonded rail return; (b) with new return rail.
4. With lead and return rails.

With a view to gaining experience in the methods obtaining abroad, one of the authors visited Belgium, France and Germany, and also collected information from all parts of the world where electricity was being used for rail traction, and the matter was thoroughly gone into. Various makers were asked to tender for the different classes of equipments, and the cost was carefully summarized. It was at once seen that the expenses of Sections 2, 3 and 4 were much too costly, the manufacturers and contractors, in fact, preferring not to quote for these, on account of this great



London & North Western Motor Car.

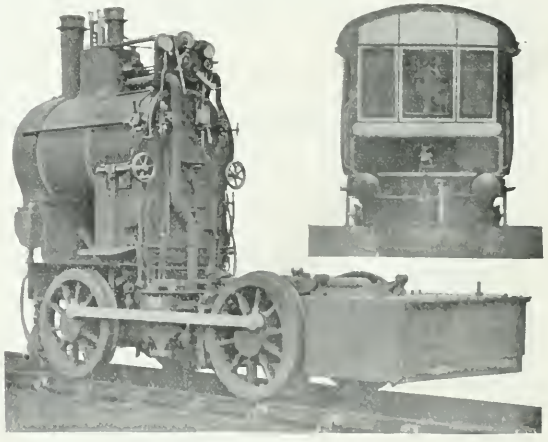
initial expense. The cost of a car with dynamo, driven by a petrol-engine with accumulators for working in parallel with the generator when necessary to overcome stiff gradients, was also considered. The outlay for this was, however, enormous, as the equipment, besides the above, also comprised a milking booster and two 75 h.p. motors, and caused the scheme to be abandoned.

The idea of a car run by current from secondary batteries was, however, given more consideration, and one of the authors visited Belgium and Swansea, and examined the cars used there, which at that time were run by storage batteries. The gross weight, without passengers, of each car was 100,800 lbs. and 43,260 lbs. respectively, and the seating accommodation was in Belgium 50 to 60, and at Swansea 42 inside, 57 outside. The capacity of the batteries was 110 ampère-hours, and the normal discharge rate 20 ampères at Swansea and 250 ampère-hours with discharge rate of 125 ampères in Belgium.

The general conclusion arrived at on the subject of battery cars was not favorable, as their first cost, namely, $20,000—$25,000, was high, and their maintenance was also excessive, while their weight and periods of inactivity when charging (a time equal to their period of activity) were all features which did not compare favorably with steam cars.

The results of the costs of the other sections are given in Table 1, and the running cost of an ordinary train is also given as a comparison, as well as the actual cost of the self-contained steam car.

These figures were based on the original design of the Taff



London & North Western Car.

*Showing boiler in position on engine truck, also wheel on rear of car for working regulator when driven rear first.*

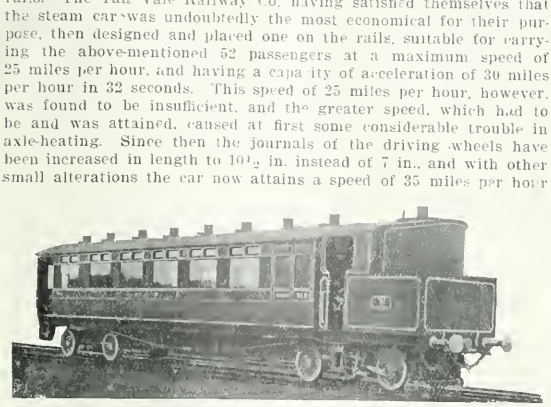
Vale Company's car to hold 52 passengers, their latest design holding 70. The conclusion drawn from these figures was, that unless the service is very frequent, that is, a train every few minutes, and the maximum distance from the power-house short, the steam service is better and more economical than the electrical. The question of taking current from a supply company in preference to installing generating plant was also thoroughly considered, and there is no doubt that when the amount of current or load factor fluctuates much, or where the power is originally small, the supply company can work at a considerably cheaper price per unit. Again, if the distance is great, that is, if the start and finish of that part of the line which is to be electrified are some way apart,

*From a paper presented at the Cardiff meeting of the Institute of Mechanical Engineers by Messrs. T. H. Riches and S. B. Haslam.

a considerable point in favor of the power supply is raised, as the current could be supplied at two or three points along the line, thereby doing away with and saving a considerable voltage drop and the resultant losses and the increased outlay. In the question of steam and electricity the subject of control has also to be considered.

It is worthy of remark that even those railroads which have gone in for the electric system have mechanical braking on their cars in preference to electrical, and it is generally held that the steam cars are, as a whole, more amenable to requirements and more easy to control. The usual system of braking on electrical railway cars is one or another of the ordinary air or vacuum brakes—the pump being driven by a small electric motor.

It was while these results were being arrived at that the London & South Western Railway Co. placed their steam car on the rails. The Taff Vale Railway Co. having satisfied themselves that the steam car was undoubtedly the most economical for their purpose, then designed and placed one on the rails, suitable for carrying the above-mentioned 52 passengers at a maximum speed of 25 miles per hour, and having a capacity of acceleration of 30 miles per hour in 32 seconds. This speed of 25 miles per hour, however, was found to be insufficient, and the greater speed, which had to be and was attained, caused at first some considerable trouble in axle-heating. Since then the journals of the driving wheels have been increased in length to 10½ in. instead of 7 in., and with other small alterations the car now attains a speed of 35 miles per hour



Car for Great Southern & Western (Ireland).
*Cylinders, 8½ in. x 12 in.; 333 tubes, 1⅜ in. outside diameter.*

with ease. The comparison of the weights, sizes and general details of the best known cars are given in Table 2.

The following points which cannot be tabulated are worthy of notice:

*Great Western Railway Car.*—The trailing pair of wheels of the motor bogie are the driving wheels and are coupled to the leading pair. The cylinders, which are fixed inside the frame, have balanced slide-valves, while the motion is of the Walschaerts type. The cars are lighted by means of 20-c.p. incandescent-gas lamps, the gas being stored in cylinders attached to the underframe. Hand and vacuum brakes are fitted to each bogie, and can be operated from either end of the vehicle, while electrical communication is provided between the motor and driver's compartments. The water tank, which holds about 450 gallons, that is, sufficient to take the car 30 miles, including stops, is attached to the underframe. The main frame of the coach body runs the whole length of the car and includes the engine and boiler.

*Taff Vale Railway Car.*—As previously mentioned, the leading pair of wheels are the driving wheels, the cylinder being fixed between the leading and trailing pairs outside the frame. The valves are operated by an ordinary link motion with rocking shaft. The compartments are heated by steam from the engine with warmers of acetate of soda, and the lighting is done by Pintsch's system of oil gas. Steam and hand-brakes are provided on the motor bogie, while there is a hand-brake in the car bogie, the latest type being also fitted with vacuum brakes. The conductor can communicate with the motorman by means of an electric bell, and also shut off steam and sound the whistle. The motor is capable of traveling at 35 miles per hour on the level, and can ascend a gradient of 1 in 40 at a speed of 20 miles per hour. This car can be driven from either end, and all operations except starting can be performed from the guard's compartment. A distinct feature of the car is the ease with which the engine can be taken from the coach body, 20 minutes being ample time for this work, while it can be put under in the same time.

*Great North of Scotland Railway Car.*—In this car again the leading pair of wheels of the motor bogie are the driving wheels, the cylinders being fixed outside the frame between them and the trailing pair. The slide-valves are placed above the cylinders and are actuated by means of the Walschaerts gear. The cars are lit by Stone's system of electric lighting, the current being generated by a dynamo suspended from the carriage underframe and driven from one of the axles. The water tank is also suspended from the underframe and holds 660 gallons. Provision is made for driving the car from either end, and for this purpose the vestibule is fitted with a steam regulator, whistle-handles and Westinghouse and hand-brakes. There is also fitted Chadburn's telegraph apparatus, which indicates the various notches backwards and forwards at which the driver wishes the gear to work.

*Great Central Railway Car.*—Both vacuum automatic and hand-brakes are used, and, together with the steam regulator and whistles, can be governed by the driver from either end, while there is electrical communication between driver and conductor. The passenger compartments are heated by steam from the engine, and the car is lit throughout by electricity, the dynamo and accumulator being suspended from the underframes, the former being driven by a belt from one of the axles. The water storage is also under the frame.

*London & North Western Railway Car.*—In this car the cylinders are carried inside the frame of the motor truck, while the water tank, which has a capacity of 455 gallons, is carried under the carriage body, but attached to the engine truck. The engine can be worked from either end of the car, which is fitted with automatic vacuum and hand-brakes, and is lighted throughout with electricity on Stone's system.

*South Eastern & Chatham Railway Car.*—The cylinders of this car are carried outside the frame placed horizontally with the valves on the top, the latter being operated by means of the Walschaerts gear. Water to the amount of 400 gallons is carried in three tanks, one on each side of the boiler with a well tank between the frames. Vacuum automatic and hand-brakes are provided. The guard's compartment is fitted with levers for working the reversing gear, regulator, whistles and hand-brake, while electrical communication is provided between each end of the car. The carriage is fitted with Stone's system of electric lighting, the dynamo accumulators being carried underneath the frame.

*Great Southern & Western Railway Company of Ireland Car.*—In this design the leading pair of wheels of the motor truck are the driving wheels, the cylinders, which are outside the frame, being slightly out of the horizontal. The valves are operated by means of the Walschaerts gear. Steam can be shut off from either end of the coach, while electrical communication is provided between front and rear portion. The average speed of this car is 20 to 21 miles per hour.

*Canadian Pacific Car.*—The car is to be operated by steam generated by fuel oil, while the boiler is a return-tube boiler with a superheater fitted in the back end of the boiler. The cars have single driving wheels and their valves, which are of the piston type, are operated by the Walschaerts valve-gear. Acetylene gas is used for the lighting purposes. The oil is consumed in a circular Morison furnace, 32 in. inside diameter by 5 ft. 6 in. long.

*Great Northern (Ireland) Car.*—The cars built by this company have cylinders fixed horizontally outside the frame, between the wheels, driving to the trailing pair which are coupled to the leading pair. The valves, which are on the top, are operated by the Walschaerts type gear. The cars are fitted with an automatic vacuum-brake operated from either end of the car, while there is a hand-brake on the car itself. The cars are all heated by steam and lit electrically on Stone's system. Electrical communication and speaking tubes are provided between the driver's and guard's compartments.

*North-Eastern Car.*—This company, while having no steam motor cars, has a number of engine and coach combinations performing practically the same service, as the engine can be driven from the front end of the coach when running behind it. A driver's compartment is forward in the rear end of the coach and fitted with a wheel for the reversing gear, a lever for the steam regulator, an air-brake valve, a hand-brake and a whistle worked from the air-brake reservoir. The driver has therefore complete control of the locomotive, with the exception of the cylinder drain cocks and sanding gear, which are worked as required by the fireman. The reversing gear is worked by the hand wheel keyed to a shaft which carries a sprocket wheel gearing with a longitudinal shaft by a chain. This shaft extends the whole length of the coach and gears to the screw of the reversing gear by means of an intermediate shaft and chain. A three-jaw clutch is interposed to disconnect the operating gear when it is desired to work the locomotive from the footboard.

This railroad company has also an electrical car running between Scarborough and Filey, which is operated in a somewhat novel way. A storage battery of 38 cells is suspended between the frames and supplies current to the generator, which is used as a motor to start up the petrol engine. After the engine has been started, the current is switched off and the motor takes its proper place as a generator. A small exciter is used both to excite the main generator which drives it and to supply the lighting current for thirty 72-volt, 16-c.p. lamps. The voltage of this machine can be increased to 95 volts for charging the battery when not required for lighting.

*Missouri Pacific Car.*—This company is now building a car which is being manufactured by the St. Louis Car Co., the special feature of which is the engine, which is being manufactured under the Wagenhals patents. The engine is the double-cylinder actuated by the Stephenson link-motion. The frame of the engine will be secured to the rear of the frame of the truck, and the forward end

of the engine-frame will be secured in journal-bearings on the axle. The crank-disc will be located on a jack-shaft carrying a gear which will mesh into a gear on the axle of one pair of wheels. Steam is generated with oil fuel, of which the car will carry 1,000 gallons, and the engine will develop 275 h.p.

*Port Talbot Car.*—The car being built to the order of the Port Talbot Docks & Railway Co. is well worthy of mention, and presents many novel features. The motor truck is a six-wheels-

able to. The rapid rate of acceleration makes the through speed higher. The experience of those railroads who have given both an extensive trial is that the system is equally advantageous for heavy and sparse traffic. In the first case the motors sandwiched in between the regular trains find a traffic without taking it away from the trains, while in the second the traffic has been developed by the more frequent service. The number of steam cars at present running, and the ever-increasing number both at home and abroad,

TABLE 1.—*Comparative Costs.*

| Details. | Cost of original system. Small engine and train. | Secondary battery. Own power supply. | Secondary battery. From Supply Co. at 2c. per unit. | Third rail system from Supply Co. | Steam cars |
|---|---|---|---|---|---|
| I.—Single car: Capital cost | ½ engine per day..... $3,562<br>Carriages... 8,626 | Car complete $19,440<br>Generating station... 5,580 | Car..... $19,440<br>Transformers..... 486 | Car..... $6,561<br>Preparing 6 mls of rls 34,681 | Car $10,206 |
| | $12,188 | $25,029 | $19,926 | $41,242 | |
| Interest at 4 per cent | $486 | $1,001 | $797 | $1,648 | $408 |
| Maintenance, wages, etc. | 4,738 | 3,480 | 2,634 | 3,305 | 1,220 |
| Total | $5,224 | $4,481 | $3,431 | $4,953 | $1,628 |
| At 11,000 miles per annum, cost per mile | 47.37c | 10.44c | 31.11c. | 44.66c. | 15.63c. |
| II.—Two cars: Cost per mile | | 39.59c. | 30.91c. | 32.93c. | ..... |
| III.—Three cars: Cost per mile | | 39.18c. | 30.70c. | 28.48c | |

TABLE 2.—*Comparison of Details of Various Steam Cars.*

| Railroad. | Number of passengers 1st. | 3d. | Length over all. ft. | in. | Size of cylinders. Diam. | Strk. | Weight on trucks in tons. Motor. | Trail'g. | Grate area, sq.ft. | Total heating surface, sq.ft. | Diameter of wheels of motor truck. ft. | in. | Water capacity, gals. | Tractive force, in lbs. | Boiler details |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G. W. Ry. | 61 | | 70 | 0 | 12 | 16 | 26.9 | 16.25 | 11.54 | 659.24 | 4 | 0 | 450 | 6,912 | Vertical 4 ft. 6 in. diameter with cone top 160 lbs. pressure. 458 tubes 1¾-in. diameter. |
| T. V. Ry. (old type) | 12 | 40 | 58 | 8 | 9 | 14 | 25.0 | 10.85 | 8.0 | 338.5 | 2 | 10 | 550 | 4,269.2 | Two barrels with 152 1¾-in. diameter tubes and smokebox each. 160 lbs. pressure. |
| T. V. Ry. (new type) | 16 | 57 | 70 | 3⅝ | 10½ | 14 | 30.7 | 11.25 | 10.0 | 464.84 | 3<br>(driving)<br>2 | 6<br>10<br>(tralling) | 550 | 5,292 | Two barrels with 232 1⅝ in. diameter tubes and smokebox each. 180 lbs pressure. |
| G. N. Ry. of Scotland | 46 | | 50 | 0 | 10 | 16 | 40 | | 9.0 | 500.0 | 3 | 7 | 660 | 4,465 | Vertical multitubular type. 150 lbs. pressure. |
| G. C. Ry. | 16 | 34 | 61 | 6 | 12 | 16 | 29.75 | 14.8 | 13.0 | 610.36 | 3 | 9 | 550 | 7,680 | Vertical boiler. 150 lbs. pressure. |
| L. N. W. Ry. | 48 | | 57 | 0 | 9½ | 15 | 27.4 | 16.0 | 6.38 | 317.27 | 3 | 9 | 455 | 4,210 | Loco. type. 175 lbs. pressure. |
| S. E. & C. Ry. | 56 | | 64 (over buffers) | 11¾ | 10 | 15 | 24.5 | 14.0 | 8.8 | 381.5 | 3 | 7 | 400 | 4,480 | Loco. type. Belpaire firebox. 160 lbs. pressure. |
| G. S. & W. Ry. of Ireland | 6 | 48 | 50 | 0 | 8¾ | 12 | 12.2 | 20.3 | 8.4 | 367.66 | 2 | 9 | 430 | 2,360 | Loco. type, 309 1⅝-in. outside diameter tubes. 130 lbs. pressure. |
| Canadian Pacific Ry. | 52 | | 72 (car frame) | 0 | 10 | 15 | 58.62 | | .... | 600.0 (about) | 3 | 6 | 750 | 2,500 | Return tubes boiler. 160 lbs. pressure. |
| G. N. Ry. of Ireland | 20 | 39 | 61 | 6 | 12 | 16 | 25.5 | 15.0 | 11.5 | 653.1 | 3 | 9 | 550 | 6,720 | Vertical multitubular. 420 1¼-in. outside diameter tubes. 175 lbs. pressure. |
| Missouri Pacific | 64 | | 78 | 0 | 11 | 12 | 58 | | ..... | ..... | 3 | 6 | 2,000 | 6,966 | Water-tube. 250 lbs. pressure. |
| Port Talbot | 61 | | 77 (buffers) | 4 | 12 | 16 | ..... | ..... | 13.1 | 660.0 | 3 | 0 | 600 | 8,700 | Loco. type. 170 lbs. pressure. |
| G. N. Ry. | 53 | | 65 (buffers) | 8⅜ | 10 | 16 | 27.3 | 15.15 | 9.5 | 382.0 | 3 | 8 | 560 | 5,120 | Loco. type. 175 lbs. pressure. |
| L. & S.W. (last type car) | 40 | | 50 | 0 | 10 | 14 | 21.7 | 10.6 | 6.75 | 347.0 | 3 | 0 | 485 | 3,889 | Loco. type. Firebox fitted with water-tubes. |
| Glasgow & S. W. Ry. | | | 57 | 0 | 9 | 15 | ..... | ..... | ..... | ..... | 3 | 6 | ... | ..... | Loco. type. 142 tubes 1⅝-in. outside diameter. |
| L. B. & S. C. Ry. | 48 | | 57 (buffers) | 3 | 8½ | 14 | 22.05 | 12.075 | 7.0 | 369.0 | 3 | 8 | 450 | 3,230 | Loco. type. 242 tubes 1¾-in. outside diameter. |
| L. & Y. Ry. (new cars) | 48 | | 66 | 5 | 12 | 16 | 32.75 | | 9.4 | 509.0 | 3 | 7½ | 550 | 7,530 | Loco. type. 4 ft. 3 in. diameter barrel. 199 1¾-in. outside diameter tubes. 180 lbs. pressure |
| N. Staffs Ry. | 46 | | 50 (buffers) | 5 | 8½ | 14 | 20.875 | 11.675 | 7.0 | 368.0 | 3 | 8 | 450 | 3,305 | Loco. type. 180 lbs. pressure. |

NOTE.—L. & Y. Ry. made their first two cars to the Taff Vale Railway Company's specification

coupled type, with 3-ft. wheels, the valves being operated by an adaptation of the Walschaerts gear. The car is lit by electricity generated by a steam turbine-driven dynamo. The gradient this car has to work is extremely stiff—three miles of 1 in 40.

It is a fact worthy of remark that, while the Metropolitan, North Eastern, and Liverpool & Southport are the only English electric lines to make use of high-tension transmission, all the foreign ones do so with the exception of the Boston Elevated and Grenoble-Chapriellan. The Isle of Man electric tramways, while perhaps not coming under the description of an electric railway, may be mentioned here, owing to the fact that they transmit the power at 6,000 volts.

Again, the foreign railroads are the only ones up to the present, with the exception of the Metropolitan, who have made use of the turbine to provide the motive power to the dynamo. In the case of the Grenoble-Chapriellan, this motor power is supplied by a waterfall 1,476 ft. high, and is distributed to the turbines from a collector placed outside the station.

The Valtellina Electric Railway also derives its motive power from water. In this case the water is taken from the River Adda, and has a flow of 550,000 cu. ft., with a maximum head of 90 ft., and is sufficient to develop 7,500 h.p.

*Advantages.*—The advantages of the rail-motor system of carrying passengers may be placed as follows: Owing to the small unit, a much more frequent service is given with a better percentage of freight to dead weight hauled, while the mileage cost of working is only about one-third the cost of an ordinary passenger train-mile. The facility of picking up and setting down passengers at line crossings, small villages, etc., makes the service more popular, and enables many passengers to travel who would not otherwise be

proves their utility, and it seems certain that in them railroads have the best, and in fact only, effective answer to street car competition.

TABLE 3.—*Details of Electric Traction on the Lines Shown Below*

| Railroad. | Gross power in k.-w. | Pressure in volts. Generated. | Used in motors. | Gross power capacity of each train, H.P. | No. of passenger seats per train. | Ruling gradient. |
|---|---|---|---|---|---|---|
| Liverpool & Southport | 6,750 | 1,500* | 600† | 1,200 | 270 | 1 in 85‡ |
| Gt. Northern & City | 3,200 | 500† | 500† | 500 | 50 | 1 in 30 |
| Mersey | 4,650 | 650† | 650† | 400 (single)<br>800 (double) | Av'g. 60 | 1 in 30 maximum 1 in 27 |
| Liverpool Overhead | 5,400 | 500† | 500† | 400 | 160 | 1 in 200 |
| Metropolitan | 14,000 | 11,000* | 550† | 1,200 | 322 | 1 in 44‡ |
| North Eastern | 11,200 | 6,000* | 600† | 600 | 186 | 1 in 27a |
| Liverpool & Manchester | 6,000 | 10,000* | 550† | 560 | 35 | ... |
| Central London | ..... | 500 | 500 | ... | 336 | ... |
| Metropolitan District | 4,000 | 550 | 550 | 1,500 | 312 | 1 in 43 |
| City & Waterloo | 1,200 | 525† | 500† | 160 (s)<br>320 (d) | 50<br>204 | 1 in 30§ |
| Boston Elevated | 36,844 | 550 | 550 | 1,200 | 192 | 1 in 20 |
| Paris Metropolitan | 6,000 | 5,000* | 600† | 200<br>300 | 60 per car. | 1 in 3.6 |
| Paris Orleans | 2,060 | 5,500* | 550† | 668 | 525 | 1 in 100 |
| Grenoble-Chapriellan | 750 | 600‡ | 600‡ | 70 | 36 per car. | ... |
| Lecco Sondrio (Ganz) | 4,476 | 20,000* | 3,000* | 600 | 56 per car. | ... |
| Valtellina Electric | 6,000 | 20,000* | 3,000† | 600 (d) | 170 | 1 in 50 |
| Burgdorf Thun | 3,720 | 4,000* | 750† | 240 | 136 | 1 in 40 |

REMARKS: Mersey—Secondary batteries are utilized in the generating station for taking peak loads; Liverpool Overhead—Above remarks apply; Liverpool & Manchester—Proposed mono-rail; Grenoble-Chapriellan—Water turbines; Lecco-Sondrio (Ganz)—Steam turbines; Valtellina Electric—Water turbines; Burgdorf Thun—Steam turbines.

*Three-phase. †Direct-current. ‡For a short distance. *For about 14½ chains. §For a distance of 900 ft. a 1 in 27 (goods line), 1 in 50 (passenger line).

## Railroad Building in Canada.

In Canada there are between 5,000 and 6,000 miles of new railroad now actually building, including the Grand Trunk Pacific, which will require the expenditure of approximately $100,000,000. The main divisions of the work are as follows: Canadian Pacific, 1,270 miles; Canadian Northern, 1,567 miles; Grand Trunk Pacific, 1,900 miles; Hill roads, 1,000 miles. In addition to these, the Minister of Railways has had no less than 43 resolutions in respect to subsidies which were voted during the last session of Parliament. They call for subventions ranging from $3,200 per mile to $15,000 per mile to assist in building 43 different lines of railroad covering 2,885 miles, and they total about $9,399,900, divided up among the provinces as follows: Quebec, $3,574,100; Ontario, $2,925,000; Maritime Provinces, $1,697,600; Western Canada, $1,203,200. At the extremes of this aid by the state may be noted a subsidy of $25 for the shortest line—nine miles—from Aylmer to Hull, Quebec, and one of $1,158,400 for the longest line, from Edmunston and Paspebere to Gaspe. The projected lines average 67 miles long.

Such remarkable activity in railroad construction and development as is now going on throughout the Dominion has never before been equalled or even approached. This is certainly Canada's year, so far as railroad building goes, and there are no signs of a let up. Contracts on the Grand Trunk Pacific are still being let as fast as bids can be received and tabulated. The Grand Trunk Pacific branch lines bill has been before the House of Commons for some time, and so amended that 22 branch lines must begin within two years and finished in ten, involving the building of over 5,000 miles of branches. Contracts for material for this work are already being awarded, and bids aggregating 68,000 tons of steel rails are now in the hands of the Railway Commission. The "Soo" rolling mills and the Dominion Iron & Steel Co., of Sydney, have each been awarded a contract of 32,500 tons of steel.

The new line from Quebec to La Tuque, on the National Transcontinental, for which MacDonald & O'Brien have the general contract, is being rushed under eight sub-contractors. The Canadian Pacific is also pushing work on a formidable lot of extensions, as it has done for several years past. Under the name of the Kettle River Railway, a line is being built from Grand Forks, B. C., to the McKinley mines, about 50 miles. This is all difficult mountain work, and has been awarded at $25,000 a mile, a total of $1,250,000. Surveys are now being made through Kicking Horse Pass, north of the present route of the C. P. R. Rights of way and capital are both said to have been secured, and it is expected that contracts for the work will be let very soon. The British Columbia Contract Co. has a contract for grading and clearing the right-of-way on the new Strassburg extension from Strassburg to Saskatoon, 112 miles, and the line from Winnipeg to Moison, 25 miles, is being built. On the Canadian Northern a line 80 miles long, east from Port Arthur, is under way, and a contract was made last June for 95 miles of road from Oakland to Makinok. The Ontario government has granted the Canada Central Railway a subvention of $5,000 per mile for 53 miles of line from Little Current to a point near Sudbury, Ont., and contracts will be let at once.

The Revillion Company, a competitor of the Hudson Bay Company, has been given several franchises this session from the government, and will let contracts at once for building 1,000 miles of railroad from Quebec northwest into the fur trading country. The company has $5,000,000 capital.

The Ontario government has given a $3,000,000 subvention to the Bruce Mines & Algoma, and a 25-mile line will be built to open up the Bruce Company copper district. A charter for the Kamloops & Yellowhead, a branch of the Canadian Pacific, has recently been granted and contracts are to be let at once for a line 250 miles long from Kamloops to Seke Junne Cache, B. C. Smith & Johnston, attorneys of Victoria, B. C., are applying to the legislature of British Columbia for a charter for the Fording Valley Railway, which proposes to build a line from a point on the British Columbia Southern through Elk River to the Alberta boundary, and thence to Okatoka and Smith via Grace and Levis, 107 miles. Contracts have been let to Rhodes, Curry Co., of Amherst, N. S., for building a 110-mile extension of the Temiskaming & Northern Ontario from New Liskeard to Temiskaming, in the Cobalt silver region.

No general charter has been granted to the Hill interests for the proposed line from Winnipeg to the coast, but several charters obtained during the last session of the Dominion Parliament are known to be "Hill charters." Mr. Hill expects to purchase lateral lines, starting from different points in the three western provinces, and will join them to the main line of the Great Northern. Such lines, many eastern people think, will direct the traffic of the west to United States ports, and will deprive the ports of Montreal, Quebec, Halifax and St. John of the trade from the west. Already Mr. Hill has 11 branches to the international boundary, beginning on the west at Summerson, Man. He also has a branch line into Lethbridge from Shelby on the Great Northern via Sweetgrass, Montana, and another into Fernie, B. C. His intention, so far as can be learned, is to build from Fernie via Medicine Hat to Winnipeg; from Fernie via Calgary to Edmonton; from Edmonton to Medicine Hat and across the international boundary to the Great Northern at Harre, Mont.; from Lethbridge an extension to Calgary; from Edmonton to Regina, thence to Sherwood, joining the G. N. line at the boundary; from Regina to Prince Albert, touching some point east of Saskatoon; from the Antler line of the G. N., to Melita, Man.; from the St. John (Dakota)-Brandon extension to the north, hugging the boundary line of Saskatchewan and Manitoba to the Saskatchewan river; from Gretna, Man., parallel with the international boundary, crossing the St. John-Brandon line to the Saskatchewan-Manitoba boundary; from the Gretna-Portage La Prairie extension to Lake Winnipegosis; from Winnipeg northeast to the country east of Lake Winnipeg.

## Single Phase Equipment for the Washington, Baltimore & Annapolis Railway.

The announcement that the Washington, Baltimore & Annapolis Railway has finally adopted the single-phase system and has let contracts for the entire electrical equipment required for this line will attract considerable interest in engineering and railroad circles, not only on account of the fact that this is one of the most important orders yet given for alternating current equipment in this country, but also because the original promoters of this line were the first to adopt the single-phase system.

Some three years ago contracts were let for the construction of this line, but due to financial difficulties the road was never built. In the former plans for single-phase equipment between Baltimore and Washington it was proposed to use a trolley potential of 1,000 volts, current being delivered at this voltage at a frequency of 16⅔ cycles per second. The present contract calls for a trolley potential of 6,600 volts at a frequency of 25 cycles per second. On the cars a four-motor equipment was proposed, each motor having a capacity of 100 h.p. The new car equipment will consist of quadruple GEA-603 motor equipments for direct or alternating currents, each motor having a capacity of 125 h.p. While the first proposed motor equipments would have driven the cars at about 40 miles per hour, the new equipments, totaling 500 h.p., will enable express trains on the road to attain a speed on tangent level track of 60 m.p.h.

The details of the new road have been carefully worked out by the Roberts & Abbot Engineering Company, of Cleveland, Ohio. Single-phase equipment was chosen only after a careful study had made it apparent that this system would prove most economical and best adapted to meet the special service conditions existing on this road.

About 60 miles of road will be operated by the new company. The main line will be constructed between Baltimore and Washington, with a branch line from a point on the main line near Odenton, extending to Annapolis. This station on the new line will be known as Academy Junction. Over the main line between Baltimore and Washington an express and local service will be established, express cars being operated under a 15 minute headway and making the run in 72 minutes. The road will be double-track, with sidings so arranged that the locals may be side-tracked to enable the expresses to maintain schedules. Nineteen express cars, capable of making 60 m.p.h. on a tangent level track will be operated. In addition two work-cars will be equipped, each sufficiently powerful to haul a train of five ordinary passenger coaches at 45 m.p.h., while four lower powered cars will be used for local service. These last mentioned cars will run at a speed of 45 m.p.h. The express and work-cars will each be equipped with four GEA-603 (125 h.p. each), A.C.-D.C. motor equipments with the Sprague-General Electric type "M" train control. The local cars will be similarly controlled, but will be driven by two instead of four GEA-603 motors.

Power for the new road will be bought from the Potomac Electric Company at Washington, D. C., and will be delivered by that company at 6,600 volts three-phase to a transformer sub-station located about three miles from Chesapeake Junction. In order to obtain a balanced load on the three-phase generators, the current as received at the sub-station will be changed from three-phase to two-phase by groups of two transformers connected three-phase on the 6,600-volt primary side and two-phase on the secondary side. Half of the transformers will have the secondaries wound for 6,600 volts and the other half for 33,000 volts. The 6,600-volt windings will all be connected in parallel on the same phase supplying single-phase current to the trolley as far as Academy Junction. The 33,000-volt secondary windings will all be connected in multiple on the second phase to the 33,000 volts transmission line, which will supply current to a step-down sub-station located at Academy Junction. The Chesapeake Junction sub-station will contain seven 800-k.w. water-cooled transformers, three with 33,000-volt secondaries, and four with 6,600-volt secondaries, one of the latter transformers forming a reserve.

At Academy Junction there will be four-water cooled transformers, 25 cycle, 800 k.w., reducing the single-phase 33,000-volt

current of the transmission line to 6,600 volt current suitable for delivery to the cars. These transformers will supply the Baltimore and the Annapolis sections of the line.

The sub-station at Academy Junction will be located adjacent to the car barns. For greater safety in inspecting and handling the cars, all of the trolley circuits in the car barn will be arranged for 600-volt direct-current, and for this purpose two 300-k.w. motor generator sets will be installed in the transformer sub-station, changing the 6,600-volt alternating-current to 600 volts direct-current. The motor end of these motor generator sets will be connected direct to the trolley circuits, one phase being led from the trolley coming from Chesapeake Junction and the other from the Academy Junction transformers. A feeder regulator will be placed in one phase so that the motor generator sets will act as balancers, permitting the Academy Junction transformers connected on phase "B" to feed into the trolley line supplied by the Chesapeake Junction transformers on phase "A." In addition to acting as balancers and to supplying current to the cars in the barns, the motor generator sets will also supply direct-current to the motors in the repair shops located at this point.

Government regulations within the District of Columbia prohibit the use of the track return so that within this section the cars will be operated with a double trolley. This portion of the tracks, as well as that within the city of Baltimore, is at present operated by direct current, and the new cars are designed to operate on direct current over these sections of the line.

The present Washington, Baltimore & Annapolis Railway Company which is constructing the line is quite distinct from the initial corporation. The new company, under the head of its President, Mr. Geo. C. Bishop, has considerably broadened the former plans. Land has been purchased for a wider right-of-way along the route, and new bridges are being built so that the roadbed will be excellent. The engineering work is in charge of the Roberts & Abbot Engineering Company, of Cleveland, Ohio, and contracts have been placed with the General Electric Company for the complete electrical equipment. The construction and operation of this road will be watched with interest, as it is one of the largest and most important installations of the single-phase railway system ever undertaken.

## New Passenger Terminal of the Chicago & North-Western at Chicago.

The Chicago & North-Western is to build a new passenger terminal in Chicago on an entirely new site, according to an announcement to that effect made on Oct. 8 by Vice-President W. A. Gardner. The new terminal is to be located not far from the present terminal, but on the opposite side of the river, as the accompanying map shows. The chief restricting feature in the movement of trains in and out of the present terminal is the river crossing, which is a double-track drawbridge. The road's heavy suburban traffic as well as all through trains, amounting to more than 300 trains daily, must cross this bridge. Furthermore, the present site is limited for track room, with no space to expand. The new terminal will be free of these hampering conditions, and there will be a freedom of access, both by passengers and trains, quite unknown with the present facilities. The approach to the old terminal from the business center of Chicago is over a single drawbridge which is frequently opened and closed.

Location of Proposed Chicago & North-Western Passenger Station at Chicago.

For a number of years Mr. Marvin Hughitt, President of the North-Western, has given his attention to the solution of the road's terminal problem in Chicago, and a year ago he associated with him as consulting engineer Mr. John F. Wallace, formerly Chief Engineer of the Panama Canal and now President of the Electric Properties Co., New York. Together, they have worked out a satisfactory solution of the problem.

The new station site fronts on West Madison street. It lies between Canal and Clinton streets and extends north to Lake street. This section is one of the oldest in the city and is, of course, solidly built up. Over $2,000,000, it is said, has already been expended in buying the property on which the station is to stand and in the purchase of other land for right-of-way. Considerable more property is still to be acquired, the estimates on the total outlay which probably will be required for this purpose reaching as high as $7,500,000. The plans for the station are at present in course of preparation, so that only its most general features can be outlined. As already mentioned, it will front on Madison street, occupying a city block in width, and will extend north across two streets—Washington and Randolph—to Lake street. The plans contemplate

no change of grade in these two intervening streets. Instead, the station is to be elevated and will span both, and street traffic will pass through tunnels a block long. There will be six street level entrances to the station—one from Madison, two each from Washington and Randolph, and one from Lake street. The general waiting room will be on the second floor on a level with the elevated tracks, of which there will be 16 in the station.

The terminal plans will provide for complete separation of passenger and freight traffic. Two new routes of three tracks each will lead from the north end of the station. At Jefferson street and Austin avenue these routes will diverge, one running in a northwesterly direction and joining the main line at Cornell and May streets, and the other running directly west along Austin avenue to the main line at Ada street. The northwesterly route will be devoted exclusively to passenger trains on the Milwaukee and the Wisconsin divisions. The westerly route will carry passenger trains to the Galena division, the Omaha line.

The present tracks, which these routes will parallel, will be given over entirely to freight traffic, and the Wells street station will be used as a freight depot exclusively. On each of the two new routes the through traffic will be conducted separately from the suburban service. The new station will have a capacity of several trains a minute, whereas the present station can handle only one train every two minutes. In area the new station will be larger than the La Salle street station, the Lake Shore-Rock Island Chicago passenger terminal, and the capacity for business is expected to equal the facilities of the Boston South station.

Work is to begin on the new terminal in the spring, and it is expected that a year and a half at least will be required to complete it, or that it will be in operation within two years from the present time. The total estimated cost is reported to be between $15,000,000 and $20,000,000, which includes the revision of the entire terminal facilities as above outlined. Mr. E. C. Carter, Chief Engineer of the Chicago & North-Western, will have charge of the work.

## Increases in Railroad Earnings in August.

The *Wall Street Journal* has compiled a striking list of the increases in August earnings of 44 railroad companies which have so far given out their figures for this period. In the following table the gross earnings of each road have increased as much as, or more than, the figures given:

| | |
|---|---|
| Atchison, Topeka & Santa Fe | $1,000,000 |
| Baltimore & Ohio | 700,000 |
| Canadian Pacific | 1,000,000 |
| Chicago & North-Western | 600,000 |
| Chicago, Rock Island & Pacific | 500,000 |
| Illinois Central | 100,000 |
| Lake Shore & Michigan Southern | 300,000 |
| Lehigh Valley | 400,000 |
| Louisville & Nashville | 600,000 |
| New York Central & Hudson River | 400,000 |
| Pennsylvania | 1,000,000 |
| St. Louis & San Francisco | 400,000 |
| Southern | 300,000 |

Increases of less than $50,000:

| | |
|---|---|
| Iowa Central. | Philadelphia & Reading. |
| Lake Erie & Western. | Wisconsin Central. |
| Minneapolis & St. Louis. | |

The only road reporting smaller gross earnings than in August of last year was the Buffalo, Rochester & Pittsburg, whose earnings decreased about $62,000.

The net earnings of the same roads do not show so many increases as the gross earnings. It is natural that at this time of the year larger amounts should be spent in maintenance. The following tables show the increases in net earnings:

| | |
|---|---|
| Atchison, Topeka & Santa Fe | $700,000 |
| Baltimore & Ohio | 200,000 |
| Canadian Pacific | 600,000 |
| Chicago, Rock Island & Pacific | 300,000 |
| Lehigh Valley | 200,000 |
| Pennsylvania | 300,000 |

Increases of more than $100,000 are reported by the following:

| | |
|---|---|
| Chicago & Alton. | St. Louis & San Francisco. |
| Kansas City Southern. | St. Louis Southwestern. |
| Louisville & Nashville. | Yazoo & Mississippi Valley. |

Increases of $50,000, or more:

| | |
|---|---|
| Canadian Northern. | Philadelphia, Baltimore & Washington. |
| Central of New Jersey. | Pittsburg, Cincinnati, Chicago & St. Louis. |
| Mobile & Ohio. | Toledo & Ohio Central. |
| N. Y., Ont. & Westn. | Wheeling & Lake Erie. |

Increases of less than $50,000:

| | |
|---|---|
| Alabama Great Southern | Illinois Central. |
| Buffalo & Susquehanna. | Iowa Central. |
| Chicago Great-Western. | Minneapolis & St. Louis. |
| Chesapeake & Ohio. | Norfolk & Western. |
| Colorado & Southern. | Northern Central. |
| Duluth, South Shore & Atlantic | Texas Central. |
| Gulf & Ship Island. | West Jersey & Sea Shore |
| Hocking Valley. | Wisconsin Central. |

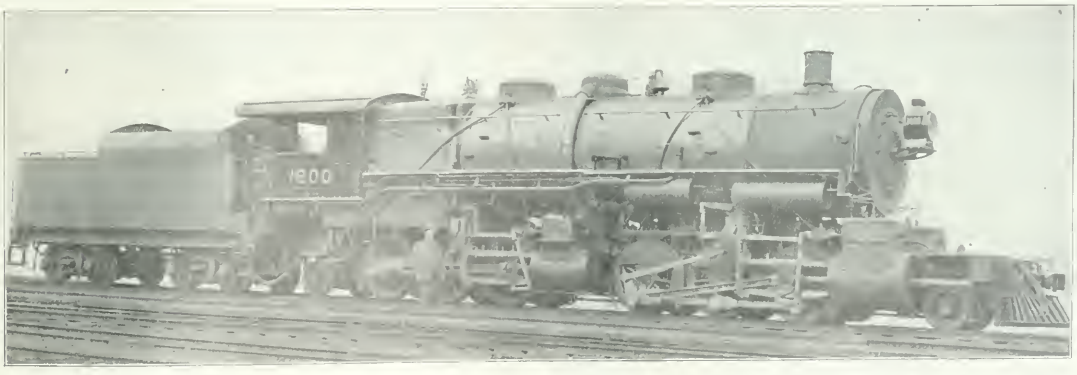
The net earnings of the Southern decreased $171,410; of the Erie $101,000, and of the Philadelphia & Reading $95,948. The other roads reporting decreases, all of them being comparatively slight, are the following:

| | |
|---|---|
| Atlantic Coast Line. | Georgia Southern & Florida. |
| Buffalo, Rochester & Pittsburg. | Kanawha & Michigan. |
| Central of Georgia. | Nashville, Chattanooga & Western. |
| Cincinnati, N. Orleans & Tex. Pac. | Rio Grande Southern. |
| Georgia Railroad | Toledo, Peoria & Western |

## Mallet Compound Locomotive for the Great Northern.

In the *Railroad Gazette* of August 17 a short description, with a photograph, was published of a new Mallet compound locomotive built by the Baldwin Locomotive Works for the Great Northern. Through the courtesy of the builders a further description of this engine with engravings of its more important features in detail is given herewith. Five engines of this type have recently been built for the Great Northern.

The Mallet compound built for the Baltimore & Ohio attracted a great deal of attention not only on account of its novelty of design, but because its great weight of 334,500 lbs., all of which was on the driving wheels. The engines built for the Great Northern are heavier, but as a portion of the weight is carried by front and rear trucks the weight on drivers is reduced to less than that on the Baltimore & Ohio engine or to 316,000 lbs.



Mallet Articulated Compound Locomotive Built by the Baldwin Locomotive Works for the Great Northern.

The following roads also report increases of $200,000 or more:

| | |
|---|---|
| Atlantic Coast Line. | Cleveland, Cincinnati, Chicago & St. Louis. |
| Canadian Northern. | Pittsburg, Cincinnati, Chicago & St. Louis. |
| Central of New Jersey. | Yazoo & Mississippi Valley. |
| Chesapeake & Ohio. | |

Increases of $100,000, or more:

| | |
|---|---|
| Central of Georgia. | Mobile & Ohio. |
| Chicago Great Western | Northern Central |
| Colorado & Southern. | Philadelphia, Baltimore & Washington |
| Erie. | Pittsburg & Lake Erie. |
| Kansas City Southern. | St. Louis Southwestern |
| Minneapolis, St. Paul & Sault Ste. Marie. | |

Increases of $50,000, or more:

| | |
|---|---|
| Chicago & Alton | New York, Chicago & St. Louis |
| Hocking Valley. | New York, Ontario & Western. |
| Michigan Central. | Toledo & Ohio Central. |
| Nashville, Chattanooga & St. Louis | Wheeling & Lake Erie. |

Mallet Articulated Compound Locomotive Built by the Baldwin Locomotive Works for the Great Northern.

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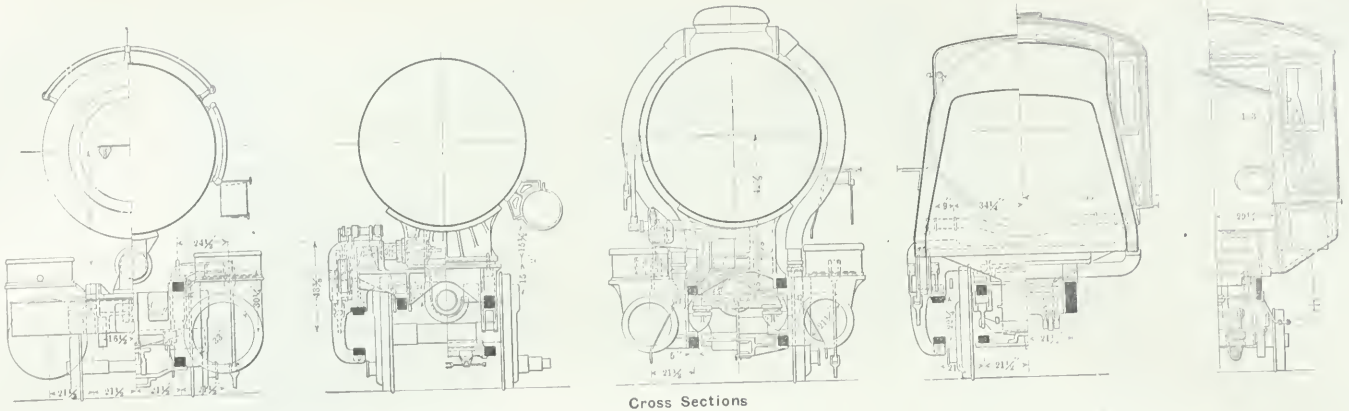
| | |
|---|---|
| Atlantic Coast Line. | Cleveland, Cincinnati, Chicago & St. Louis. |
| Canadian Northern. | Pittsburg, Cincinnati, Chicago & St. Louis. |
| Central of New Jersey. | Yazoo & Mississippi Valley. |
| Chesapeake & Ohio. | |

Increases of $100,000, or more:

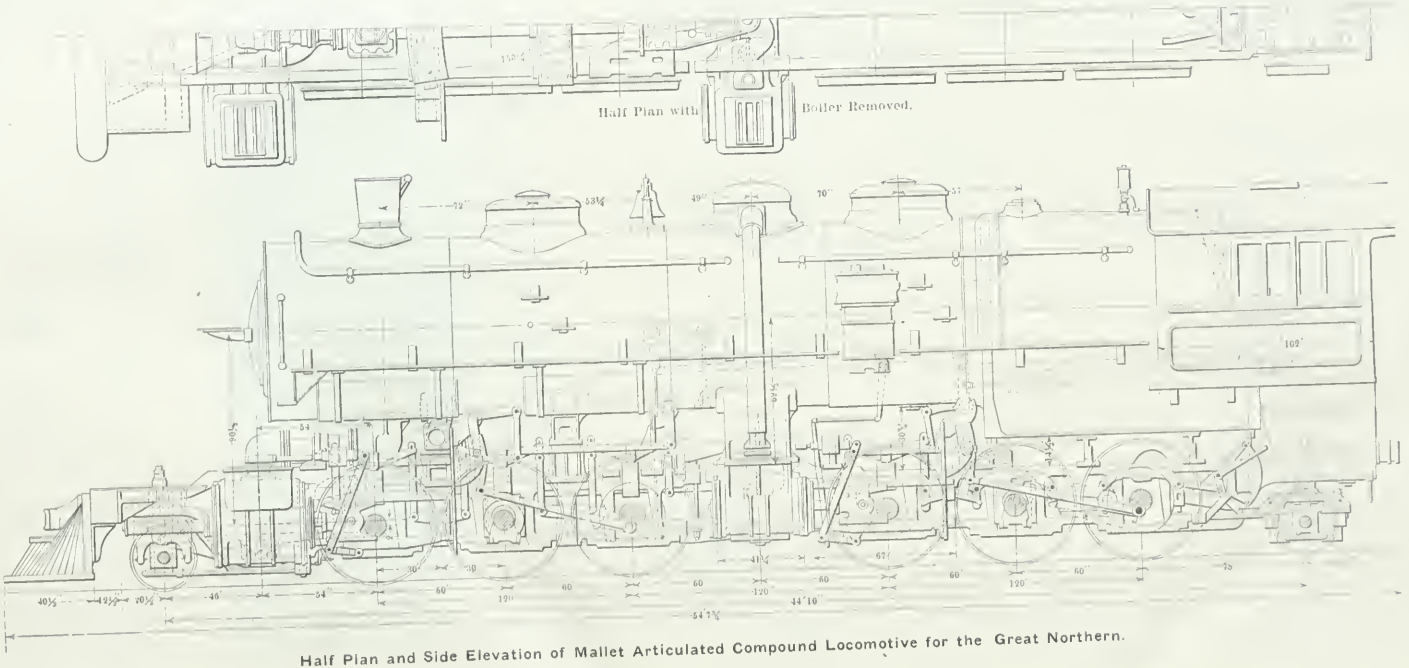
| | |
|---|---|
| Central of Georgia. | Mobile & Ohio. |
| Chicago Great Western | Northern Central |
| Colorado & Southern. | Philadelphia, Baltimore & Washington |
| Erie. | Pittsburg & Lake Erie. |
| Kansas City Southern. | St. Louis Southwestern |
| Minneapolis, St. Paul & Sault Ste. Marie. | |

Increases of $50,000, or more:

| | |
|---|---|
| Chicago & Alton | New York, Chicago & St. Louis |
| Hocking Valley. | New York, Ontario & Western. |
| Michigan Central. | Toledo & Ohio Central. |
| Nashville, Chattanooga & St. Louis | Wheeling & Lake Erie. |

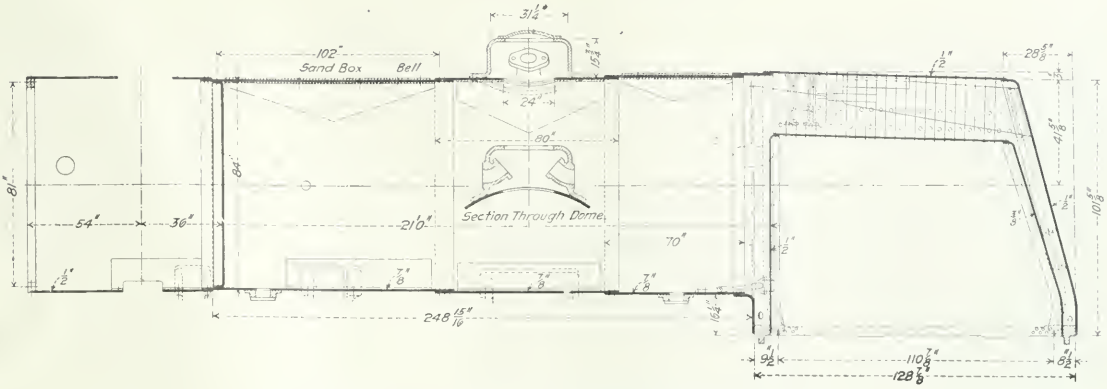


Cross Sections

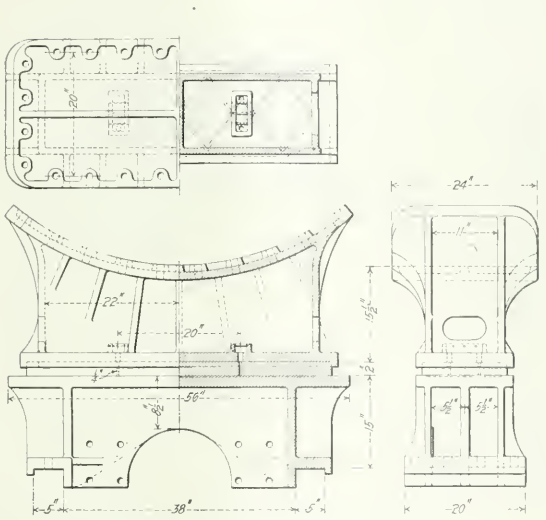


Half Plan with Boiler Removed.

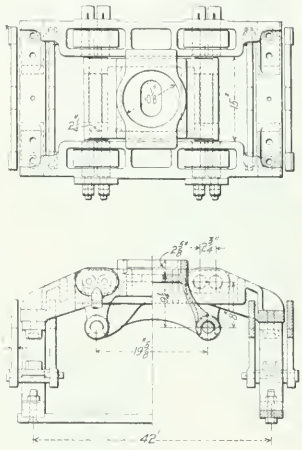
Half Plan and Side Elevation of Mallet Articulated Compound Locomotive for the Great Northern.



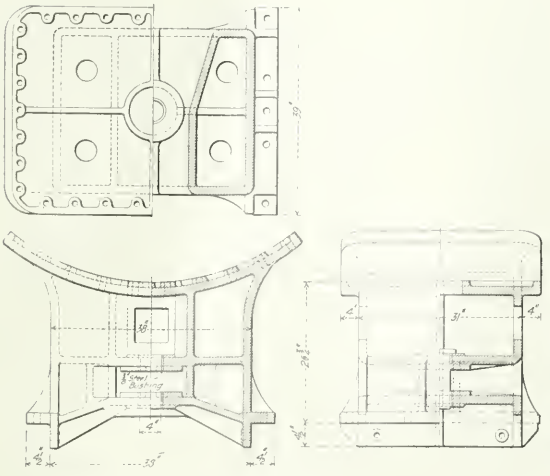

Boiler of Mallet Compound Locomotive for the Great Northern.



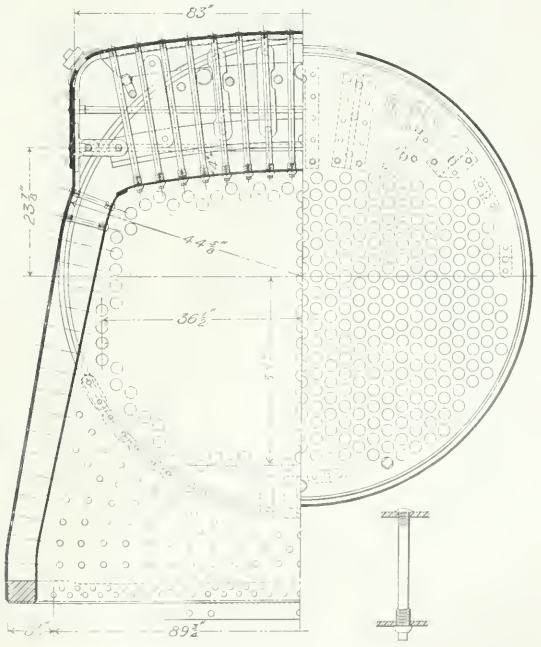
Waist Bearer.



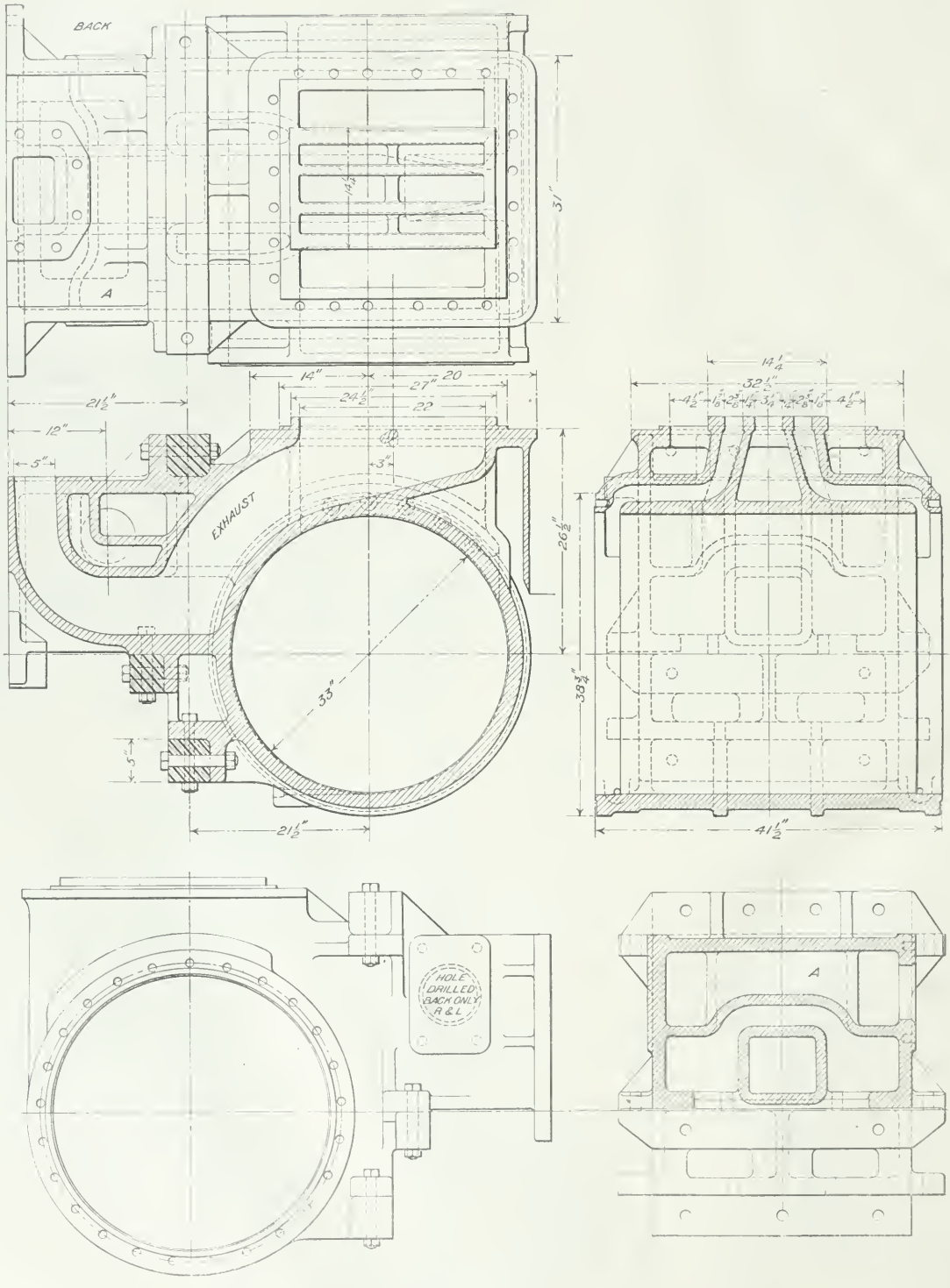
Front Engine Truck.



Cylinder Saddle.



Cross Section of Firebox.




Low Pressure Cylinder for Mallet Compound Locomotive for the Great Northern.

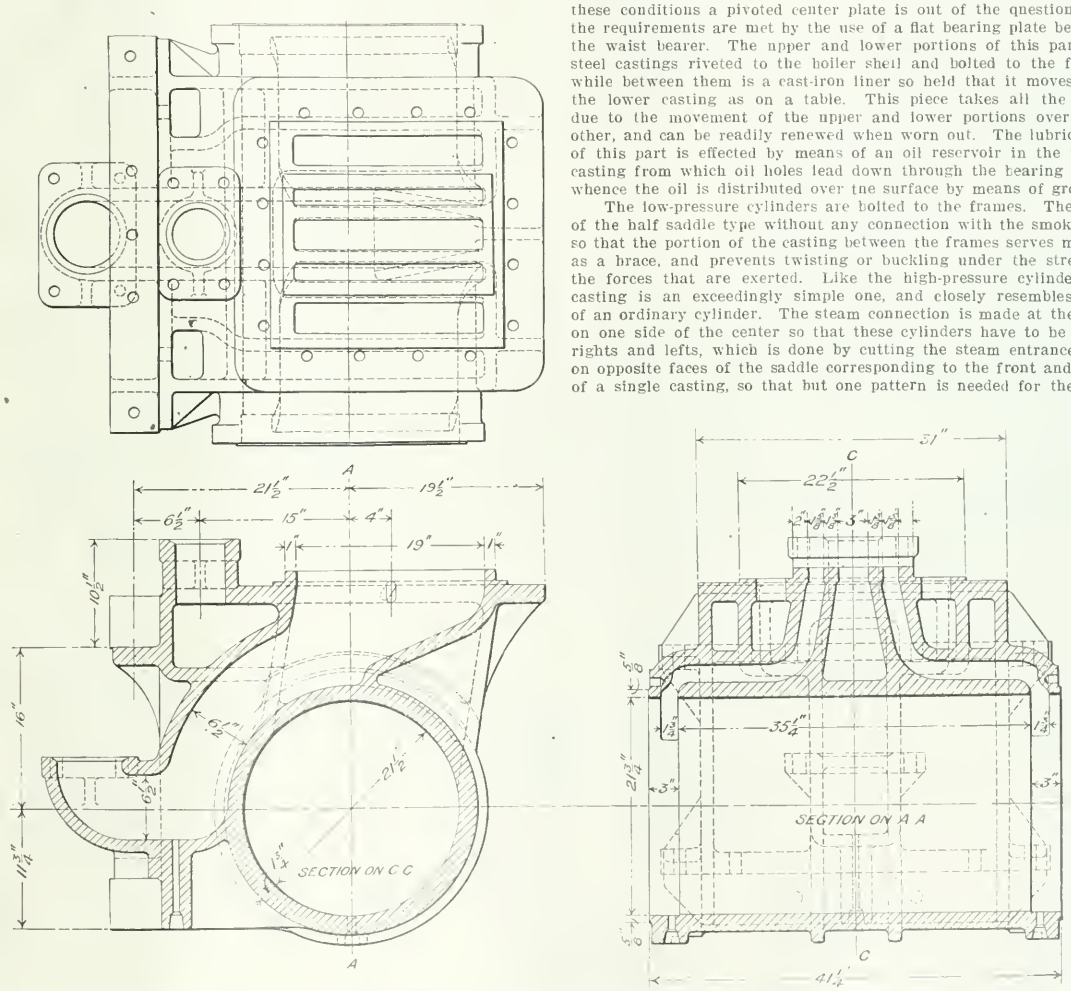
the word, though the forward one is capable of turning beneath the boiler. As arranged, the engine may be likened to the frames and running gears of two mogul (2-6-0) locomotives placed rear to rear, and there coupled together, upon which the boiler is loaded very much as long material might be loaded upon two flat cars.

Turning now to the details of the parts, the boiler is riveted to the saddle of the high-pressure cylinders just as the ordinary saddle is riveted to the smokebox and rests upon the rear frame at each side. It has an opening in the center for the reception of the tail or radius bar by which the tractive effort of the low-pressure cylinder is transmitted direct to the rear frame without putting any stress upon the boiler. This connection is made by means of a 4-inch pin set in steel bushings, which are pressed into holes bored in the saddle as indicated in the engraving. The lead from this pin is flared up and down so that there can be considerable difference in the level of the frames without any binding. The rear frames are thus rigidly attached to the boiler at a point 7 ft. 2⅝ in. in front of the outside throat sheet. The firebox rests upon the frames at the rear, so that the boiler is at all times in alinement with them. The high-pressure cylinders are bolted to the frames. For the top rail the bolts for the cylinder and saddle are the same. At the bottom the cylinder is bolted by itself, as the saddle has no connection at that point. The cylinders being thus rigidly fastened to the boiler, there is no need for a flexible connection to the dome, so that an ordinary curved steam pipe with ground ball joint connections at the ends is used to lead the steam from the dome direct to the steam passages of the cylinder casting. Here the arrangements are almost identical with those of a simple engine. The steam passage is forked and enters the steam chest at each end. After doing its work and being discharged into the exhaust it passes between the frames and reaches an elbow cast on with the cylinder, by which it is turned up, as shown on the engraving of the high-pressure cylinder. It is from this point that the flexible system of steam piping starts.

Before entering into the details of the piping, the connection of the forward frames with the boiler and the cylinders will be considered. It is evident that this connection must be an exceedingly flexible one. Not only must these frames be free to turn beneath the boiler, but they must have a longitudinal and transverse motion as well. The longitudinal freedom is demanded by the possibility of wear, expansion and other causes producing a difference in the distance between the high and low-pressure frames. The transverse freedom is necessitated by the fact that the boiler is at all times in alinement with the rear frames, so that upon curves its center cannot coincide at any point with that of the front frames. Under these conditions a pivoted center plate is out of the question, and the requirements are met by the use of a flat bearing plate beneath the waist bearer. The upper and lower portions of this part are steel castings riveted to the boiler shell and bolted to the frame, while between them is a cast-iron liner so held that it moves over the lower casting as on a table. This piece takes all the wear due to the movement of the upper and lower portions over each other, and can be readily renewed when worn out. The lubrication of this part is effected by means of an oil reservoir in the upper casting from which oil holes lead down through the bearing plate, whence the oil is distributed over the surface by means of grooves.

The low-pressure cylinders are bolted to the frames. They are of the half saddle type without any connection with the smoke-box, so that the portion of the casting between the frames serves merely as a brace, and prevents twisting or buckling under the stress of the forces that are exerted. Like the high-pressure cylinder the casting is an exceedingly simple one, and closely resembles that of an ordinary cylinder. The steam connection is made at the rear on one side of the center so that these cylinders have to be made rights and lefts, which is done by cutting the steam entrance hole on opposite faces of the saddle corresponding to the front and back of a single casting, so that but one pattern is needed for the two. The interior passage A thus extends the whole width of the saddle with conduits leading off at each end to corresponding points in the steam chest. A slide valve distributes the steam and finally delivers it to the exhaust passage that is carried out between the rails of the frame where it makes a right angled bend upward for connection with the exhaust pipe exactly as in the case of the high-pressure cylinders, except that here the centers of these passages are brought so near together that both deliver into a single casting bolted to the top of the saddles and over the union between the two.

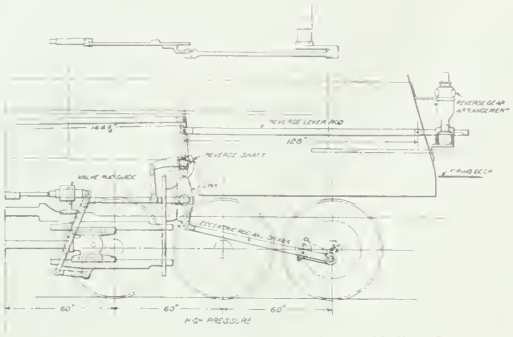
Turning now to the flexible system of piping alluded to, the general plan of the cylinder connections shows the system leading from the high to the low-pressure cylinder. The vertical outlets of the two exhaust passages are connected by a cast tee, where the ordinary ground ball joints are used for tightness. Into the back of this tee a pipe leading to the starting valve in the cab is

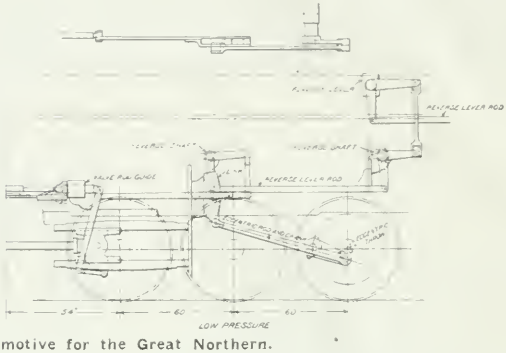



High Pressure Cylinder for Mallet Compound Locomotive for the Great Northern.

tapped, to which live steam is admitted to this pipe and thence to the low-pressure cylinders.

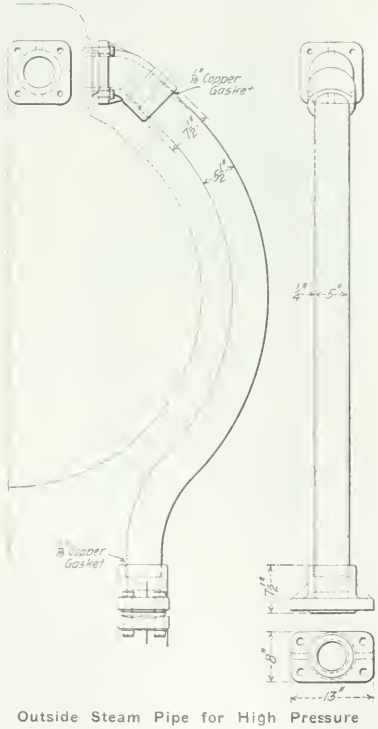
By referring to the plant it will be seen that the coupling pin, by which the front and rear frames are connected, is the transverse center line of the cylinders. As this pin passes through a tail piece that is rigidly bolted to the front after the manner of the ordinary deck plate, it is evident that the whole of the front pair of frames with the attached cylinders and machinery swings about this pin as a pivotal point. Hence if the steam pipe is fitted with a




Reversing Gear; Mallet Compound Locomotive for the Great Northern.

universal joint at this point it can be led off in any direction, and always keeps in alinement with the front frames, thus avoiding the necessity for a second ball joint. This is what has been done. The center of the ball joint is located directly below the center of the coupling pin in the high-pressure saddle and thence the steam pipe is led to the low-pressure cylinders. Just before reaching the saddle it is forked and the two legs are attached to the right and left hand cylinders, respectively, by means of the usual bolted ball joint connection. The spherical joint at the rear thus provides for all vertical and transverse variations in the alinement of the two frames. Variations due to expansion and wear that change the longitudinal distances are provided for by a slip expansion joint with a gland and packing box in the forward Y by which the steam is delivered to the two cylinders. It is, of course, evident that this pipe, connecting the two sets of cylinders, also serves as an intermediate receiver.

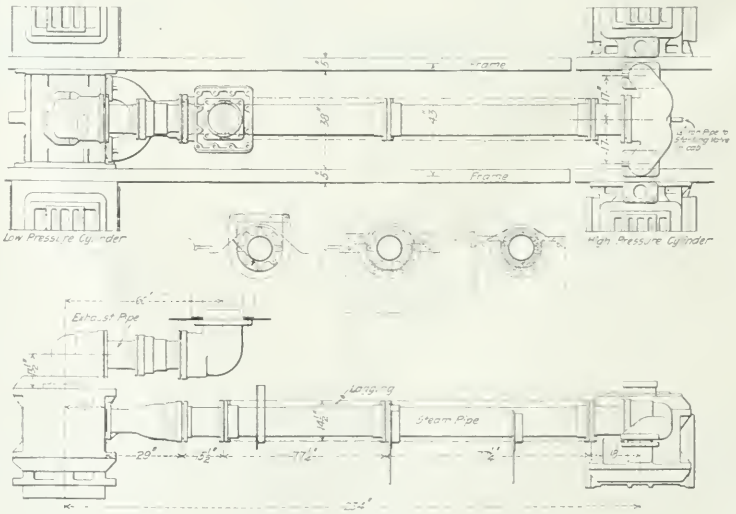



Outside Steam Pipe for High Pressure Cylinder.

The conveyance of the exhaust from the low-pressure cylinder is really a much more complicated matter than that of leading it forward from the high-pressure cylinder. In the case of the exhaust pipe allowance must be made for a relative motion of the cylinder saddle and the smokebox in three planes. There is the transverse motion due to the swing of the boiler over the frames; the longitudinal motion due to the variation in frame positions and the vertical due to wear, inequalities of the track and the like. These conditions are met by the arrangement of the exhaust pipe shown in the engraving. A casting, already referred to, is bolted to the cylinder saddle and covers both exhaust openings. This casting is in the form of an elbow that turns to the rear and forms the shell of a ball and socket joint. The steam pipe, terminating in a ball, runs back from this to another casting bolted to the bottom of the smokebox and facing to the front. These two joints form a universal connection by which all angular variations in the relative positions of the smokebox and cylinders are provided for, while the variations in the distance between the centers of the ball-and-socket joint are cared for by a slip expansion joint with the usual packing box and gland located in the run of the pipe.

This concludes the outline description of those features which belong purely to the Mallet compound locomotive as embodied in this design. In an engine of this size and capacity there are, however, other items of interest, and not the least of these is the boiler that must furnish steam for the large cylinders. As noted in the previous article the boiler is of the Belpaire type, with a straight throat sheet and sloping back head. It contains 5,658 sq. ft. of heating surface, of which 225 sq. ft. are in the firebox and 5,433 ft. in the tubes. It is built for a steam pressure of 200 lbs. per sq. in.

As will be seen from the engraving of the cross-section of the firebox, the construction varies from the strict Belpaire design in that the roof and crownsheet are both crowning instead of being flat. The curves of the two sheets are, however, struck from the same center, thus maintaining a constant distance between them and keeping the staybolts truly radial to both, and retaining the essential feature of the Belpaire firebox. The water legs widen from 7½ in. at the top to 5 in. at the bottom, by which a liberal allowance is made for the rising currents of steam. The sling

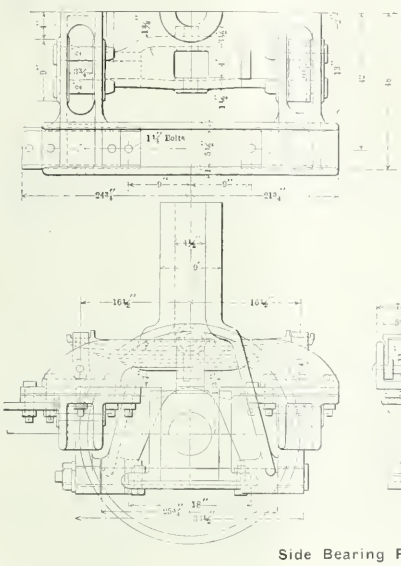



Cylinder Connections.

stays at the front end of the firebox are suspended from T bars riveted to the roof sheet and carrying similar bars that might be called suspended crownbars that are attached directly to the crown-sheet. The tubes have the extraordinary length of 21 ft. or 75 per cent. in excess of what would have been considered an average length twenty-five years ago. The crownsheet has a slight slope down toward the rear, and the foundation ring is horizontal. The dome and its cap are of steel castings, an innovation used in order to facilitate the making of the steam pipe connections, as indicated in the cross section. Beneath the two sand boxes the boiler shell is strengthened by plates riveted on inside and out, and a similar plate is riveted around the dome opening as a stiffening ring. The outside diameter of the front course of the shell is 84 in., and the thickness of the plates used is 7/8 in.

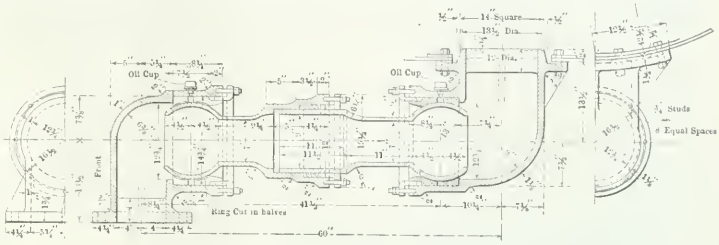
The locomotive, as a whole, has already been likened unto two mogul locomotives, and this is borne out by the construction and arrangement of the trucks. They are both of the two-wheeled or pony type, with radius bars connected in the usual manner. They differ from each other in that the forward truck has a center bearing, and the rear side bearings. The front truck is, therefore, substantially the same as the ordinary pony truck with axle box yokes for the spring suspension and a swing motion for the center plate.

The rear truck has side bearings, but, as will be seen from the engraving, they are brought in so close to the center that their effect in preventing a tilting of the frames will be almost a negligible quantity. In this semi-elliptic springs are used over the axle boxes, and the frame is made continuous by means of yoke bars extending from front to back between which the springs are placed.




Side Bearing Radial Truck.

As in the case of the Baltimore & Ohio locomotive the Walschaert gear is used for the operation of the valves. Four distinct sets of this motion are used, one for each cylinder, and they are so connected that they are manipulated by a single reverse lever or the McCarroll air reversing mechanism. The ordinary reach rod extends to the reverse shaft lever of the high-pressure gear, and operates it in the usual manner. From an upper connection on this lever an extension of the reach rod runs forward to a downwardly projecting arm on an intermediate reverse shaft for the low-pressure motion that is attached to the boiler. A hanger reaches down from the horizontal arm of this shaft to a second intermediate reversing shaft fastened to the forward frames. This hanger is connected by toggles to each of the two arms so that a relative transverse motion between them is permissible. Any change in longitudinal alinement is allowed by the ordinary swing of the hanger. Either of these motions brings about a slight shortening of the hanger with a corresponding change in the point of cut-off; but this is so insignificant as to be of no moment in the working of the engine, since it affects both cylinders alike because only one hanger is used. By following the movement of the several levers of the two sets of motions it will be seen that the positions of the eccentric pins, the link blocks and other parts are the same for each motion, the only essential difference being in the throw of the eccentric and the resultant travel of the valve.

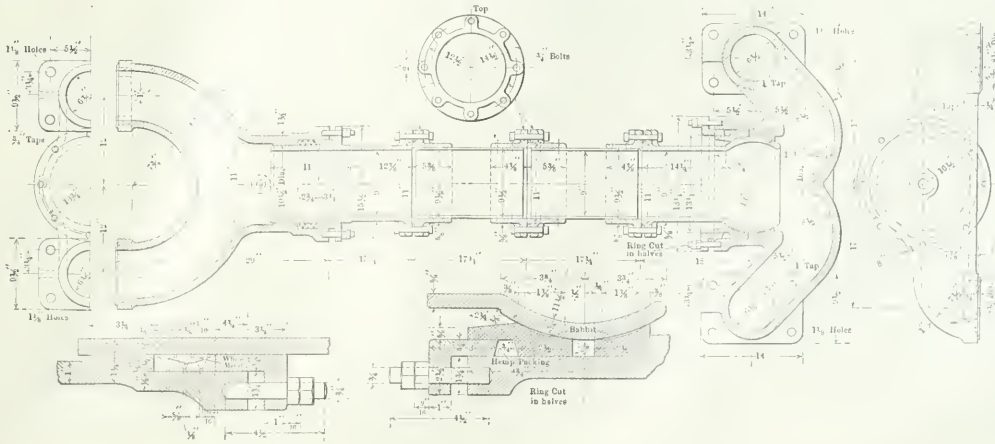



Low Pressure Exhaust Pipe Connection.

These are the main points to which attention should be drawn in these locomotives, which are intended for heavy freight service on portions of the line where the curvature is sharp and the high tractive power of 71,600 lbs., which they possess, will be required.

For convenience of reference the following principal dimensions are reported from the previous description:

| | |
|---|---|
| Cylinder, diameter, H. P. | 21½ in. |
| Cylinder, diameter, L. P. | 33 " |
| Piston stroke | 32 " |
| Heating surface, firebox | 225 sq. ft. |
| " " tubes | 5,433 " |
| " " total | 5,658 " |
| Grate area | 78 " |
| Driving wheels diameter | 55 in. |
| Tubes, number | 441 |
| " length | 21 ft. |
| " diameter | 2¼ in. |
| Tank capacity, water | 8,000 gals. |
| Tank capacity, coal | 13 tons. |




Details of Receiver Pipe; Mallet Compound Locomotive for the Great Northern.

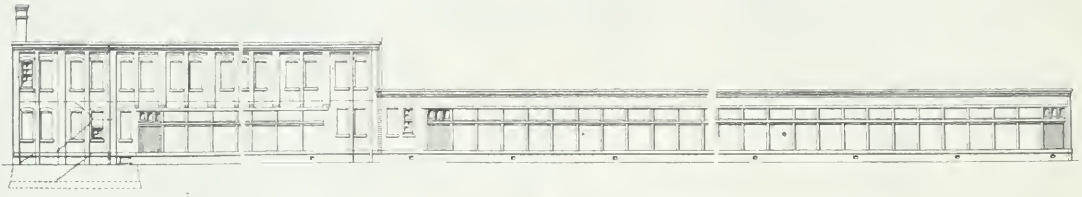
## The New Freight Terminal at St. Louis of the Rock Island-Frisco Lines.

Our issue of September 21 contained some notes taken from the report of Messrs. Robert Moore and Albert T. Perkins, Consulting Engineers, to the Municipal Bridge and Terminals Commission of St. Louis concerning the freight facilities of that city. As is generally known, St. Louis has for some years suffered seriously from inadequate facilities of this character. This, in conjunction with the presence of a great river, dividing the district formed by the two cities on its sides, has been the cause of much congestion of and delay to freight at the St. Louis gateway. The total amount of freight received and forwarded at St. Louis and East St. Louis in 1905 was 40,000,000 tons.

During the past 12 months several of the larger systems which previously had been deficient in freight terminal facilities in St. Louis have been engaged in providing terminals that not only answer present requirements but will be adequate to the city's growing needs for some time to come. The Wabash was the pioneer in this movement, its new terminals at Franklin avenue and Third street being described in these columns last December (Dec. 29, page 604). The Rock Island-Frisco system is now engaged in a similar undertaking on property situated immediately north of the Wabash terminal. This district, which is just north of and therefore in proximity to the business center of the city, and also quite close to the west end of the Eads bridge, has developed into an important freight house locality. Besides the two large terminals above mentioned, the new Missouri Pacific terminal lies immediately east of the Rock Island-Frisco site, the Louisville & Nashville, and Missouri, Kansas & Texas both directly north, and the Burlington just southeast. All are served by the Terminal Railroad Association's tracks, the Wabash, however, also having its own track to its terminal.

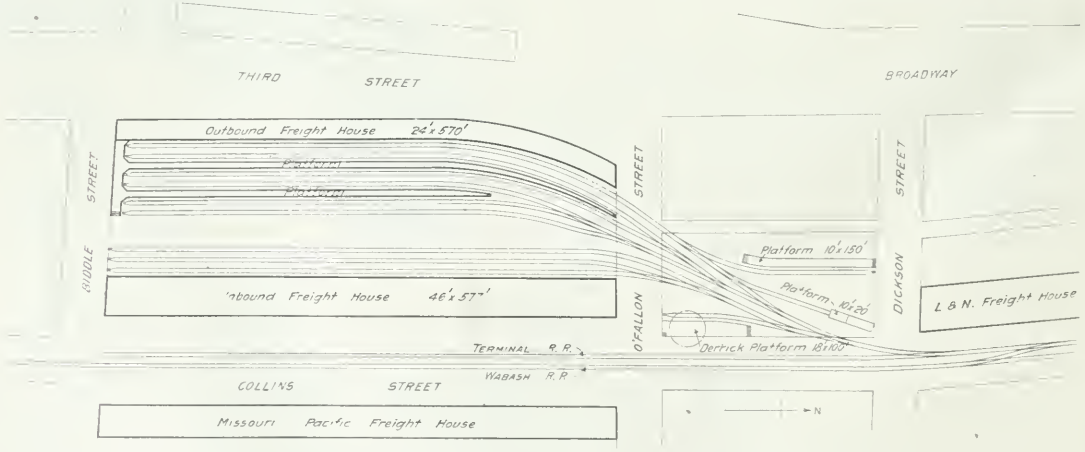
The Frisco has a good-sized freight house a short distance east of the Union Station and therefore about a mile southwest of the new terminal. The Rock Island has been using the Louisville & Nashville facilities already mentioned. The site for the new terminal was all valuable improved property, occupied by stores and dwellings, and was acquired at great cost, the outlay in round numbers approximating $2,000,000. As appears from the plan herewith, it lies between Biddle street on the south and O'Fallon street on the north, and between Collins and Third streets on the east and west respectively, at the junction of the latter with Broadway. The half square on O'Fallon, Collins and Dickson streets is also included and is occupied by the entrance tracks of the terminal. The relation of this section to the remainder of the property is such as to require all of the tracks to enter the freight house area on a curve. As a result the north end of the outbound house had to be swung around to parallel the adjacent track.

First Floor Plan of Outbound Freight House, New St. Louis Terminal of the Rock Island-Frisco Lines.



Collins Street Elevation, New St. Louis Terminal of the Rock Island-Frisco Lines.

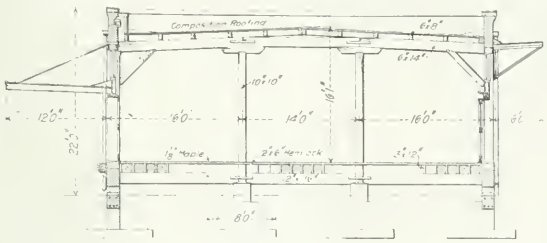
The outbound house is 24 ft. x 570 ft., and the inbound house 46 ft. x 577 ft. The latter is two stories high for 208 ft. at the south end, for offices. Also, it will be observed that the outline of a future six-story warehouse, for storage of inbound freight, is indicated above and including the one-story portion of this house, with a total height of 84 ft. This may and probably will not be needed for some time to come but the foundations, walls, columns, etc., of the present structure are designed to sustain the load which the additional five stories will impose. This explains the unusual dimensions of these parts of this one-story building. A primary object in the design of the houses was to obtain the most economical construction consistent with the requirements of the situation. High-pitched roofs, steel framework, etc., were omitted, and such use made of iron, brick, etc., as compliance with the fire ordinance required. The typical cross-sections included in the illustrations show the character of construction. The concrete foundation walls are reinforced by ¾-in. Johnson corrugated steel




General Plan of St. Louis Freight Terminal of the Rock Island-Frisco Lines.

bars, as indicated on the drawing. Both houses have 12-ft. canopies on the team side and 6-ft. canopies on the track side. Parallel sliding wooden doors are provided on the track sides and counterweighted sliding doors on the team sides. Not only is this type of door cheaper but it was regarded as being more satisfactory in many ways than other types of doors intended for similar service. A detail of the door and framing is included in the illustrations.

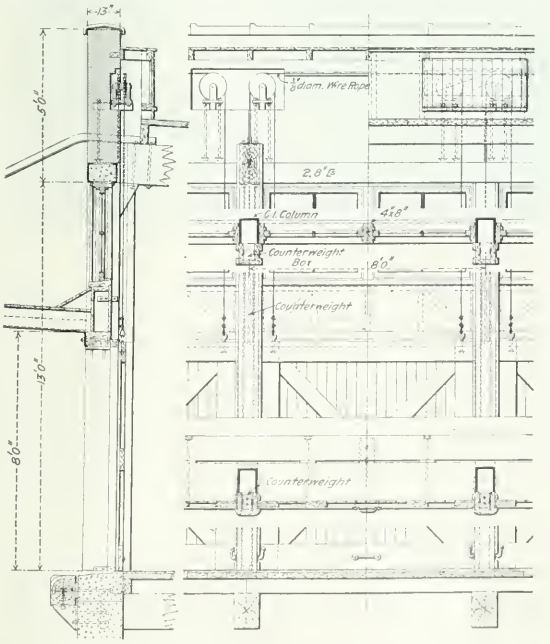
The space of 152 ft. between the parallel portions of the houses contains nine tracks and two 8-ft. transfer platforms. It will be




Cross Section Through Freight House; New St. Louis Terminal of the Rock Island-Frisco Lines.

observed that these latter are joined at the south end to a 10-ft. platform fronting on Biddle street. This plan provides a good arrangement for handling agricultural implements, vehicles, etc. There is an unoccupied space 40 ft. wide in this area which will be graded for a driveway, converting the adjacent track on each side into a team track.

The local freight offices will be located on the second floor of the inbound house. The outer office will contain a hundred clerks and special attention was given to the provision of suitable ventilation for their quarters. Ventilating fans of ample capacity are to be used, so that windows need not be opened at all for this purpose. Ample toilet facilities and all other necessary conveniences for the comfort and accommodation of employees are provided. The buildings are to be steam heated and electric lighted. The offices will have combination gas and electric fixtures. On the




Details of Door, Team Side.

first floor of the inbound house is a room 14½ ft. x 21 ft. to be used as a cooper shop for repairing damaged boxes, barrels, crates, etc.

It is expected to have the terminal ready for business by the first of November. Its total cost will be approximately $2,250,000, the greater part of which is for the site, as already explained. The plans were prepared under the supervision of Mr. J. B. Berry, Chief Engineer of the Rock Island, by Mr. A. T. Hawk, Architect. The local freight officers at St. Louis were given full opportunity to criticise the plans and make suggestions. The contractor is the Kellerman Construction Company, St. Louis.

## The Working of the Liverpool & Southport Electric Line.

At a session of the International Railway Congress last year the following remarks were made by Mr. J. A. F. Aspinall, Lancashire & Yorkshire Railway (Great Britain):

The description which Mr. Gerard has given of the Liverpool & Southport Railway is so complete that I do not think I can add anything to it of a technical character, but I fancy I understood him to say that he considered that electric traction would result in economy of working. We did not enter into electric traction with any idea that we should get economy of working. We did not expect to save money; we expected to make money—two very different things. We started to operate our line on the 22d of March last year, and, therefore, we have had practically twelve months' experience, and the results in the increase of traffic have been most satisfactory, but the results of operation have shown us that we were right in expecting that it would cost more money to work than it did when we used locomotives in the ordinary way. The cost per ton-mile for coal, for instance, is greater. The cost for the train crew is less, and that is less because we are able to get a larger mileage per day out of our stock. Perhaps I might mention here that our train crew consists, with our express trains, of two men. The trains are formed of four cars 60 ft. long, and sometimes five cars, but generally four cars with the express trains. There is one motorman, there is one guard. There are none of the numerous men that you carry in this country upon the different platforms. As soon as the express train starts it is the duty of the guard to go forward into the motorman's compartment so that he may be there to assist him should it be required. With regard to the stopping trains, we have three men, a motorman, a guard in the front baggage compartment, a guard in the rear baggage compartment, and we have a trouble which you have not got here, because we have two classes, third class and first class, and we have to handle the baggage which is brought by the ordinary passenger for any of the intermediate stations. The journey over our Southport line occupies 37 minutes, and we stop 14 times. We allow 15 seconds for each stop, and that 15 seconds is found to be sufficient to enable us to let in our passengers and to get in our baggage, and the public themselves open the doors on the platforms and shut them. We have been considerably assisted in getting our passengers in and out by having issued in the first instance notices to the public requesting them to get in at the rear door of the train and to get out at the front door of the train. That request has been complied with in a very extraordinary degree, and it enables us to load and unload our trains within the prescribed time.

So far as the advantages of electrical equipment are concerned, one of the things which led us to change from steam to electricity on this particular line was the difficulty that we had at our terminal station at Liverpool in handling the large number of people who have to come in during the rush hours, and it is quite obvious that if you work into a terminal station with steam trains, every time a steam train comes in and goes out, you have four platform operations and eight signal operations. First of all the train comes in; then a locomotive follows it, that is two; then the train goes out, that is three; then the locomotive which brought it in goes out, that is four. That is four platform operations, which means eight signal operations. That all takes time. Now, with the electric train, you come in; that is one. The motorman goes to the other end of the train; the train goes out; that is two. You have only two platform operations, four signal operations. *The result is that you double your terminal accommodation.* In addition to that, it so happened that we had upon this particular line four tracks going out for a certain distance toward Southport. We were able, as a consequence of the electrification, to relinquish the use of two of those tracks and devote them to freight train service; but the number of passengers traveling has become so great, through the increase, that we have almost immediately to equip those tracks with the third rail and begin to use them partially again during the rush hours for passenger service.

So far as the original cost is concerned, it does not seem to be possible, dealing with a line such as that which Mr. Gerard has described, to run the service which he has given—to run coaches such as we have, which are much larger than the coaches which you use upon your subway, say, in New York, and which are much more like main line coaches—it does not seem possible to look forward to equipping such a line with electric traction for less than £20,000 per mile, and that roughly, I think, represents something like three and a half times the cost of equipping it for steam traction. The result is that when you come to add your operating costs to your interest and depreciation, there is no doubt that it will cost you more money per ton-mile run, though you may very well get it back again by the very large increase in passenger traffic. I want to repeat that it is not a question of saving money;

it is a question of making money. (Applause.) Therefore the conclusion of Mr. Gerard's report, in which he says: "In England, on the lines where electric working is now in operation, the electrification is attended with an increase in the number of trains and consequently in the facilities offered to passengers." I need not read all that, but I merely want to say that one's own conclusions agree with that.

Will you permit me to add, Mr. Chairman, that we do not find that the weight of what we may call the locomotive equipment of the train is any less than it would be with the steam locomotive; and dealing with main line work, there is no doubt that the aggregate weight of the motors, the controllers and the electrical equipment will, in almost every case, come to as much as, if not more than, the weight which would be required if the train were going to be hauled by a steam locomotive.

### Canton-Hankow Equipment.

The accompanying photograph was taken at the opening of a branch line near Canton, China, of the Canton-Hankow Railroad. The locomotive is one of many sold to this company by the Manhattan Elevated Railway, New York City, when the elevated lines were electrified several years ago. On the roof of the cab can be seen the signal disks formerly used to indicate down which avenue in New York City the train was to go, and whether it was an express or a local. It is also interesting to notice that these locomotives now pull seven cars, which are probably heavier than the five-car trains used in their former service in New York. The cars, which are second-class passenger, were originally flat cars, and were

Second-Class Passenger Train, Canton-Hankow Railroad.

also shipped from this country. The line near Canton is well ballasted with rock, but the rest of the road running up to Hankow is ballasted mostly with sand. For through traffic heavier locomotives of the Mogul type are used.

### The Archaic Resistance to Railroads.

Practically the earliest railroad opened to traffic in Connecticut and one of the earliest opened in New England was the Hartford & New Haven line, between those two cities. It was opened in 1839, after having been incorporated in 1833 with power to "locate, construct and fully complete a single double or treble railroad or way," and also to use "the power and force of steam of animals or of any mechanical or other power or any combination of them"—terms that strangely anticipated by almost three-quarters of a century the charter needs of the up-to-date railroad project in the direction of electricity. The Hartford & New Haven road, with its later extension to Springfield, Mass., became—before its absorption in the present New Haven system—one of the most prosperous roads in the country, paying from 12 to 16 per cent. annual dividends, with frequent distributions of new stock. But at the outset the enterprise encountered much opposition, especially from representatives of the old "turnpike" interests. The nature of that opposition is curiously shown by the subjoined petition addressed to the Connecticut legislature in 1832, and signed as "overseers of turnpike stock" by Simeon Baldwin, Roger Sherman and Epaphroditus Champion, three of the most prominent citizens of the state. It is reprinted from the volume "In Olde Connecticut," by Charles B. Todd, recently published:

"Your memorialists, to their very great surprise, have lately been informed that a petition is now pending before your honorable body, which has been referred to a joint committee, for the incorporation of a railroad from Hartford to New Haven. However beneficial in general such improvements may be, it is very certain that they may be adopted under such circumstances as to produce more harm than good, and may result in great injury and injustice to private property. A railroad is a monopoly in a peculiar sense. On a canal or turnpike every citizen has a perfect right to use his own vehicles—not so on a railroad. The carriages upon that must all belong to the proprietors of the road or run by their especial permission, and must be subject to one superintendence. In the monopoly now contemplated your memorialists are informed and believe that, although no names appear on petition but those of the citizens of this state, yet a great majority of the interest is to be owned and held by strangers, citizens of other states, proprietors of those great and overwhelming establishments of steamboats and railroads which now monopolize the conveyance of passengers between the cities of New York and Philadelphia, and are endeavoring to seize the exclusive right through this state and Long Island Sound, and unite the whole with such additions as they may hereafter acquire under one power. Should they, by aid of legislative groups and immense and increasing wealth, extend into Massachusetts and reach the capital of New England a traveller who would enjoy the advantages of a conveyance between Boston and Washington, must submit to such terms as they please to prescribe. No line of steamboat not connected with that company could partake of the right of conveying passengers on these long and frequented routes. A passenger entered at Boston or Hartford for Philadelphia or Washington would pay is fare at the commencement of his journey and be lost to ever intermediate conveyance. Thus all competition would be put down and the great sums now invested by and extensively divided among our citizens, tending to cheapness and convenience, as well as to quality of rights and privileges, would be annihilated and the expense of traveling would depend on the will and pleasure of that united interest which would find its advantage in the highest possible rates of fare.

"By the grant now contemplated four turnpike companies between New Haven and Hartford, in which many widows, orphans and persons in moderate circumstances have invested their property, the steam navigation from Hartford to New York, the steamboats between the latter city and New Haven and many other of the vested interests of our own citizens would be utterly destroyed."

### Foreign Railroad Notes.

The *Jiji Shimpo*, a Tokyo newspaper, has arranged after consultations with the railroad bureau, the Nippon Railway and the Gyanyetsu Railway Companies, to run an exhibition train, in which the merchandise of leading stores in Tokyo will be exhibited for sale. The train will consist of three large passenger carriages. One or two cars will also be attached as storehouses. The train was scheduled to cover a distance of about 1,500 miles in days.

The Cape of Good Hope Government Gazette publishes the texts of two acts promulgated by Cape Colony, South Africa, providing for the construction, equipment, maintenance, etc., certain lines of railroad to have a total length of 499 miles at a cost of $9,860,824, and the other authorizing the raising of a loan for the purpose of new and additional railroad works, including the building of a portion of line at $277,390; locomotive workshops, $[illegible]662; ice-making machinery, $243,325; electric lighting, $243,

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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All records for heavy locomotives will be surpassed when the Erie Railroad receives from the American Locomotive Company next April three Mallet compounds which have just been ordered. This type of locomotive was first introduced in this country on the Baltimore & Ohio, where the one engine in service has been working on mountain grades east of Pittsburg for about two years. While the results have been satisfactory as regards maintenance and cost of operation, it is significant that the Baltimore & Ohio has not ordered more locomotives of the same type. Last week we described the Mallet compounds which the Baldwin Locomotive Works are building for the Great Northern, to be used on the steep grades over the Rocky Mountains. The Great Northern engines, which are the heaviest yet built, have a total weight of 355,000 lbs., with 316,000 lbs. on the drivers, and a tractive effort of 71,600 lbs. The locomotives for the Erie will weigh 410,000 lbs., all carried on 16 driving wheels divided into two groups of eight wheels each. They will be used between Hornellsville, N. Y., and Susquehanna, Pa., where the grades are steep and the line full of curves. It is proposed to haul 2,000-ton trains without pushers. The locomotives will have a tractive power of 98,000 lbs., and will be able to haul about 175 loaded cars on level track.

Last year 7,500,000 ties, or about 10 per cent. of the total number laid in track, were treated by some preservative process, according to a recent bulletin of the Department of Agriculture. Most of these ties were laid in the Middle West, where the supply of hardwood timber suitable for ties has almost disappeared. Ten railroads now have their own tie-treating plants and others are planning to build similar works for their exclusive use. Straight creosoting and the somewhat cheaper process of zinc and creosote combined are now in most general favor. Mr. Octave Chanute in discussing a recent paper by Mr. W. C. Cushing on the treatment of tie timber, warns prospective users of the creosoting process against too small doses of this costly antiseptic. He gives some figures showing the life of creosoted ties on the Western Railway of France, where the process has been in use for more than forty years. Beech ties laid down in 1865 which were treated with from 40 to 48 lbs. of antiseptic per tie when taken up 25 years later were in perfect condition. In 1878, in order to reduce the cost of the treatment, the amount of creosote injected was brought down from 26 to 33 lbs. At the end of three years some of the ties began to decay, and after five years a large number were removed. After this experience the amount of antiseptic injected was again increased to 39 lbs. and later to 48 lbs. as a minimum.

The Interstate Commerce Commission and the railroads are working together to devise regulations for filing and posting tariff schedules and classifications that will give shippers and passengers full information about all rates without imposing undue expense on the roads or needlessly increasing the difficult changes in rates. One of the complaints under the old law was that schedules, as filed and posted in stations, could be understood only by experts. As the new rate law requires schedules to include more information, it will make them still more complicated and difficult to understand unless some means of simplifying them can be devised. The object of the law in requiring schedules of rates to be filed with the Commission and posted in stations is to insure equality of treatment to all passengers and shippers. It is to the interest of all concerned to allow the roads the utmost liberty, consistent with insuring this equality, as to changing their rates. Such liberty tends to gradual reduction in rates, for a carrier will be restrained from reducing a rate if the reduction itself entails expense and it cannot be restored again without still more expense. The recognition of this fact led the Commission, under the old law, to approve the system of changing rates by filing and posting supplementary tariffs, thus relieving the roads of the great expense of reprinting their entire schedules every time a change was made. Most of the complaints about the difficulty of understanding the published tariffs have been based on the multiplicity of these supplements. One of the problems now being considered is as to what limit, if any, shall be placed on the number of supplements which can be filed before the entire tariff or classification must be reprinted. The Commission was at first disposed to limit the number of supplements to any tariff to five and the number to any classification to ten, but it is now likely that a broader rule will be adopted. To require reprinting of an entire schedule after every five changes would tend to petrify rates almost

as much as a complete prohibition of amendments. A suggestion that may have some merit is that a loose-leaf system be adopted, so that changes could be made by reprinting only the sheet or sheets on which the new rates appeared. These new sheets could then be inserted in the schedule in place of the sheets that had been superseded and the schedule kept up to date without any supplements whatever. The Commission, recognizing the difficulties of the question and the desirability of expert advice, invited the roads to make suggestions and gave a hearing on the subject last week. At this hearing it was made clear that both the Commission and the roads were disposed to work in harmony, that the Commission desired to enforce the law without imposing unnecessary hardships on the roads or unduly restricting their freedom to change rates, and that the roads were ready to observe in good faith any reasonable regulations made by the Commission. An understanding was reached in accordance with which schedule experts to be selected by the roads will meet experts to be selected by the Commission, and after considering the entire subject of schedule regulations will make recommendations to the Commission. Under this arrangement the railroads are to select one passenger expert and one freight expert from each of the four classification divisions into which the country is divided. This action by the Commission and the railroads affords additional ground for the belief that both sides are determined to do all in their power to make the new law effective and to avoid friction under it.

A peculiar instance of corrosion of crown sheet staybolts in a locomotive boiler was recently brought to our attention. The locomotive was a rather small, radial-stayed, narrow-firebox switcher on a road in the Central West. It had seen a good many years of service, and had been neglected in the matter of repairs, particularly boiler repairs. A change of mechanical officers occurred, and the new head of the motive power department ordered the engine into the shop for a new firebox. Removal of the old firebox disclosed a condition of some of the crown sheet stays that was surprising and puzzling. The bolts affected included three longitudinal rows on both the right and left-hand sides of the sheet, correspondingly located and nearer the side than the center. Beginning about an inch above the sheet these bolts were eaten away for perhaps an inch of their length until their diameter at the affected point was reduced one-half, on the average. Some of the bolts had already parted before the box was removed, while others were not so deeply corroded as the average; but every bolt in the rows mentioned was affected, and the action was confined to these rows. The mechanical officers were never able to discover the cause of the condition, nor have they any satisfactory theory to account for it. If there is any other case of the sort on record we do not know of it. The fact that the action was symmetrical with reference to the center lines of the crown sheet—affecting like rows in number and position on each side—suggested the possibility of some peculiar condition of circulation being responsible in some degree, though it is not easy to imagine how that condition might have been brought about. Perhaps some readers may know of similar cases or have theories or knowledge on the subject which would be of interest.

## WHEN BRAKES FAIL TO WORK.

Two recent passenger train wrecks, caused by failure of the brakes to work, have been attributed to the closing of an angle cock in the brake-pipe, thus cutting out the air-brakes on the rear cars. In the butting collision on the Canadian Pacific, near Sudbury, Ont., September 12, the brakes on three heavy sleeping cars and a dining car failed to work on approaching a meeting point and the engineer was unable to control the speed of his train which ran into another passenger train headed in the opposite direction, killing 12 persons and injuring 20. At Eddington, Pa., on the Pennsylvania Railroad, September 29, three persons were killed and 30 injured in a rear end collision. A train had stopped on account of defective brakes and the following train could not be stopped before running into it. After the accident an angle cock was found closed between the third and fourth cars, cutting off the engineman's control of the brakes on the last three cars of the train, all heavy Pullman cars. The evidence seems to show that in both cases the closing of the angle cock was accidental and not due to carelessness or malicious tampering. Such accidents are a rare but not unknown danger which has baffled the efforts of railroad men and inventors for 25 years.

With the enormous increase in the number of air-brakes in service since their use was extended from passenger trains to freight trains, the number of runaways and collisions due to the closing of an angle cock somewhere in the train has largely increased, although the aggregate number is still small. Of the total number of cases of closed cocks which have caused damage the large percentage, probably above 95 per cent., has been due to mistakes or carelessness of trainmen in not making sure that all cocks were open before the train started. Such cases can only be corrected and prevented by severe and constant discipline. But there are cases of accidental closing, even though the number be small. It is possible that officers in charge of this department have been too much influenced by percentages and, having other troubles which they could not settle to within 95 per cent. of perfection, would naturally devote a large share of their attention to these other and more pressing problems. It is this 5 per cent. of dangerous imperfection that we speak of now.

In the early development of the air-brake a simple horizontal plug cock was put in at the end of the brake-pipe under each car. The handle was placed to hang downward by the side of the cock when open, so that it would always tend to remain open by gravity and could not be jarred shut. As a further safeguard against accidental closing by an object flying up from the track and striking the handle, of which cases were not unknown, the Pennsylvania Railroad introduced a sheet of metal or shield placed in front of the handle. This device was later widely adopted.

When the quick-action air-brake was perfected some years later all the old plug cocks were removed and replaced with the present form of angle cock. The feature of a curved handle bent to conform to the shape of the cock body and lying close to and over the pipe when the cock was open was patented at the time as a safety device on the valve. Inventors were then working, and are still working, to provide a safeguard which should prevent disaster either from the negligence of a trainman, accident or malice of a trespasser, failure of the parts themselves, or to missiles striking the valve handle from outside. The Westinghouse Brake Company used in England for years, on passenger cars, air-brake couplings designed to open the valves in the pipes of both cars when the couplings were put together; to close both when separated in the proper manner, and to leave open the valves in both cars when separated violently, as in the case of the accidental parting of a train. Then, as now, the flexible couplings hung, when coupled, U-shape, and the trainman, in uncoupling, pressed upward at the bottom of the U; this upward movement closed the valves. The separation of the cars while in motion pulled the hose coupling apart without lifting, and the valves were so designed that this would leave them open. This device was imperfect, however, and it was finally abandoned. One of its imperfections was that an accidental separation would sometimes lift the coupling, as in normal uncoupling, and thus close the valves and prevent the automatic application of the brakes. In such a situation the rear part of the broken train would run uncontrolled and collision might result. This abandonment was due in part to the real or supposed remoteness of the danger which the invention was designed to provide against.

We have been told by trainmen that handles turned to the wrong position have been discovered when no wreck has resulted, and they attribute this to tramps using the handles as grab irons, and also, perhaps, to tramps riding on the buffer blocks and, in maintaining their unsteady position, putting a foot against the handle and accidentally turning it.

On some passenger cars the safety chains are so placed that, when one of them is not hooked to the adjoining car, it hangs dangerously near where a swing may cause a link to catch and turn the angle-cock handle. It is said, too, that handles have been shaken from their proper position by vibrations of the train-pipe.

The use of a lock to hold the angle-cock handle securely in one position was also early proposed, but it appears that all of the designs were defective in some way, or failed to find favor. No railroad found it practicable to introduce a locked handle in any other way than to put in a new valve; and this was expensive.

A locked handle is now made and has been used on tenders for some time. The Westinghouse Company has delivered thousands of these handles to railroads within the past few months, indicating that they are being put on cars as well as tenders. The design is simple, being practically the same in principle as that of a common type of switchstand. Normally the handle lies flat. Its movement is to the right or left, horizontally, but before being moved horizontally it must be lifted vertically over a

lug. In fitting old cars the valve itself does not need to be renewed, the new design of handle being made to fit the present valve. It would seem to be, in itself, and without a shield, as complete a protection as can practically be made to prevent accidental closing of the train-pipe.

## THE STATUS OF THE HOLDING CORPORATION.

Subject to future uncertainties of politics and the attitude of a legislature thus far divided against itself, the state of Massachusetts, through its executive branch, has decided to push through the courts its case against the New York, New Haven & Hartford Railroad Company for alleged violation of the law prohibiting direct or indirect control of street railways by a steam railroad corporation. At the instance of Governor Guild, the Attorney-General of the state has entered an information in the Supreme Court praying for an injunction and, in a kind of supplemental information, asking on technical grounds for a receivership of two of the minor lines taken over by the New Haven company several years ago. The full text of the information is not before us but printed extracts indicate that it raises pretty clearly—or must raise in the course of future proceedings—the legal status of the holding companies, general, local and "voluntary," which have been interposed between the steam company and the controlled trolley lines in Massachusetts. In that comprehensive shape, the suit, coming as it does in a state whose law is apt to be good law, has unique value and suggests some ideas of a broader character on the nature of holding companies and their relations to various important interests.

As related to the carrying of persons and property by rail those companies are of many species. They may be temporary, like a brief voting trust, or permanent and intended as a plan for regular control, or they may be indefinite, to be continued or closed, as conditions suggest. They may be formal chartered bodies subject to fairly close restriction and with defined functions, or, on the other hand, only a kind of "gentlemen's agreement" with a status not essentially different from that of a single big controlling shareholder who naturally agrees with himself. The same diversity appears in the motives for their creation. They may be intended to check speculation or, on the other hand, as a means to promote it. They may be a bar to speculators who seek immediate control of a great railroad property or an instrument of those same speculators, once having gained control, to hold it while releasing their funds for fresh speculation; as Wall street history, and comparatively recent history, attests. They may be, as in the Massachusetts case, a piece of railroad strategy to resist, impair or thwart the operation of a statute. They are both interstate and intrastate, falling, and intended to fall, sometimes under one jurisdiction, sometimes under another. Very often the underlying motive bears directly or indirectly on competition, the New Haven's policy, for an example, having in view future perils of rivalry from long distance electric parallels. The railroad holding company in such a case assimilates itself very nearly in practice and principle to the familiar industrial trust.

In such wide variations of the holding railroad—and railway—companies are naturally to be found elements both good and bad. They are good when, in conservative hands, they protect the shareholder from speculative raids. As representing also the general principle of consolidated management with closer economies, the strengthening of weak subsidiary lines and better public service, they are benign; and even as checks on competition, when competition would otherwise result ultimately in combination with inflated capital, the holding company may have excellent public uses. On the negative side the main evils are irresponsibility to the stockholder and to the public. The stockholder loses direct relation to his property interest and is one degree removed even from the position of a minority shareholder in an ordinary corporation; while, as to the public, the relation to it of the holding corporation is generally loose and ill-defined both by legislatures and courts. This laxity gives rise to anomalous situations, as, for example, enforced returns from controlled corporations while the bigger controlling (holding) body is compelled to make no return at all. This is particularly true of the voluntary or, at least, unchartered holding combinations. On the other hand, when the holding body is chartered, legislative devices for unduly amplifying charter privilege are apt to become too easy; for instance, the old trick of vesting, by a few words, hidden in a verbose charter amendment, the holding corporation with all the powers given originally by a liberal charter to a small subsidiary line. On the whole the public dangers of the holding company have considerably overbalanced its public benefits, which is only another way of stating the corporative truism that indirection is worse than direction.

This brings us back to the prime fact that the railroad holding company, as an organization taking manifold shapes, needs legal outline and definition. Chartered or unchartered, inside the state or interstate, protective or speculative, temporary or permanent, it is a comparatively recent institution, increasing both in number and forms and on which as yet legislation is crude and judicial decisions scant. Hence the special import of the controversy which now seems fairly joined in Massachusetts, covering a wide range of questions, likely to traverse the state courts and, on issues of constitutional rights of voluntary associations, likely to reach federal jurisdiction. Even if the case does not travel that long and sinuous legal path, the preliminary findings of the state tribunals may have far-reaching and original values.

## THE WABASH FINANCES.

The capital arrangements of the Wabash Railroad are peculiar. Between the common and preferred stocks and the straight mortgage indebtedness of the road are two issues of so-called debenture bonds; one of $3,500,000 series A bonds, the other of $26,500,000 series B bonds, both bearing a 6 per cent. nominal return. For several years up to January, 1904, the full 6 per cent. was paid on the "A" bonds. Since then no payments have been made on this issue. On the much larger issue of "B" bonds no interest has ever been paid. These issues of debenture bonds, put out at the time of reorganization of a weak property, have been a tremendous handicap to the road. The Wabash is one of the weaker railroads in a highly competitive territory. The strong roads like the Vanderbilt and Pennsylvania lines have been constantly improving their facilities in roadbed, track, motive power, cars and terminals. They have either been free to make new bond issues or, as has more usually been the case, have been able to provide for betterments out of surplus earnings. Meanwhile the Wabash, handicapped at the start, has had difficulty in maintaining its relative position. Not until interest should be regularly paid on the debenture issues was there a possibility of issuing new bonds, while surplus earnings from operation were insufficient for necessary betterments. This stumbling block in the road's progress has within the last year or two, as improvement requirements have broadened, become more and more of an obstacle. Its removal, in a way which should leave the road free to put in force a comprehensive plan of capital expansion, has become steadily more necessary.

The matter was brought to a head by formation in March, 1905, of a committee representing the debenture B bondholders, whose object it was to obtain payment of interest on these bonds, on the ground that surplus earnings applicable to such payment under the terms of the mortgage had been diverted to the improvement of the property. The mortgage covering the "B" bonds is so worded that the holder of the bonds is practically assured of 6 per cent. on his security before any new issue of mortgage bonds is made or any dividends paid on either class of stock. This right, although it stands in some question could, in all probability, be upheld in court. On the other hand, as long as it is insisted upon, there seems little chance that the road will either pay interest on the "B" bonds or hold its own in the keen competition which it must always face. Thus the position of the debenture bondholder is that of a man with the right to insist on a condition, insistence on which is likely to result both in its non-performance and in depreciation in value of his property. A compromise plan has, therefore, been made which is to be presented at the annual meeting of the road next Monday, which provides that the Wabash is to issue $200,000,000 of 4 per cent. consolidated mortgage bonds; each $1,000 of debenture B bonds is to be exchanged for $700, par value of the new mortgage bonds, $500 in preferred stock, now selling at about 45, and $500 in common stock, now selling at about 20.

In the annual report just issued President Delano sums up the present financial situation of the road in the following language, which is interesting also as expressing the opinion of a railroad officer in regard to the present rate situation:

> It seems appropriate to submit to the holders of stock and debenture bonds certain considerations which have been of growing importance to their interests and which seem to the management to be now of controlling importance. Certain definite and settled conditions have resulted from the vast consideration which has been given in this country to the relations between the public and the railroads. Public requirements have become clearly imperative that rates shall be fixed, stable and universal in their

application and that facilities shall be adequate and impartially provided. As a just correlative, however, there seems to be now existing a wider and larger tolerance of rates remunerative for the service rendered. The management is not apprehensive of serious reduction of the present scale of rates (which in our territory are very low), but it is apprehensive that unless ample provision is made for considerable capital outlays, the company will not be able to fully meet its obligations to the public in furnishing facilities or to gain the greatest measure of profit from the operation of the property. In short, it is believed that the tendency in rates is toward a just, but fixed standard; that the competition of the future will be in the character of services and facilities offered to the public, and that the profits of operation must grow or be reduced and disappear in the measure in which service and facilities are advanced, or suffered to halt and decline.

It must be remembered that the lines of the Wabash traverse a zone of dense traffic, handled on a basis of rates normally so low as to absolutely require ample and perfect facilities for economical operation if operation is to be, and continue to be, profitable. Moreover, this is an era of revolutionized views of what constitutes railroad efficiency, and vast expenditures of capital are being made to conform railroad plants to modern standards. Competing lines, great systems to the north and south of your property, have had the benefit of large and continued capital expenditures while the Wabash, with its debenture mortgage as an obstruction to every important source of new capital, has been seriously handicapped in this respect; restricted, as it has been, to its surplus earnings as its almost exclusive capital fund and with this fund limited in its application by the provisions of the mortgage. The management has not been indifferent to the disappointment from year to year of the expectations of the debenture bondholders, but not only has the application of surplus revenue been necessary in the effort to keep pace with competitors in facilities furnished and to meet the growing demands of the public, but these revenues, conditioned in their use by the terms of the mortgage, have been insufficient to fully meet these needs in the past and are wholly inadequate to enable your company to follow the great strides now being taken by competing systems.

In view of these considerations the management is constrained to urge upon stockholders and debenture mortgage bondholders the importance of the provision made in the plan, now pending for their consideration, to meet immediate and future capital requirements and to enable the company not only to increase the profits of operation but to make these profits distributable. As bonds under the new mortgage will be reserved for retirement of existing liens, equipment obligations and notes, in addition to reservation for exchange of the debenture bonds, the provision through the remaining bonds for the improvement, equipment and extension of the property and for required additions to its terminal and other facilities will be by no means excessive to cover the future requirements of your great and growing property. Owners of the property must appreciate that neglect to furnish needed facilities or equipment not only drives business away to our competitors, but invites hostile legislation and criticism, whereas there is every certainty that money wisely spent in such added facilities will, by the increase in earnings it will bring, render a full return on the investment and in addition greatly enhance the value of the existing property. Indeed, earnings, now some $10,000 per mile, ought, with intelligent expansion of our facilities to be readily increased to even double that figure.

This is a clear statement of the difficulties which the road now faces, and which, in order to make it the property which it should be, must be removed. The annual report, reviewed in another column, shows the favorable results already obtained by the new management. There is also beginning to be felt some benefit from the Pittsburg extension. With the debenture issue out of the way and funds for improvements provided, the next few years could hold a very bright future for the Wabash. The "B" bondholder, therefore, may either hold out for his full 6 per cent., with little likelihood of getting it, at least without a protracted lawsuit; or with faith in the future of the property, abandoning what he may with justice believe to be his rights, join hands with the management in carrying out a plan which will make possible the general up-building of the road. If this shall result, as is natural to suppose, in an increase of earning power, such as that suggested by Mr. Delano, the exchange of debentures for mortgage bonds, preferred and common stock is likely in the end to prove a profitable one.

## Report on Salisbury Disaster.*

The report of Major J. W. Pringle, inspector of the British Board of Trade, on the disaster at Salisbury, on the London & South Western, July 2, when 24 passengers were killed, was briefly summarized in the *Railroad Gazette* of October 5, page 292. As before stated, the inspector, as well as the officers of the road, is settled in the conviction that the speed of the train at the time of the derailment was very high, perhaps as high as 72 miles an hour, the descending grade approaching Salisbury being for some of the way as steep as 46 feet to the mile. The train had not only to pass through the 8½ degree curve at which the engine was overturned, but, if it had kept on, would have encountered, a short distance farther on, a cross-over track with reverse curves of 11½ degrees. This at once disproves the theory that the engineman purposed to stretch the speed limit to the highest possible point, expecting to get through by the skin of his teeth. No reader of the testimony can for a moment think that he intended to run through Salisbury at that speed, except on the assumption that he was crazy. The action of the driver is inexplicable. The testimony of men who had seen him before the run was all to the effect that he was sober and in normal physical condition. He was a total abstainer. He had been on duty about 9 hours. He was 40 years old, had been in the company's service 22 years, and a passenger runner between London and Exeter 8 years. This evidence that high speed was unintentional is important, because the engineman had never before run this very fast train, and, it is believed, never before had run a train which had to pass through Salisbury without stopping. An engineman on a difficult run for the first time is likely not only to be abnormally anxious, but to take risks which he would not take under more familiar circumstances; but it is unbelievable that any man could have thought of running through a 11½ degree curve without superelevation at 60 miles an hour.

At the curve where the derailment occurred the outer rail was elevated 3½ inches for most of the way. The sharper curve, which the train would have traversed about 300 feet beyond the point of derailment, was on a cross-over track, and there was, therefore, no superelevation. The train consisted of a 4-4-0 engine, with 6 ft. 7 in. drivers, and weighing 121,000 lbs. The center of the boiler was 8 ft. 6 in. above the track, and the center of gravity of the engine was about 5 ft. above the track. The weight of the five cars in the train, empty, was 112 gross tons, or, loaded, 120 gross tons, estimated.

The special weekly express for the American line steamers was put on in April, 1904. It was scheduled at 50 miles an hour for the first half of the journey (to Templecombe), and 57.9 miles for the last half. Although the time of departure of this train could not be fixed beforehand, a special time table was issued, giving, at the principal stations, the number of minutes from the starting point, and indicating four places where speed must be reduced. After the train had been run a few times an order was issued that nonstopping trains must not pass through Salisbury at a greater speed than 30 miles an hour. On June 14, 1904, a bulletin was issued to the effect that the train must not make up time, and with the addendum, "any driver running at higher than scheduled speed will be taken off his engine." On February 10 of this year a revised time table was issued in which the train was allowed one minute extra as far as Basingstoke for slackening through Salisbury station. Basingstoke is some 30 miles beyond Salisbury. These details are of interest as showing with what care the schedule had to be adjusted to the capacities of the locomotives.

When engines were changed at Templecombe on the fatal night the head guard, who rode in the kitchen van at the tail end of the train, did not test the vacuum brake by reducing the pressure of the vacuum in his gage; but he asserts that he saw the pressure rise in his gage after the new engine was attached, and therefore was satisfied that the brake was in working order. The evidence shows that steam had been shut off when the train passed through Salisbury station, but that the brake had not been applied. The inspector could find no evidence from the condition of the guard rails or sleepers that the engine mounted or jumped the rails, and he concludes that it was overturned by centrifugal force. It had been in service less than a year, and there was no hollowness of tires or sharpness of flanges. Neither were there marks on the flanges of the front truck wheels to show that any obstruction had been struck. All of the axles on the train were found unbroken. The suggestion that the front truck of the engine would not curve is untenable, as the center pin had a clearance of ⅛ inch. With the estimated center of gravity of the engine, a vehicle on this curve would be unstable at about 67 miles an hour, even after allowing for the 3½ inches of superelevation.

Moreover, it is probable that the effect of centrifugal force would have so acted on the springs, whilst the vehicle was still in a state of stable equilibrium, as to bring the center of gravity into the position it would occupy if the vehicle were a rigid body, and there were no superelevation. Unless there is a gradual lead into a sharp curve of this description, the effect of sudden impact has also to be taken into consideration. It is in accordance with the views of well-known writers to make some allowance for effect of impact, in determining the speed at which overturning, due to centrifugal force on a sharp curve, becomes imminent. Some disregard the beneficial effect of superelevation, others make a much greater allowance, by doubling the amount of centrifugal force. In this particular instance, if the small amount of superelevation be not taken into account, a calculation, or diagram of forces, will show that for the engine and tender, taking the centers of gravity as 5 feet and 3⅜ feet above rail level, respectively, overturning is imminent on a curve with a radius of 8 chains at speeds of about 63 and 65 miles an hour. * * * Bearing this in mind, and for want of any evidence from the condition of the permanent way, engine wheels, etc., of ordinary derailment, I have come to the conclusion

*Reported in the *Railroad Gazette*, July 6 and 20, General News Section.

that the high speed at which the train was traveling caused the engine to overturn.

The head guard, in the last car, noticed the excessive speed, but was either very slow in discovering it or dilatory in taking action, for the only thing that he did was to apply the vacuum brake lightly after entering Salisbury yard, so as to attract the attention of the engineman. The inspector finds some contradictions between his testimony and that which he gave before the coroner, and concludes that he was little fitted for his responsibility.

Thirty miles an hour, the limit prescribed by the company, is held to be too fast for this curve. While it may be slow enough for safety, if the maximum superelevation is provided in the outer rail of the curve, it is not slow enough for the comfort of passengers, and this last is an element to be considered. In view of the presence of the cross-over track the inspector thinks that 15 miles an hour is the highest allowable speed. In a foot-note he suggests the further consideration that the distant signals at both ends of the yard should be held at danger against trains, with the object of emphasizing the speed limits.

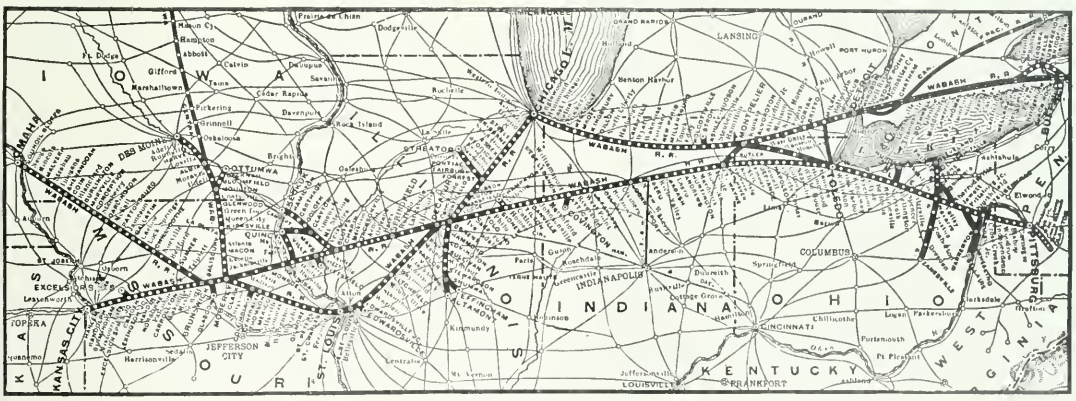
Some of the passengers were not promptly released from the wreck, and it has been suggested that there were not enough saws and other cutting tools available. But an inspector arrived at the scene of the accident within 20 minutes, bringing three adzes, three hand saws, two cross-cut saws and one axe, so that no criticism is offered on this point. The inspector concludes with the remark that there is "no other known case in the United Kingdom where overturning has been caused by high speed," and that in the last 17 years only two passengers have been killed in train acidents on the London & South Western.

## Wabash.

The last fiscal year is the first during which the present management of the Wabash has been in control. Many changes have been made. The engineering and maintenance of way departments have been reorganized; the locomotive and car departments consolidated; the fuel and store departments converted into a supply department, with jurisdiction over fuel, supplies, stationery and material; the President Delano's remarks about the limitation of necessary future improvements by the present outstanding issue of debenture bonds are quoted and discussed in the editorial columns.

The report is divided into four parts instead of two, as in previous years. These are signed, respectively, by the president, the general manager, the traffic manager and the fourth vice-president in charge of the accounting department. In order not to limit the comparison with the abnormal year ended June 30, 1905, which was greatly affected by the St. Louis Exposition, figures are also included in the report for the year ended June 30, 1904, which would naturally furnish a fairer comparison. There was naturally a large decrease in passenger earnings, as compared with the World's Fair year, but this was a little more than made up by freight earnings, which increased more than 18 per cent. In 1905 passenger earnings made up 36 per cent. of the total, against 27 per cent. last year. The opening of new rail lines between Chicago and St. Louis (Chicago & Eastern Illinois) and between St. Louis and Kansas City (the St. Louis, Kansas City & Colorado line of the Rock Island), the competition of electric lines in Illinois and Indiana and the recent two-cent fare law in Ohio are mentioned as further causes of the loss in passenger earnings. While gross earnings show an increase of only $318,779 over 1905 the fact that there were large decreases in the three important expense accounts is responsible for the gain of $2,744,336 in net earnings, which is at the rate of over $1,000 a mile. Maintenance of way expense decreased $898,000, maintenance of equipment $895,000, and conducting transportation $626,000, the latter increase being due to a much larger train load and the taking off of the fast World's Fair passenger trains, which besides being operated at an extremely small margin of profit greatly impeded operation of the freight traffic.

The unit maintenance costs were $983 per mile for straight maintenance of way, against $1,360 in 1905, and $1,141 in 1904. Maintenance of way, including additions and improvements, cost $1,235 per mile, against $1,592 in 1905, and $1,463 in 1904. Exclusive of payments for new equipment, straight maintenance of equipment cost $2,037 per locomotive, against $2,790 in 1905; $597 per passenger car, against $884 in 1905, and $50 per freight car, against $78 in 1905, this last abnormally high figure being due to the repairing of freight cars by an outside company, already mentioned.




advertising and commissary departments reorganized, and the dining car and restaurant service improved with the result of a decreased deficit from these services; an industrial department has been organized, and the mail department reorganized with a view to increasing the business. New agencies have been established in Atlanta, Ga.; Memphis, Tenn.; Dallas, Tex.; Hannibal, Mo.; Moberly, Mo.; Peoria, Ill.; Indianapolis, Minneapolis, Los Angeles and San Francisco. A system of fast freight trains has been put in service between all principal terminals to be regularly run on advertised schednles, together with a system of reports by which shippers are promptly advised of the whereabouts of their property. The Buffalo and Detroit divisions and the St. Louis and Western divisions have been consolidated and other changes in operating policy made. For instance, a large reduction in passenger mileage was made by taking off unnecessary trains that were not paying expenses. Again, in the previous year 3,045 freight cars were sent to the American Car & Foundry Company to be repaired or rebuilt, at a cost of $468,000. Last year it was not found necessary to have any cars repaired at outside shops. As a result of the effort to handle a larger share of through freight moving between the Missouri river and the eastern terminals of the road there was brought about an increase of 10 per cent. in the average freight haul, or from 228 miles to 252 miles.

The increase in the revenue train load was from 293 tons in 1905 to 348 tons last year, a gain of 55 tons, or 16 per cent. Including company freight the train load was 367 tons, against 317 tons in 1905. Less than ten years ago, in 1898, the average load, including company freight, was 217 tons. The increased freight haul was counteracted from the standpoint of earnings by a decrease of 7 per cent. in the ton-mile rate, or from 0.58 cents in 1905 to 0.54 cents last year. This low rate is an evidence of the highly competitive character of the road's traffic. Unfortunately, no figures showing kind of traffic hauled are given, so that it is not possible to judge from this standpoint of the road's progress during the year.

The principal results of operation for the last three years are as follows:

| | 1906. | 1905. | 1904. |
|---|---|---|---|
| Mileage worked | 2,517 | 2,517 | 2,517 |
| Freight earnings | $16,138,466 | $13,650,181 | $14,064,657 |
| Passenger earnings | 6,733,658 | 8,917,829 | 7,015,025 |
| Gross earnings | 25,015,379 | 24,696,600 | 23,023,627 |
| Maint. of way and structures | 3,109,022 | 4,007,506 | 3,681,608 |
| Maint. of equipment | 3,679,948 | 4,575,148 | 3,478,002 |
| Conducting transportation | 10,629,921 | 11,255,972 | 9,978,629 |
| Operating expenses | 18,077,887 | 20,503,545 | 17,683,503 |
| Net earnings | 6,937,491 | 4,193,156 | 5,340,118 |
| Surplus | 509,333 | 1,459,572* | 14,291 |

*Deficit.

### Denver & Rio Grande.

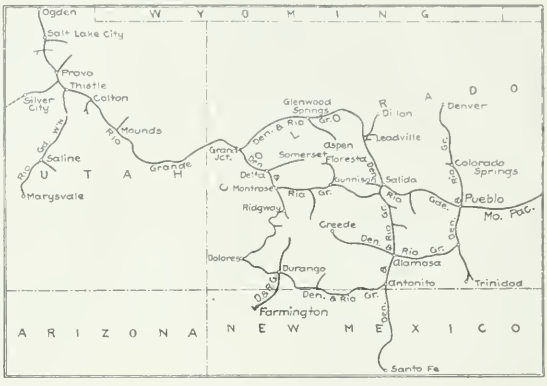
The year has been a prosperous one for this Colorado road, with an increase of $2,654,607 in gross earnings and $719,393 in net earnings, gains of 16 and 10 per cent. respectively. Accordingly, after the regular dividend payments on the preferred stock, there was an appropriation of $1,150,000 for betterments—$1,000,000 for additional standard gage equipment and $150,000 as part cost of new engine-house at Denver and Pueblo—against a like sum of only $283,915 charged against current account in 1905. The gain in gross earnings was evenly distributed between freight and passenger traffic, as freight earnings increased over $2,000,000 and passenger earnings $570,000. The gain in net earnings was not the result of skimping the maintenance account, as there were increases in every item of unit maintenance. Maintenance of way per mile was $975, against $826 in 1905; maintenance of equipment per locomotive was $2,277, against $1,970 in 1905; $607 per passenger car, against $466 in 1905, and $57 per freight car, against $44 in 1905. An increase of over 200 per cent. in the cost of rail renewals is one instance in which expenses under the ordinary operating accounts are working for the betterment of the road. The largest proportionate increase under maintenance of equipment is in repairs and renewals of baggage, mail and express cars, which increased over 100 per cent. Cost of conducting transportation rose 17½ per cent., a fairly normal increase, corresponding with the increase of 21 per cent. in revenue ton miles. The item injuries to persons under this head increased for the year by $68,000, or 58 per cent., probably as a result of the disastrous collision at Adobe, Colo., on March 16 of this year.

Like the Colorado & Southern, the Denver & Rio Grande gives statistics for both tonnage and revenue of classified freight traffic. Bituminous coal furnished 32 per cent. of the tonnage and 20 per cent. of the revenue; precious ore, 25 per cent. of the tonnage and 16 per cent. of the revenue; manufactures made up 6 per cent. of the tonnage and furnished 12 per cent. of the revenue, and miscellaneous and general merchandise, 4 per cent. of the tonnage and 18 per cent. of the revenue. The Denver & Rio Grande evidently does not obtain so high a rate on lumber, for this item of traffic furnished 3 per cent. of the tonnage and 4 per cent. of the revenue, while on the Colorado & Southern lumber made up 2 per cent. of the tonnage and furnished a much larger proportion, 7 per cent., of the revenue. The train load increased from 207 tons in 1905 to 220 tons last year, or including company freight, from 236 tons to 252 tons. The average receipts per ton-mile were 1.29 cents, against 1.34 cents in 1905. This is a high ton-mile rate and is largely responsible for the present prosperity of the road. The passenger mile rate also decreased, from 1.91 cents in 1905 to 1.81 cents last year.

Extensions and improvements during the year include the construction of a 28-mile extension of the Bingham branch to reach extensive smelting plants on the south shore of the Great Salt Lake, about 15 miles west of Salt Lake City, Utah, 12 miles of the extension being made necessary by the fact that the existing line into the Bingham mining district, known as the Copper Belt Railroad, has such steep grades as to make it impossible to carry the daily tonnage which the mines produce and the new smelters will require. There were 16 miles completed on these extensions during the year, as well as a 4-mile branch from Roy Station near Ogden to Hooper. Since the close of the fiscal year the western portion of the main line of the third division between Montrose, Colo., in the Uncompaghre Valley, was changed from narrow to standard gage. The work of laying 80-lb. rail on the main line between Denver and Grand Junction was completed. On the main line west of Grand Junction 77½ miles of this weight of rail were laid, making about 127 miles on the western section laid with 85-lb. rail. Of the remaining 200 miles, 143 miles are laid with 75-lb. rail and about 58 miles are still to be laid with the heavier section. The engine-houses which have been in use at Denver and Pueblo were originally designed for narrow gage motive power. They were found to be inadequate and the construction of new engine-houses is now under way. The one at Denver is nearly finished. The larger engine-house at Pueblo is to be a 49-stall brick building, with concrete cinder pits, a 600-ton capacity coaling station and an 80-ft. electric turntable.

In regard to the Western Pacific, which is to be the Denver & Rio Grande's Pacific connection, it is stated that scarcity of labor has retarded the work and the amount accomplished thus far is less than was anticipated. The financial details, unfinished a year ago, were concluded by increasing from $50,000,000 to $75,000,000 the capital stock of the Western Pacific, under which arrangement the Denver & Rio Grande and its subsidiary Rio Grande Western Company, hold $50,000,000, or two-thirds of the capital stock in their treasury.

The report continues, "Recent events in San Francisco have in nowise disturbed the confidence your directors have expressed in this new line of railroad and in the advantage to be derived from development of its local resources and its importance and value to the Denver & Rio Grande. Faith in the future of the Western Pacific is just as strong as it was before the San Francisco disaster. The city will be rebuilt on finer, more attractive and better engineering plans. The great harbor will continue to hold and increase its ocean commerce. The navigable streams of the Sacramento Valley will always attract and sustain inland navigation. San Francisco as a financial center will maintain her supremacy on the Pacific coast. Trade and commerce by land and water will pay tribute in greater volume than ever before to her merchants, manufacturers and




Denver & Rio Grande.

citizens. The soil of California is as fertile as before the disaster, the mines as productive, the forests as rich in timber, and the other natural resources just as extensive and valuable."

The principal operating results, with comparison with the preceding year, are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,477 | 2,420 |
| Freight earnings | $13,943,556 | $11,932,420 |
| Passenger earnings | 4,609,428 | 4,039,418 |
| Gross earnings | 19,686,115 | 17,031,507 |
| Maint. way and structures | 2,415,353 | 1,998,494 |
| Maint. of equipment | 2,566,411 | 2,031,523 |
| Conducting transportation | 6,621,986 | 5,632,606 |
| Operating expenses | 12,104,172 | 10,168,961 |
| Net earnings | 7,381,943 | 6,862,547 |
| Net income | 3,712,474 | 2,932,452 |

## NEW PUBLICATIONS.

*The San Francisco Earthquake and Fire.* By A. L. A. Himmelwright, M. Am. Soc. C. E. New York: The Roebling Construction Co. 9¾x11 in.; 270 pages; 173 illustrations. Price, $5.

A brief history of the San Francisco disaster, a presentation of facts and resulting phenomena, with special reference to the efficiency of building materials, and the lessons to be drawn from the effects of the disaster in this respect, are given by Mr. Himmelwright in this work. The author made a personal inspection and detailed examination of every building of fireproof construction in the burned district. There are 74 such buildings included in the report, and the effect of the fire on several non-fireproof buildings is also discussed. These included the Palace Hotel and four or five other buildings having brick walls and floors and roofs of combustible material. Each building is covered individually in the report, the name, location, architect and owner being given, followed by details of construction, effects of the fire and earthquake, and such brief comments as the latter suggest regarding the general condition of the structure and the conclusions to be drawn therefrom. The engravings illustrating these effects are practically all full-page half-tones from photographs which were carefully taken and are excellent in detail. These engravings present a most interesting and instructive series of studies and form a valuable record in the history of fireproof building construction. The general comments and conclusions of the author resulting from his investigation, filling 23 pages, follow the individual exhibits and discuss the character of different types of construction and the efficiency of the various kinds of building materials. In this presentation he endeavors (1) to point out those methods and details of building construction which developed good efficiency in the fire; (2) to call attention to those features of construction which were either defective or failed to fulfill the requirements; and (3) to note important omissions in designs. The volume concludes with 12 lessons to be drawn from the fire and six from the earthquake, all presented in concise form.

*Proceedings of the American Railway Master Mechanics' Association.* 1906. Chicago: Published by the Association. Half leather, 6 in. x 9 in.; 570 pages.

The report of the thirty-ninth annual convention of the American Railway Master Mechanics' Association held at Atlantic City, N. J., June 18 to 20, 1906, is the largest volume yet published by the

Association, indicating the growth of the scope of its work and the interest taken in the discussions of reports and papers by the members. Among the subjects of committee reports included in the volume are tire shrinkage and design of wheel centers, flexible staybolts, water softening, locomotive tests at St. Louis, front ends, classification of locomotive repairs and specifications for cast-iron. A number of individual papers are also printed, including special valve gears for locomotives, superheated steam, welding locomotive frames, injectors and fire kindling. These papers and committee reports are, if anything, above the high standard of previous years, and contain information and data to be found in no other publication. As in previous editions, the standards of the Association are shown on folded sheets inserted in the back of the book, and a good index to the contents of the reading pages is also included.

*Index of Papers and Subjects Discussed by Railway Clubs.* Published by the Society of Railway Club Secretaries. 23 pages, 3 in. x 6 in.

The list of the subjects presented at the railroad clubs in the United States at meetings from May 31, 1905, to May 31, 1906, is now being distributed. The pamphlet begins with a brief history of the work and growth of these organizations, the first of which, the Master Car Builders' Club, was formed in 1871, the name being changed in 1887 to the New York Railroad Club. The Society of Railway Club Secretaries was organized in 1896 to systematize and simplify the work of the various associations.

*Consolidation Type Freight Locomotives.* 72 pages, 6 in. x 9 in. Published by the American Locomotive Co., 111 Broadway, New York.

This is the latest of a series of pamphlets devoted to types of locomotives built by the American Locomotive Co. The locomotives described are those weighing less than 175 lbs. There are four pages of tables giving the principal dimensions of 30 locomotives, and the rest of the pamphlet is taken up with more extended illustrated descriptions of these engines. This publication is the third of a series, the first two describing Atlantic and Pacific type locomotives.

## Recent Interstate Commerce Commission Rulings.

The Interstate Commerce Commission has announced the following rulings: A copy of an arrangement between common carriers governing joint rates between them on interstate business must be filed with the Commission. When such an arrangement is verbal or is contained in correspondence between the parties, or is a part of their custom and practice, a memorandum of its terms must be filed with the Commission.

The recent notice to the effect that a joint rate on a given route higher between any points than some of the local rates between the same points by the same route may be reduced to the sum of such local rates until December 31, 1906, upon posting the reduced rate one day in advance and mailing a copy to the Commission has been amended to apply to the joint rate in effect by a given route higher between any points than the sum of the locals between the same points by the same or another route.

Rates for a series of excursions limited to either a period of not more than three days or to a period of more than three days and not more than 30 days may be established upon notice of three days as to the entire series, and separate notice of the excursions on each day covered by the series need not be given. Round trip tickets on the certificate plan may be issued at reduced rates and their use confined to delegates to a particular convention or members of a particular association on condition that a certain number of such tickets be presented for validation before the reduced rate for the return trip be granted to any holders. The notice regarding these tickets must be regularly filed and posted; such tickets may also be issued to government employees going home to vote and returning to their employment. The Commission suggests that not less than 100 tickets be presented for validation before the reduced rate be granted to any. Free transportation may be granted to only such employees of carriers as are actually in the service of a carrier and use substantially all their time in the work or business of such carriers. However, a carrier may give the necessary free transportation to a person traveling over its line solely for the purpose of attending to the business of or performing the duty imposed upon a carrier, and a carrier may transport free household and personal effects of an employee, who has to remove from one place to another at the instance of or in the interest of the carrier by which he is employed. Free transportation or reduced rates may be given to contractors for material, supplies and men for use in the work on the line of the carrier, but such arrangements must be made a part of the specification of the contract. Members of the family of clergymen are not entitled to free transportation or reduced rates. Officers of the government, the army or the navy cannot be given transportation or reduced rates. Whenever by special permission of the Commission the tariff is made effective in less than 30 days, such tariff must bear notice that it is issued by such special permission.

## Ways and Means to Maintain Car Supply.*

BY L. C. BIHLER.

There are opportunities for bettering ways and means to maintain car supply both on the industrial and the railroad side, which will assist in preventing shortages of cars. For one thing, deliberate and premeditated overshipment on the part of certain shippers in supplying raw material to customers in their eagerness to forward all they can, if they have permission to ship all they can produce, should not be encouraged or tolerated. There are conditions, however, which, from the standpoint of the receiver, make it necessary for practical operation to have perhaps larger shipments on one day than can be unloaded; for instance, in the case of holidays or an actual strike in sight, which might affect supply; and the same conditions might govern also as regards a stock of material for current consumption. Too often, by far, is the overshipment of certain classes of material by certain shippers tolerated by railroads. In fact, there have been some cases where it has been deliberately helped along by the railroads themselves, and the available car supply has been given largely to the people who have overshipped.

If a commodity like coal was subject to the same vigorous treatment as other commodities and a system devised whereby, at tidewater or at Lake Erie ports, it could be unloaded over trestles and the steamer loaded from the supply under the trestles, car supply for ore and limestone could be largely increased and maintained. It is only necessary to refer briefly to the fact that each coal carrier has anywhere from 20 to 50 or more shippers on his line, each shipping a few cars a day, each of three or four sizes coal, to Lake Erie ports or tidewater, all of which are detained at the water front until the quantity of a cargo of each grade is reached and loading of vessel begun, before the first cars are released. In no other line of traffic is this tolerated. This, therefore, is one of the most important questions whereby the railroads and the coal shippers, in working together for a common purpose, can accomplish some good in radically increasing and maintaining the supply of cars.

Another feature which might be touched upon is the practice of some shippers in loading a partially completed order in a car and detaining the car until the remainder of the order is manufactured, all of which is, of course, wrong, and if abandoned by all shippers, will also assist in increasing the available supply of cars for full loads, waiting either at the plant or elsewhere.

The question of prompt repair to crippled equipment is also deserving of the closest attention on the part of railroads at all times, since it is a matter of common knowledge that hundreds of cars are frequently standing on sidings awaiting opportunity to get into the repair shops, when, as a matter of fact, perhaps more than half of the cars, requiring light repairs only, could be repaired where they stand, if traveling gangs of car repairmen were maintained. It is surely possible, without a great deal of expense, to have slightly crippled cars repaired where they stand, leaving the others to take their turn to get into the shops, and in busy times to send to the shops only those cars that cannot be treated outside the shop. We might also briefly touch on the point of maintaining in proper and safe condition freight car equipment and motive power at periods when general business is dull, when it can be done at less expense to the railroads. It is a matter of record and repeated fact that, during dull periods, the condition of equipment and power of many railroads is permitted to run down, defects are not remedied, and the effort to always be in shape for any increase in business that comes along, is not made until after the increase in business has arrived, when the matter of repairs is more difficult of performance because of the busy conditions of all branches of labor which comes with an increase of business. "In time of peace, prepare for war," might here be applied, by preparing in times of dulness to have the maximum amount of equipment ready for service when required.

There have been times in the past when restrictive or prohibitive loading rules were created by the Master Car Builders or the motive power departments of railroads, which have been without due regard, in some instances, for the rights of shippers, or without full and free consultation with the traffic and operating departments, in so far as these M. C. B. rules affected directly or indirectly the maximum load limit, which, if small, particularly of double or triple length or overhang material, increases the given number of cars required to carry a certain tonnage. Any reasonable shipper will always be willing to regard safety first, but he hesitates at arbitrary decisions of one department of a railroad which are "iron-clad," when these carry with them the imposition of additional costs for securing loads, a maximum quantity that may be loaded, and make it necessary to have more cars to carry a given tonnage, increasing the demand of a shipper for equipment at times when liberal, reasonable and safe rules do not always absolutely require it. In other words, there is opportunity for practical co-operation between shippers and motive power, mechanical,

*A paper read before the Traffic Club of Pittsburg.

car building, operating and traffic departments of railroads.

It is also desirable that the division superintendents, car distributors and trainmasters always keep in close touch with all the shippers along their divisions, in order to know what kind of cars they can use for their material. For instance, a shipper of brick or sewer pipe can, as a rule, use a box or gondola car, and it is not, to my mind, good railroad practice if the railroads, as they frequently do, carelessly give him the first cars of either kind they can lay their hands on, when some other shipper who needs a gondola car and cannot use a box car, is deprived of the gondola by reason of its having gone to the brick shipper, and a box car, conveniently handy, which could have gone to the brick shipper, is standing idle because the brick shipper has his gondola, and the shipper who wants the gondola, cannot use a box car. The same remarks would apply to coal shippers who can load either gondola or hoppers; likewise to sand shippers. Cases of this kind have been known to happen frequently, but they need not have happened if the car distributor had sufficiently informed himself as to his shippers' needs. By care in this respect a better supply of cars is surely available.

Another important point is in regard to the negligent or careless waste of car capacity, something that may be corrected by full co-operation by the railroads and the shipper. It frequently happens that shippers will ask for a large capacity car when a smaller one will answer for the shipment at hand, and surplus capacity which some one else would be anxious and glad to have is wasted. On the other hand, there have been many cases where, when a shipper has ordered a smaller sized car, he has been given a large capacity car, because it was more convenient to place it than another, although smaller capacity cars have been available and some other person who wanted a large capacity car is, perhaps, deprived of it because of careless division of available equipment, the practical result being deficiency in carrying capacity.

The question of prompt unloading of inbound material, in order to create car supply for outbound, has been so fully discussed that it needs no particular reference at this time. The division of certain kinds of equipment as between the railroad company for their own fuel and ballast needs, and shippers, also has an important effect on car supply. The railroads invariably place and select for their own uses the character of equipment most suitable for them and most economical to unload, and then out of what is left, they make the division, frequently forcing additional expense on the consignee. For instance, in case of limestone, coal, etc., which mill operating conditions generally require should be received in hoppers or drop bottom cars for unloading over a trestle, too frequently solid floor gondolas are furnished, the railroads using the available hoppers for their own company material, and the extra cost of shoveling over the sides of a high gondola loaded with sand, limestone, dolomite, ore and similar material, is imposed on the consignees. The extra time consumed in unloading undesirable equipment not only restricts production, as raw material can frequently be consumed faster than it can be unloaded from unsatisfactory cars, but also adds to car detention. Any extra cost in unloading operations should not be borne entirely by the shipper or consignee.

As to the proper kind of equipment for the several classes of open car freight, which move in extraordinarily large volumes, it seems probable that a universal gondola-hopper car or composite car will be the car of the future. Several years ago, one of the large systems provided a large number of gondola cars, with sides 30 in. high, steel underframe and drop ends, cars being about 37 ft. 8 in. long inside. This innovation was hailed with delight, because of the belief by iron and steel shippers that something had been done in their behalf, by providing something that had never before been attempted, namely, a car peculiarly adapted to carry iron and steel of long lengths, without incurring the maximum cost for blocking such long pieces, as customers require and the tendency of the trade of later years demands. Bridge sections, girders and like material are now demanded by buyers in longer sections than before, all of which had made the long car with drop ends particularly valuable for the shipment of such material. It was not long, however, before this pattern of car became scattered all over the country, because of the large volume of traffic moving from the iron and steel district in all directions, and these cars drifted and continue to drift, notwithstanding efforts to the contrary, into coal, sand, brick, lumber, stone and other trade, until now, what was formerly a large supply of suitable cars for long lengths of iron and steel, has dwindled to a comparatively small available supply. This character of solid floor equipment has gone into the iron ore and limestone trade, and in time of extreme stress and emergency, consignees are willing to accept the material loaded in this class of equipment, rather than be forced to go without it, notwithstanding the large expense of handling the load over the side as compared with unloading through a car dumper or over a trestle.

It will probably never be possible or practicable to entirely limit the use of special equipment to the particular class of trade for which it was designed and is peculiarly adapted, consequently the suggestion of a composite or universal gondola-hopper car for all that class of traffic which has to move in open cars seems reasonable. The special equipment to which reference has been made is not always capable of carrying the weight capacity indicated; for instance, a car will carry 100,000 lbs. of steel or ore, but would only carry perhaps 60,000 lbs. of coal, and there is, therefore, probably 40,000 lbs. of weight capacity wasted. The same car also is so long that it does not go through some of the car dumpers used in connection with blast furnace plants. Apparently, the capacity and length of a car dumper was perhaps not given sufficiently thorough consideration by both railroad and manufacturing interests at the time the railroads adopted this long car. In adopting a universal car, the opinions of the shipper, receiver and carrier must be taken into consideration. One of the roads in this district (Pittsburg) has recently taken a step in undertaking to provide a car which goes towards filling the bill for universal gondolas. Several thousand new cars have been bought covering some of the good points of the modern open car, but not all of them. The length of the car in question is 41 ft. inside, capacity 100,000 lbs., height of sides 50 in. This car was designed in the belief that less weight capacity would be wasted, and therefore the maximum use of equipment and a more far-reaching maintenance of supply would be gained by its use. It is figured that a car of the dimensions indicated will carry the full weight of coal, to the extent of its marked capacity, and will also serve for iron, ore, coke, limestone, sand, brick, ordinary length steel, pipe, lumber, clay or any other open car commodity. This car, however, without drop ends or drop doors, or hoppers, is less valuable than a universal car that is provided with hoppers and drop endgates. For extra length pieces of iron or steel extending over two or more cars, the load will have to be superimposed, at extra cost to shipper for blocking, and M. C. B. rules would restrict loading limit, thus wasting capacity.

The modern freight car of to-day is a car built wholly of steel or with steel underframe, insuring maximum safety to property and life, with a minimum of cost for maintenance and repairs. One of the large systems of the country has served notice that on and after Jan. 1, 1907, they will not accept for transportation any cars not up to their standard of construction. A second large system, which recently intended to place an order for 20,000 or more freight cars, having in mind steel or partial steel construction, were so late in placing the orders that in order to get the equipment at all, they had to take a wooden car. Since then, however, information received is to the effect that half of the order for wooden cars has been canceled, principally with the idea in mind of securing a more durable car. Within a few years the time will be here when the large systems of the country will all refuse to handle cars unless up to modern standard of construction as to suitability, safety, etc., and it is not unreasonable to assume that national legislation may be created and enforced, requiring at least certain standards of construction. The modern steel car costs considerably more than a wooden car, but its life is very much greater; therefore, when considering the purchase of new equipment and the desirability of its being of a modern standard of construction, new equipment should be designed as far as possible with the idea of taking care of the greatest possible variety of different kinds of loads offered, thus going a long way towards the question of maintenance of a supply of freight car equipment.

In 1905, railroads of the United States placed orders for about 350,000 freight cars, two years' work for all the combined car shops of the country. It would be interesting to know, of these 350,000 cars, how many were based on designs planned after full and free consultation with the traffic departments of the railroads. With the idea of furnishing cars that could handle the greatest possible variety of loads, the traffic departments of the railroads have the means at hand of canvassing the shippers and receivers to learn what classes of freight they have in large volumes and what kinds of cars are best adapted to move it. It would be equally interesting to know how many Master Car Builders, motive power, mechanical engineering and operating departments of the roads, who ordered or planned this large lot of equipment, consulted the traffic departments or shippers or receivers for ideas as to universal cars. Is there not room here for the best kind of co-operation between the traffic departments of industrial concerns and the various departments of the railroads?

If the carriers of the country will take advance steps to meet the legitimate needs of the growing traffic of this great country and place themselves beyond just criticism of the public, we shall hear less of that class of railroad legislation which threatens to penalize the railroads if they do not deliver empty cars ordered for shipment within a given number of hours.

It is figured that there is a deficiency in freight car equipment in the country to-day of over 200,000 freight cars. The estimated tonnage of the greater Pittsburg district for the year 1905 was in the neighborhood of 100,000,000 tons, which is an increase of some 132 per cent. over the figures for 1897, a period of eight years, yet who will venture to say that the transportation lines have increased

the supply of equipment nearly as much in the same length of time. Incidental to all this is the all-important question of sufficient motive power available at all times to keep cars moving. It has been suggested that perhaps there are too many freight classification yards at division terminals, and that once a road engine is hooked onto a train, the road movement is fairly good, but that the effect of the good movement on the road is largely nullified by the exceedingly great delays to which a car is subjected in the classification yards. There seems to be no particularly good reason why through freight at least should not be handled with the same degree of despatch at division terminals as through passenger trains.

One of the underlying principles of the entire subject is practical co-operation by all parties. In an address delivered before the club some months since by Mr. H. W. Thornton on the subject of "Co-operation" (*Railroad Gazette*, August 31, pages 170 and 182), some of these features were touched upon in a somewhat different way, and in an address delivered also before this club some seven or eight months since by Mr. J. B. Yohe, a statement was made that if loading and unloading by shippers or consignees could be speeded, it would mean an increase in available number of cars. It is also pertinent to remark that if the mileage per hour of freight trains were increased and some of the delays at yards and division ends cut out or reduced, it would also increase the available quantity of equipment. Equipment is practically valueless without sufficient motive power in first class condition with which to promptly move it; consequently, the question of motive power is a prime factor in the entire question of maintenance of supply of equipment. Meantime, until some better condition is reached, if there is more general and actual co-operation between the railroads, the shippers and the consignees, an improvement in existing conditions is surely bound to come.

## Railway Signal Association Reports.

The annual meeting of the Railway Signal Association was held in Washington, D. C., Oct. 16-18. Below are given extracts from some of the committee reports presented:

### INSTALLATION AND MAINTENANCE OF STORAGE BATTERIES.

At the January meeting this committee made a preliminary report. On June 15 a list of questions was sent out, but only 20 replies were received, and information was given by only 10. The committee does not feel justified, considering the small number of replies received as compared to the storage battery installations, in making other than the following recommendations at this time.

*Construction of Cells.*—Storage cells for railroad signaling should have the grids made of one piece to prevent possible resistance, due to contact losses. The formation should be of the Plante type.

Separators of rubber for portable, and rubber or glass for stationary cells should be used.

Covers should be used to prevent loss of electrolyte due to spray and to keep out foreign matter. They should not be sealed.

Portable cells should have splash proof covers with gas vent. Jars should be rubber, placed in suitable wooden cases.

Stationary cells should have glass jars in sand trays on insulating supports to distribute the weight and prevent current losses due to grounds.

Stationary cells should be placed in a ventilated shelter that is acid proof. A coating of acid-proof paint will assist in making it impervious to acid fumes.

The fumes should be kept away from all signal apparatus.

Damage to bright metal instruments and connections can be prevented by a coating of vaseline.

Protection from cold temperatures is not necessary.

Electrolyte, when prepared, should be made of chemically pure sulphuric acid and distilled water.

Electrolyte should be obtained from manufacturers when possible.

Impurities in the electrolyte will lower the capacity of the cell.

*Installation, Transmission Line System.*—The transmission lines should be equipped with lightning arresters, and can be put on poles with telegraph wires, and carry 500 volts.

They should go from line to batteries through air when possible.

The same wires can be used for charging batteries for motor signals and track circuits.

Duplicate sets of batteries should be used.

Only one long track circuit should be supplied from one set of cells.

The cells should have a reserve capacity to give five days service after interruption of supply.

*Portable System.*—The cells should have a capacity to run the signal 30 days with a reserve supply of from 25 per cent. to 50 per cent. at the end of that time.

There should be about 25 per cent. more sets than there are signals.

Sets of storage cells should be shipped between signals and power house by freight and motor car or by motor car alone.

This system is giving entire satisfaction on single track roads in the west for motor signal circuits.

*Gravity Battery Storage System.*—Gravity cells in this system do not require any special attention provided connections are good.

The number of gravity cells should be such that the charging e.m.f. and the counter e.m.f. will adjust themselves automatically.

This system is giving good satisfaction where used.

*Maintenance.*—Storage cells used in signal work should be examined once a week, by making voltage and specific gravity test, and inspecting for short circuits.

If the electrolyte is kept free from impurities and the plates free from short circuits, the cells will hold up under severe conditions.

The specific gravity of the electrolyte must never be adjusted until the cause of the disarrangement is found and removed.

A pilot cell is not advisable in small sets such as are used in signaling.

An overcharge once a month will keep the cells in good working state under ordinary conditions.

### *Tests of Electrolyte for Impurities.*

*Platinum.*—Pour the electrolyte into a cell in which the regular battery plates are immersed. If gassing takes place for some time on open circuit, the presence of platinum is indicated and a test by a skilled chemist should be made as the smallest trace will discharge the cell.

*Iron.*—To half a test tube of electrolyte add a few drops of chemically pure nitric acid, $HNO_3$, boil and when cool to half of this add a few drops of potassium-sulphocyanide, KCNS. A deep red color will show the presence of iron. To the other half add ammonia in excess and set aside to cool. A brown precipitation shows iron present in dangerous quantity.

*Chlorine.*—Dilute electrolyte with five or six volumes of water and add a few drops of nitrate of silver, $A_gNO_3$. A cloudy white precipitate, turning blue in sun light, indicates chlorine.

*Nitrates.*—Put 25 cu. cms. electrolyte in a test tube and add 10 grams of strong ferrous sulphate solution; carefully pour down the side of the test tube 10 cubic centimeters of chemically pure concentrated sulphuric acid. If nitric acid be present it will be indicated by a stratum of brown color which will form between the solution and the concentrated acid. The depth of color will indicate the relative proportion of nitric acid present.

*Copper.*—To a sample of electrolyte add an excess of ammonia hydrate. A rich blue color indicates the presence of copper. Or, to a sample of electrolyte add potassium hydrate. If a blue precipitate is found which turns black upon boiling, it is an indication of copper.

*Mercury.*—The presence of mercury in the electrolyte is indicated by a black precipitate when lime water is added, or by an olive green precipitate when potassium iodide is added.

M. E. Smith, G. B. Gray, W. J. Eck, J. E. Hackman, I. S. Raymer, Chairman.

### HOW TO REMEDY THE EFFECTS OF FOREIGN CURRENT ON AUTOMATIC BLOCK SIGNALS.

Under "methods of protection" against foreign current interfering with the working of automatic signals, the committee submit the following conclusions for adoption by the Association:

1. When there is a crossing of an electric road with a steam road, batteries must be placed at each end of steam road track next to crossing and battery current arranged to flow in direction with foreign current leading into track circuit, if foreign current is found to flow in a definite direction. The connections, through block section for control of signals, must be made by means of line wire circuits. If there is sufficient foreign current to improperly work the track relay when an insulated joint is broken down, the multiple track relay arrangement should be used.

2. For situations where there are power houses and foreign currents follow the track rails, although there may not be a crossing or connection with an electric road, it is recommended that the conditions be carefully studied and exact information obtained as to the source, direction, amount and pressure of foreign current and provision should then be made for removing or blocking out this current.

3. To minimize as far as possible the effects of foreign current on line wire circuits, it is regarded as important that trunking be kept above the top of the ground, the rubber and other insulations be kept in first-class condition and the common wire limited to a length of ten miles.

4. For multiple arrangement of track circuit relays, a resistance of 16 ohms is suggested for relay at battery end and 4 ohms for the relay at the other end of track circuit. The committee recommends that further research be made to establish the proper re-

lation of the resistance, pick up and releasing point of the two relays of the multiple track circuit arrangement.

5. For track circuits having but one relay, a resistance of 9 ohms is recommended for circuits 500 feet and under, and a resistance of 4 ohms for circuits of greater length than 500 ft. While it is recognized that the best results are to be obtained by using a relay having a resistance proportioned to the resistance of the circuit, the benefits do not compensate for the disadvantage, from a maintenance standpoint, of having to keep in stock track relays of a number of different resistances.

6. It is advisable to thickly coat with a heavy oil the parts of an insulated joint before the joint is put in place. If there is interference from foreign current it is advisable to put a heavy oil on the joint and particularly around the exposed ends of the fiber at least every two months.

7. For direct current track circuit connections run in trunking, No. 8 or larger B. S. gage soft drawn copper wire with $^{3}/_{64}$ in. rubber insulation wall is recommended.

8. For signal circuit connections run in trunking a No. 12 or larger B. & S. gage, soft drawn copper wire with $^{3}/_{64}$ in. rubber insulation wall is recommended.

9. Trunking when run parallel with the track should be kept clear of the ground. When run across tracks, trunking should be put in with top clear of the ballast and with top of capping not less than 1½ in. below bottom of rail.

10. The standard ground should be made by burying in moist earth an annealed copper plate $^{1}/_{16}$ in. thick, two feet square, to which has been brazed for a length of 12 in., a No. 4 B. & S. gage soft drawn bare copper wire. The plate to be buried in clay or in a six-inch layer of fine charcoal and the connecting wire is not to exceed 150 feet in length. The effectiveness of the ground should be tested by a Wheatstone bridge.

W. H. Elliott, Chairman; C. C. Anthony, Azel Ames, Jr., C. C. Rosenberg.

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SPECIFICATIONS FOR RUBBER INSULATED SIGNAL WIRE 600 VOLTS OR LESS.

The committee has not yet gone fully into the matter of stranded conductors or cables, either aerial or submarine, but submits a specification for rubber covered wires covering solid conductors of sizes Nos. 0, 1, 2, 4, 6, 8, 9, 10, 12, 14, 16 and 18. A conference was held in New York with Messrs. LeRoy Clark, W. A. Connor and Wallace S. Clark, a committee of the Rubber Covered Wire Manufacturers' Association. While the specifications submitted are not exactly those drawn up as representing the joint consensus of opinion of the Manufacturers' Committee and the Association's Committee, the committee of the Association presents them for discussion and recommends their adoption for use on signal circuits carrying current at pressure of 600 volts or less.

The committee suggests that it be permitted to continue its work and make later report on the matter of underground, submarine and aerial cables.

*Specifications for Rubber Insulated Signal Wire—600 Volts or Less.*

*1. Conductors.*—Conductors must be of soft-drawn, annealed copper wire having a conductivity of not less than 98 per cent. of that of pure copper. Each wire forming a conductor must be continuous without splice throughout its length, must be uniform in cross section, free from flaws, scales and other imperfections and provided with a heavy uniform coating of tin.

*2. Rubber Insulation.*—The vulcanized rubber compound shall contain not less than 30 per cent. nor more than 33 per cent. by weight of fine dry Para rubber which has not previously been used in rubber compound. The gum itself shall not contain more than 3½ per cent. of resinous extract. The remaining 70 per cent. of the compound shall consist of mineral matter only. The insulation must be tough, elastic, adhering strongly to the wire, must be homogeneous in character and placed concentrically about the conductor.

*3. Taping and Braiding.*—(a) The rubber insulation must be protected with a layer of cotton tape thoroughly filled with a rubber insulating compound, lapped one-half its width and so worked on as to insure a smooth surface.

(b) The outer braid must consist of one layer of closely woven cotton braiding $^{1}/_{64}$ in. thick, saturated with a black, insulating, weatherproof compound which shall be neither injuriously affected by nor have injurious effect upon the braid at a temperature of 200 deg. Fahrenheit.

*4. Tests.*—The manufacturer must provide at his factory all apparatus and other facilities needed for making the required physical and electrical tests and must provide the buyer's representative with all facilities for assuring himself that the 30 per cent. of rubber as above specified is actually put into the compound. The inspector shall not be privileged to ascertain what mineral ingredients are used in making up the remaining 70 per cent. of the compound. The manufacturer shall give free access to the place of manufacture and opportunity to test at all necessary times. Tests will also be made upon the finished product after delivery, and the wire will be rejected if it fails to meet the requirements of the specifications. The manufacturer must pay freight charges for return of all wire that may be rejected by the railroad company.

*5. Physical Test of Copper Conductors.*—Each solid conductor must stand an elongation of 25 per cent. of its length in 10 in. before breaking. In torsion it must stand before breaking 30 twists in 6 in. It must be capable of being wrapped six times about its diameter and unwound without showing signs of breakage after this process has been gone through twice. The tension and torsion tests will be made on separate pieces of wire.

*6. Conductivity Test of Copper.*—The conductivity of the copper shall be determined by measuring the resistance of a length of the wire and comparing with Matthiessen's standard of copper resistance.

*7. Tests of Tinning.*—Samples of the wire shall be thoroughly cleaned with alcohol and immersed in hydrochloric acid of specific gravity 1.088 for one minute. They shall then be rinsed in clear water and immersed in a sodium sulphide solution of specific gravity 1.142 for 32 seconds and again washed. This operation must be gone through with four times before the wire becomes clearly blackened.

*8. Tests of Braiding.*—Six-inch sample of wire with carefully paraffined ends shall be submerged in fresh water of a temperature of 70 deg. Fahrenheit for a period of 24 hours. The difference in weight of the sample before and after submersion must not be more than 10 per cent. of the weight of the sample before submersion less the weight of the copper and vulcanized rubber.

*9. Physical Tests of Rubber Insulation.*—A sample of the vulcanized rubber insulation not less than 4 in. in length shall have marks placed upon it 2 in. apart. The sample shall be stretched until the marks are 6 in. apart and then at once released. One minute after such release the marks shall not be over 2⅜ in. apart. The sample shall then be stretched until the marks are 9 in. apart before breaking and must have a tensile strength of not less than 800 lbs. per square inch.

*10. Chemical Tests of Rubber Insulation.*—The vulcanized rubber compound shall contain not more than 6 per cent. by weight of acetone extract and not more than 0.7 per cent. of free sulphur.

*11. Electrical Tests of Rubber Insulation.*—The circular mills cross-section, the thickness of the rubber insulation (measured at the thinnest point), the minimum insulation resistance in megohms per mile and the dielectric strength for the various sizes of wire shall conform to the following table:

| Size B. & S. gage. | Area in circular mills. | Thickness of insulation. | Insulation resistance, megohms per mile. | Test voltage alternating current. |
|---|---|---|---|---|
| 0 | 105,592 | ⅛-in. wall | 1,200 | 10,000 |
| 1 | 83,694 | ⅛-in. " | 1,300 | 10,000 |
| 2 | 66,373 | ⅛-in. " | 1,400 | 12,000 |
| 4 | 41,742 | $^{3}/_{32}$-in. " | 1,300 | 9,000 |
| 6 | 26,256 | $^{3}/_{32}$-in. " | 1,500 | 9,000 |
| 8 | 16,509 | $^{3}/_{32}$-in. " | 1,700 | 9,000 |
| 9 | 13,090 | $^{5}/_{64}$-in. " | 1,700 | 7,000 |
| 10 | 10,380 | $^{5}/_{64}$-in. " | 1,800 | 7,000 |
| 12 | 6,530 | $^{5}/_{64}$-in. " | 2,000 | 7,000 |
| 14 | 4,107 | $^{5}/_{64}$-in. " | 2,100 | 7,000 |
| 16 | 2,583 | $^{1}/_{16}$-in. " | 1,900 | 4,000 |
| 18 | 1,624 | $^{1}/_{16}$-in. " | 2,000 | 4,000 |

The test for insulation resistance must be made upon all wire after at least 48 hours submersion in water and while still immersed results being corrected to a water temperature of 60 deg. Fahrenheit. Tests must be made before the application of tape, braid or other covering with a well insulated battery and galvanometer, with not less than 150 volts and readings must be taken after one minute's electrification. The test voltage must be applied to the completed length of wire before the insulation test for a period of five minutes, using alternating current from a generator and transformer of ample capacity.

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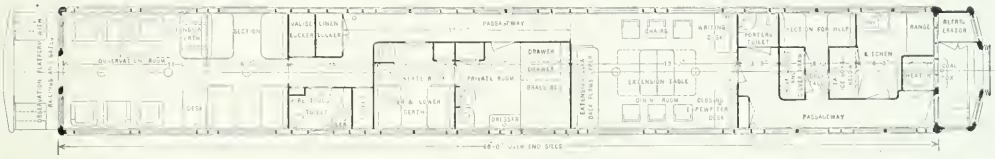
## Labor Agitation in England.

By way of engineering the "national conference" which is proposed by the Amalgamated Society of Railway Servants of England for this November to formulate a programme for improvement of hours and wages of all grades of railroad servants, preparatory meetings are being arranged at various railroad centers and resolutions are being passed for such things as a universal eight-hour day, a minimum wage of 12 cents an hour and a guaranteed week's work for everyone. But the managers of this agitation seem to have an uneasy feeling that they are unlikely to get anything like what they want unless they can enlist public sympathy on their side, and so harrowing details are published about engine drivers being forced to work for 15 or 16 hours a day and goods guards being kept on duty for over 20 hours. The union leaders will have, however, to persuade the public that the railroads habitually and systematically impose excessive working hours on their servants, and to do this a few isolated instances are by no means sufficient.

## Private Car "Chicago" of the Western Union Telegraph Company.

A private car for the use of Mr. Thomas P. Cook, General Superintendent of the Western Union Telegraph Company, has recently been turned out by the Hicks Locomotive & Car Works, Chicago. Utility was a primary object determining the interior arrangement and finish, and Mr. Cook's own ideas were embodied in various features. The car is 68 ft. over end sills, 9 ft. 8 in. over side sills and 13 ft. 11 in. high (New England height) over all. Its exterior appearance is shown by one of the engravings.

Private Car "Chicago" Built by the Hicks Locomotive and Car Works.



Floor Plan of Private Car "Chicago," Western Union Telegraph Co.

Interior of Dining Room.

Being a business car, the interior finish and decoration is plain, though attractive. It is in quarter-sawed oak, golden finish, the style being flat with a single inlay. The design is intended to furnish the minimum of dust-catching surface consistent with attractive appearance. The ceiling is semi-empire deck in a light olive color with gold leaf decorations. The seats in the observation and staterooms are upholstered in olive frieze plush; the sections adjoining the observation room are similarly upholstered. Leather is used in the dining room. The seat in the observation room is an extension berth, and the sofa berth in the dining room is arranged for the back to form an upper berth, making sleeping accommodations for ten people in addition to the help. The stateroom has full-section upper and lower berths, white metal washstand and hopper. The private room adjoining has brass bed, dresser, white metal washstand and hopper. The stateroom and private room both have large lockers, and the brass bed has two large drawers underneath opening into the private room and intended for clothing. There is also space under the brass bed for one or two steamer trunks. One aim in designing the car was to provide as much closet and wardrobe space as possible for the convenience of the occupants.

There are three desks in the car. The one in the observation room is a small flat-top desk with two drawers underneath and occupies a space against the section on one side. In the dining room there is a folding typewriter desk at one side of the passageway door and a small drop-lid desk with pigeon holes and drawers on the other side. Above both are bookcases extending to the crown molding. The car has large china and linen lockers and a small but fully equipped and conveniently arranged kitchen with ice boxes and all conveniences. The refrigerator on the forward platform extending to the hood has capacity for 200 lbs. of ice. The ice boxes under the car have capacity for 1,000 lbs. and other boxes for provisions are ample for an extended stop at any point. Water capacity and gas storage are also large, providing ample hot and cold water and Pintsch gas for lighting during any delay to the car on account of special work on the line.

The unusual form of the windows in the observation room will be noted. There are no upper sash or gothics, making the entire window opening available for light and observation, enabling the occupants of the room to see easily the tops of telegraph poles along the line.

## Testing Coal.*

BY A. BEMENT.

It is the principal object of this paper to emphasize the necessity for improving the practice governing specifications and inspection, and also to suggest certain lines along which the research work should proceed, and it is fuel coal from the Eastern interior coal basin that is more particularly considered.

The improvements and corrections which concern terms of specifications, and the inspection service, require that determinations of the following be abandoned:

Moisture,
Volatile matter.
Fixed carbon.
Sulphur,
Evaporative power of the coal.

Every essential requirement of the purchaser may be fulfilled by confining specifications and tests to the three following charac-

*A paper presented before the Western Society of Engineers, Oct. 3.

teristics; in fact, these three features alone will insure greater protection to the purchaser than obtainable under present general practice:

Per cent. of ash in the dry coal.
Size of the coal.
Heating power of the pure coal.

The latter, according to prevailing practice, would preferably, of course, be expressed in British thermal units.

The reasons for the above recommendations are given under the following captions:

MOISTURE.

Moisture is a great and uncertain variable. It not only differs in various coal seams as the coal lies in the ground, but is affected in fuel as received in shipment, by conditions of weather, temperature and time the coal may be in transit. It is approximately correct, however, to say that each coal seam has a characteristic moisture content of its own, which is uniform over at least very considerable areas, but the after influence above mentioned changes it, so that there is no assurance of what it may be except under specially defined conditions.

Therefore, the producer or coal dealer can exercise no control over moisture, and as the prime object of fuel inspection service is to insure that the customer is served to the best ability of the dealer, specifications and tests of moisture in coal delivered can offer no protection to the purchaser. As before mentioned moisture varies in different coal seams; for this reason it might appear that its determination would indicate the seam from which the coal came. This is not true, however, for reasons above mentioned. If tests are expected to identify the seam which produced the coal other means must necessarily be employed.

However, in coal inspection service, moisture has been found to be very high in cases where delivery is by wagon, which, owing to lack of sufficient explanation of phenomena at the time, may have led to the opinion that the dealer wetted the coal for the purpose of increasing its weight at the time of loading. If this is the practice, it necessarily complicates the problem, but the writer has had cause to visit every coal yard in Chicago, and never observed any wetting of coal or any appliances for such purpose. It would be a difficult and expensive matter to wet fuel as loaded, and require water pipes located along team tracks, which in some cases extend for several hundred feet, and with the finer sizes of coal it would necessitate a man stationed at each wagon to supply water as fast as the coal was loaded, otherwise it would be impossible to add any great amount, because simply flooding the top of a wagon load of screenings, for example, would only insure the upper surface being wetted as the water would not penetrate the mass. A further study of this matter has made it appear to the author that this high moisture in wagon delivered coal, is due to the practice of wetting coal while it is being unloaded, very often done for the purpose of allaying dust, and to the water which is commonly added in the fire room for various reasons, both prior to the time of sampling.

This matter of moisture also complicates the problem as far as the inspection service is concerned, because it is impracticable for the inspecting company to have its sampler present when a wagon load of coal arrives, as it would entail an expense which the service could not bear. Also, sampling attempted at the time of unloading could not be properly performed, as the sampler would be unable to gather from a wagon at the sidewalk and prepare a sample as it should be done. Thus it appears, that the determination of moisture, even in wagon delivered coal, serves no useful purpose. With fuel received in cars, there could, of course, be no opportunity for adding water.

VOLATILE MATTER.

No fuel coal of this locality is purchased for the purpose of making gas or for use in by-product recovery plants, therefore tests for this constituent are unnecessary, unless there be a great difference in the coal. "Volatile matter" is not very well understood. The best conclusion is that coal is a complicated hydrocarbon which breaks down in distillation into various fractions, depending upon temperature and duration of heating period, and that the difference in coal of this basin is not greater than that due to the varying effect produced by the volatilization test itself; or, in other words, the variation may be caused by the test rather than by the composition of the coal. Thus the volatile matter test is not sufficiently accurate to be of service in this case. It is, of course, true, that it would distinguish between bituminous, semi-bituminous and anthracite coal, but one may do this merely by inspection without any test whatever.

All coal of this basin is high in "volatile matter"; all will make smoke if burned in sufficiently bad furnaces, and all will make smokeless combustion and good efficiency in good furnaces.

FIXED CARBON.

In coal analysis the disposition is to follow precedent. Coal mining became an important industry in the East long before it did in this locality. Much coal in the Appalachian basin is suited to the manufacture of a high grade of coke, and the amount of residue, or, in other words, the coke obtained under the conditions of the process, is a matter of first importance. This has had the effect of emphasizing the importance of "fixed carbon," so that it has been looked upon in many quarters as of more moment than any other characteristic of coal, and these ideas, extending to our locality, have to a considerable extent influenced opinion regarding fuel. The same remarks regarding the uncertainty of the determination of volatile matter apply to that of fixed carbon, because the test for the former is the one giving data for the latter. If coke was made from coal of this locality, it would be possible under certain conditions, to make a useful application of the test for fixed carbon; inasmuch, however, as it is not the case, this constituent is only a troublesome and misleading feature of analysis.

SULPHUR.

Sulphur has been in a measure treated in the past the same as fixed carbon. In metallurgical work it is of extreme importance, and in this connection has received more attention than with fuel coal. This has given a prominence to the sulphur determination which it would not otherwise possess, and upon the assumption that sulphur is in the form of pyrites or very largely so, the conclusion has been accepted that the amount of sulphur is an indication of the tendency of the ash in the coal to clinker. This is true, however, to only a slight extent; in fact, may not even be considered as a working hypothesis in this coal basin, because some of the seams which are the highest in sulphur produce the least clinkering, therefore conclusions regarding the behavior of the ash in this respect, are not justified by the amount of sulphur in the coal.

EVAPORATIVE POWER.

This is something which should never, under any circumstances, become a feature of specifications or guarantees, for several very important reasons. In general, too many variable factors enter into the problem. For example, boilers differ, some being more efficient than others, absorbing greater or less amounts of heat from the coal for reasons due to their individual superiority or inferiority. Then furnaces differ greatly; in some cases all of the volatile matter may be burned; in others, a large portion be wasted. Again, fire grates differ in like measure, causing varying losses of fuel which falls into the ash pits, and the combination of grate and furnace has an important influence on the excess of air which necessarily enters, and for this latter reason, also, the useful result obtained from the coal is affected to a marked extent. The above refers to the characteristics of the apparatus itself, but at this point another and most serious variable must be considered, that of the personal equation of the fireman or furnace operator; therefore it is apparent that in such a test, one may be unable to discover whether the result is due to the fuel, the peculiarities of the apparatns or its manipulation. In the case of a coal purchaser who does not realize these facts, the result is always attributed to the object in view, which is, in such instance, to determine the value of the coal. If he had wished to discover whether he employed a good fireman or not, the experiment would have been precisely the same, and he would have then considered the result due to manipulation. It is not only the above features which have an important influence, but the character of the load on the plant is a matter of great moment. In a works where boilers run steadily for 24 hours, the result secured, everything being equal, will be much better than in one where the work is necesarily interrupted by stoppages at noontime, shutting down at night, or with peaks of load as in electric railway service. Any one of the foregoing causes may exercise a greater influence on the evaporative result secured than that due to variation in fuel.

It is not intended in the above to imply that coal burning experiments are not useful, because there are some things which may be settled as affecting certain plants; for example, fuel high in ash generally costs less per ton than that containing less ash, and it might be a question which would be the most economical to use; or, the matter of the most desirable size of fuel may be in question. These two are the only features which can be settled by burning coal under a boiler, and they should not be made part of a specification or guarantee, but used entirely for the guidance of the fuel user in selecting the best grade.

The behavior of coal under boilers is a problem very little understood, because it is the result of many variable influences, and for this reason it is often felt that the calorimetric test is unreliable, which, however, is not true, because the calorimeter does its work very accurately as far as the coal itself is concerned, and its efficient utilization in service is influenced only by the amount and fusibility of the ash associated with it and the size of the pieces of the fuel. This matter has been extensively treated elsewhere.

It is well in this connection to direct attention to the fact that there is a feeling more or less prevalent, that coal from different localities or seams, may possess some undefinable peculiarity in its chemical combination, which causes it to behave differently under a boiler than it would be in a calorimeter. Such conclusion is untenable, because the process is identical in each case, that of combination of oxygen with the carbon, hydrogen and sulphur of the

coal, and this combination cannot be any different under the boiler than in the calorimeter, unless certain influences due to the peculiarity of the boiler apparatus and its manipulation assert themselves, and it is the disposition as far as the coal is concerned, to blame it for effects which are due to causes other than its chemical composition. It is well in this connection, to call attention to the fact that the heating power of the coal proper, or, in other words, the pure coal in Illinois, only ranges from 14,000 as a minimum, to 14,750 British thermal units as a maximum, and that about 80 per cent. of the fuel produced ranges between 14,000 and 14,500 British thermal units per pound. Thus the enormous variation found in service under boilers as far as the amount of water evaporated per pound of coal is concerned, is mostly due to the characteristics of the apparatus, its manipulation, and to the size of the coal and the amount of ash associated with it.

Thus it is very clear that specifications or guarantees covering amount of evaporation per pound of fuel or per cent. efficiency, are not only useless but troublesome to the purchaser and dealer.

The three approved tests may now be considered, and while in the above classification they are presented in the order of greatest importance, it will be convenient to change their arrangement.

PURE COAL.

For better understanding, it is desirable to consider coal as the chemical combination of certain elements which are principally heat producing. The association of ash and moisture with these, results in an aggregation which may be designated as fuel, although generally called coal, which, from this standpoint, however, is not correct, because neither ash nor moisture produce heat.* The expression, pure coal, is the equivalent of what has erroneously been called combustible, the pure coal containing all of the combustible matter, and some water of composition and nitrogen which are not combustible, but as these two ingredients are associated chemically with the combustible, the ultimate conception of coal is covered by this term, pure coal. Thus in the heating power determination, it is more to the point to base results on the pure coal than on any of the fuel mixtures, illustrated as follows: Let it be assumed that in one case the B. t. u. per pound of dry coal is 13,250, and in another 12,450, from which it would appear that the two lots of fuel were different, but if the percentage of ash content in each is known, and the first sample contained 7 per cent. and the latter 12 per cent., it appears that each sample has a pure B. t. u. of 14,250, or, in other words, that the coal is the same in each, there simply being more ash associated with it in one case than the other. Basing the heating power determination on pure coal has another very important advantage, as it enables one to judge of the accuracy of analysis, because when the heating power and the source from which the coal comes is known, there is evidence indicating whether or not the analysis has been correctly performed, because, if it has not been, it will be shown by the B. t. u.

ASH.

An important reason why ash should always be considered as a percentage of the dry coal instead of the moist fuel, is, that like the B. t. u. determination, unless it is placed on some common basis, proper comparison cannot be made on different lots of fuel; for example, in two samples, the moisture may be 8 and 13 per cent. and ash in the dry coal 10 per cent. in each, but expressed on the moist coal basis, it appears that one has 8.7 and the other 9.2 per cent. of ash, and it would seem that one of the fuels contained more than the other. In this connection the fact should be borne in mind, that no one burns moist coal; the moisture is evaporated and passes away; in fact, dry coal is not burned, the ash remaining; it being the pure coal which enters into the process of making fire.

SIZE OF COAL.

As a general proposition, the value of fuel increases with the size of the pieces, so that a very fine "duff" is of little use, but as the pieces become larger, the actual value increases in a greater ratio than does the heating power, and this continues to egg size and lump. Thus smaller pieces containing the same amount of heat per pound as larger ones, are of less value than the larger coal.

The size of the pieces of coal exercises an important influence, not only on the capacity which may be produced by a boiler, but on the resulting efficiency, and the best size to be used in a given case is dependent upon many conditions, such as the strength of draft, kind of stoker or grates, method of firing, etc., and the selection of the proper size of fuel or the method of utilizing the available size, often affords an opportunity to effect important economies.

SAMPLING.

One feature of the matter, referring especially to coal inspection service, is proper and reliable sampling. In very many cases the coal inspection service is rendered by a company, which, while acting as the purchaser's representative, is depended upon to furnish the seller with reliable reports concerning the composition of coal supplied. Under such conditions, it is absolutely necessary that not only shall the inspecting chemist be both competent and reliable, but that he shall be as fully responsible for the collection of the samples as he is for the analytical report, and it is also absolutely essential that the purchaser or his employees shall not be allowed to sample any coal or assist in the sampling, because under such conditions, the chemist may not know whether the report which he makes is correct or not, and it is well to emphasize the fact that the sampling is of as great importance as the analysis itself.

Referring to the branch of the subject before mentioned as that of research, there has been in operation for some years at St. Louis, what has been designated as a fuel-testing plant, under the direction of the United States Geological Survey. Its principal published work so far, however, has been largely confined to "tests" under boilers, which have been thought to show the "real steaming value" of the fuel. The author's remarks above regarding testing coal under boilers will refer to this branch of the work.

Probably the reference to coal in the plural has done much to cause confusion, because it has led people to believe that there are very many "kinds" of coal. For example, fuel from Herrin and Carterville in this state would, according to this, be considered as different "coal," when, as a matter of fact, they are from the same seam, and the most exact analytical tests so far made, do not indicate a difference. The amount of ash associated with the coal may or may not vary, but the coal is the same, and it is coal and not coals, otherwise, every mine would produce a different kind of coal, notwithstanding the fact that seams in Illinois sometimes run through an entire county without it being possible to detect any variation in the quality; therefore, the expression, kinds of coal, which has been used frequently in connection with coal-testing work, should not only be better defined, but limited in its application to those cases where there is a real difference, which, as is well known, does exist; for example, it must be conceded that anthracite and bituminous are different kinds of coal, but the most liberal application to this coal basin would allow only two kinds, which are the block coal of Indiana, all the remainder being bituminous, the latter also including what is known as semi-block of Indiana.

The state of Illinois has made an appropriation covering cost of investigations to be conducted by the Engineering Experiment Station of the University of Illinois, and there is certain important work which it is hoped will be undertaken, having a bearing on the values of fuel, studies tending to define the laws controlling the influence due to the size when burned with some different kinds of stokers or grates, and similar studies to ascertain corresponding effect due to varying amounts of ash in coal, also degree of fusibility of such ash.

The recently established State Geological Survey will present by all means a very much better coal report than has so far been published by any state, and it will be a great help to the purchasers and producers of coal, if certain values as affecting heating power, ash and moisture are authoritatively presented. As before mentioned, the three essential items are heating power of the pure coal, percentage of ash in the dry coal, and moisture. The B. t. u. values would be the simplest of the three, as these results would apply to pure coal, and are, no doubt, practically constant for a particular locality of a seam; therefore, once determined, it will not be necessary to repeat tests. Establishing ash values would be a more difficult matter, because it would not only involve ash in seams as the coal lies in the ground, but the various grades of fuel shipped from those seams. Ash, however, at the mine would be the same in quantity as when received by the consumer. Securing moisture values would be a far more complicated problem, because of greater variation due to temperature, weather conditions and time in transit. For these reasons, it is difficult to arrive at any conclusion regarding the amount of work which may be justified in the establishment of such values. Some idea of the complication may be illustrated; for example, the washed and sized coal shipped so extensively from Williamson County has a characteristic moisture content due to the difference in the size of the pieces, the larger ones being drier, and these moisture contents vary over wide ranges between summer and winter, and also according to the length of haul; thus at least average moisture values would be needed for each size, at the city where the coal was received.

A recent expression which has come into use, is that of "air-dried coal," which is based upon allowing the sample to become dried in the open air of the laboratory, the idea being that this shows the fuel as it would reach the customer. No standard conditions, however, appear to be employed in this air-drying, and if there were, the values obtained thereby do not indicate the amount of moisture in coal when it reaches the consumer. Some samples of air drying on Illinois coal have shown the moisture as being between 5 and 6 per cent., when as a matter of fact the same coal

*Journal American Chemical Society, Vol. XXVIII, page 632.

is never received with less than 7 per cent. and in the winter time it is very much more. This moisture value should be abandoned, as it serves no useful purpose, tending only to increase existing confusion and misunderstanding.

## Cross-Ties Purchased by the Steam Railroads of the United States in 1905.*

The following report upon the cross-ties purchased by the railroads in 1905 is based upon statements from 770 steam railroad companies. Of those which failed to report, only one operates more than 1,000 miles of track, and that one less than 1,300. The average mileage of the remainder is approximately 45. The total mileage unreported is 8,671. Since the total trackage in the United States on Jan. 1, 1905, was, according to Poor's Manual, 293,937 miles, the unreported trackage amounts to but 2.9 per cent. of the total.

These statistics do not necessarily represent the number of cross-ties used in 1905, since they are compiled from the statements of ties purchased. However, the total represents, with a very fair degree of accuracy, the actual number of ties laid.

The total number of ties reported is 77,981,227, switch ties being reduced to an equivalent number of cross-ties. Of the total number of ties purchased, 14,459,521, or approximately 18.5 per cent., were for use in the construction of new track, leaving 63,521,706 for renewals. Assuming that the unreported 2.9 per cent. of track required ties in the same proportion as the reported trackage, the total number of ties purchased by the steam railroads of the United States in 1905 was 81,562,150. Estimating 10,000,000 additional ties for the electric lines, the total number of ties purchased last year in the United States was, in round numbers, 91,500,000.

Oak, the greater part of which is doubtless some variety of white oak, furnishes 44.5 per cent., or almost one-half, of the total number of ties. Assuming that the average tie contains 30 ft., board measure, the amount of timber represented by the white-oak ties is over one billion board feet, or approximately one-fourth of the total amount of oak lumber produced in one year. Nearly all of the oak is converted into hewed ties, only 12.6 per cent. being sawed.

Pine ranks next in importance, with 23.5 per cent., and while it cannot be definitely stated just what proportion should be assigned to the various species, it is certain that more than three-fourths of the pine ties are southern yellow pine. The white and Norway pines should be credited with from 3 to 4 per cent. and the western yellow pine of the Rocky Mountain and Pacific Coast regions with from 17 to 18 per cent. Cedar ranks third with 8.9 per cent., followed closely by chestnut with 6.1 per cent. Both of these species are excellent tie woods and would figure more largely in the total production were it not for the limited distribution and supply of each. The percentage of the total number of hewed and sawed ties is, hewed, 77.4; sawed, 22.6.

Statistics are lacking for a comparison of the present output of ties with the number from each kind of timber in other years, but it is probable that were they available it would be shown that the number and proportion of the pine ties have increased materially within the last decade. Correspondingly, the proportion of oak ties would doubtless show a decrease for the same period.

The four leading kinds of timber for ties are oak, pine, cedar and chestnut, which combined furnish 83 per cent. of the total number, oak and pine alone furnishing 68 per cent. Next in rank is the red fir of the Pacific Coast and Rocky Mountain region with 4.6 per cent., followed by the cypress of the South with 4.5 per cent. The tamarack, or eastern larch of the New England and Lake states, and the eastern hemlock are the only other species credited with more than 1 per cent. of the total number. Beech, birch and maple were reported in amounts of less than one-tenth of 1 per cent. each. The miscellaneous classification includes a number of woods, among which the most important are red gum, black locust, elm, hickory and red cedar. Thus some 20 kinds of timber enter into the production of railroad ties, but of these only seven, at most, are important.

Until a comparatively short time ago the railroads were usually able to secure an ample supply of ties from lands adjacent to their rights of way. This has been especially true of the vast network of lines which traverse the territory east of the Mississippi river. While this source is by no means exhausted, it has become seriously depleted, and where in former years the purchasing agent could contract for an almost unlimited number of white-oak ties with the assurance that they would be promptly furnished, at the present time it is necessary to contract for small quantities and to anticipate the demand far in advance.

Wherever the whole tree is worked up into ties, sawing permits of by far the closer utilization of material. From this it might be inferred that the present practice of hewing the majority of the ties is poor policy, judged from the standpoint of economy. As a matter of fact, however, little of the material which is converted into hewed ties is saw timber, consisting, as it does, of tops left from lumbering both conifers and hardwoods, or small trees from which, even though sawed, little, if any, additional tie stock could be secured, and heart timber full of knots, shake and similar defects.

Where the tie was once the major product, it is now generally a minor product. The Pacific Coast is practically the only region in the United States where ties are produced as a major product of the forest. One of the most important sources of the ties in the east is the farmer's woodlot. During the winter in this region large numbers of ties are hewed and hauled to the railroads.

In determining the geographical distribution of the regions of supply, it was found impractical to attempt a classification by states on account of the manner in which the railroad companies furnished the information on this item. It was found possible, however, to determine the source, with a degree of certainty, by grouping the states as follows:

| Region. | States included. |
|---|---|
| Southern | Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Texas, Indian Territory. |
| Central | Ohio, West Virginia, Kentucky, Tennessee, Indiana, Illinois, Missouri. |
| Lake | Michigan, Wisconsin, Minnesota. |
| North Atlantic | New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland. |
| Pacific Coast | Washington, Oregon, California. |
| Rocky Mountain | Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico. |

The Southern States rank first, furnishing over 38 per cent., while the Central States rank next with nearly 23 per cent. of the total number of ties. These groups of states, which comprise practically all of the great hardwood forests of the country and all of the cypress and southern pine forests, furnish nearly two-thirds of the number of ties. The Lake States rank next with 15 per cent., followed closely by the North Atlantic with about 13 per cent. Thus it will be seen that practically 90 per cent. of the ties are now obtained east of the Rocky Mountains. The Pacific Coast and Rocky Mountain regions, as yet, are not very important factors in the production of ties. This is explained by the fact that these regions at the present time probably do not supply tie material for much trackage beyond their limits, since the long haul to the eastern market makes it impossible for their ties to compete successfully with ties produced in the east.

The method of production in the Pacific Coast region, as compared with other regions, is striking. The Pacific Coast is the only region in which more sawed than hewed ties are produced, 82.3 per cent. being sawed. Practically the opposite condition is found in the Southern, Lake and Central regions. The Rocky Mountain region follows next in proportion of sawed to hewed ties. Here, however, but 35 per cent. are sawed. This condition is explained in part by the fact that timber is more plentiful and the stumpage value lower in the west than elsewhere; consequently the market for the lower grades of lumber is poor, and as there is always a ready market for ties, much of the lower grades is sawed into ties. Other factors also have an influence, the most important of which is the sparse population, which deprives the region of the supply obtained from farmers' woodlots, an important feature in the eastern tie market. While it is not to be expected, as with the production of lumber, that the Pacific Coast will ever become the chief source of supply for railroad ties, nevertheless the proportion will doubtless steadily increase.

The statistics for 1905 show that 7,510,000 ties, or nearly 10 per cent. of the total number purchased, were given a preservative treatment of some character. During 1905 at least ten railroad companies were operating their own plants for the preservation of their construction material, and several others are contemplating the installation of such plants. In addition to the roads which treat their own timber, many others have their timber treated at commercial treating plants.

*Extracts fram Circular 43, of the U. S. Department of Agriculture, Forest Service.

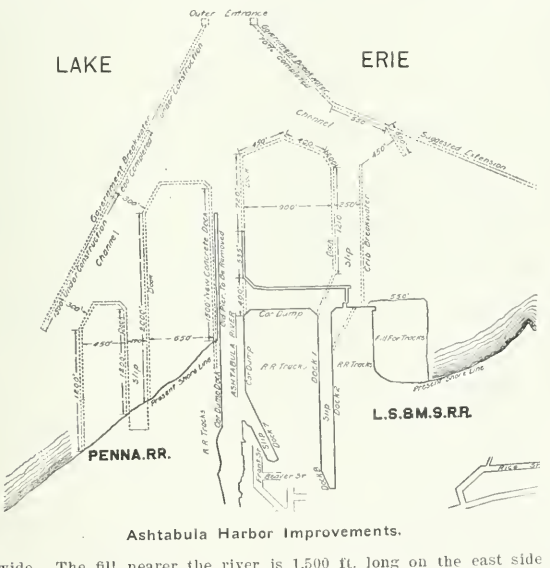
## Chinese Railroads.

The Chinese Government has failed to fulfil its promise to provide funds for the completion of the Shanghai-Nanking Railroad. Tang Shao-yi has since informed the British Legation that an edict in reply to his memorial for the provision of funds will probably be issued shortly. This policy of constant disregard of promises is difficult to understand. It was also difficult to understand why China should authorize the construction under an imperial guarantee of railroads joining the three great centers of population—Shanghai, Su-chau and Nanking—and then permit officials like the corrupt Sheng or the conservative Viceroy Chau-fu to prevent the railroad from coming nearer than five miles to Nanking city wall or nearer than four miles to the business quarter of Su-chau. The negotiations for the Kau-lung-Canton Railroad were opened recently. The 90 mile railroad from the mines to the waterway is not earning running expenses, and the guarantors, the Pekin Syndicate, are compelled to pay 1,500 taels (about $1,100) a month

for losses in working, in addition to the $175,000 per annum guarantee. The Pekin Syndicate, however, hopes that if the water difficulties can be overcome prospects will improve. Meanwhile the syndicate has arranged to purchase 15,000 tons of coal from the native coal mines in the vicinity of the syndicate's mines and to transport the coal by junk to Tientsin for sale during the coming winter.

### Harbor Improvements at Ashtabula.

Ashtabula, Ohio, is the greatest iron ore receiving port on the Great Lakes. The receipts during last July were 1,077,526 tons; the next largest receipts being at Cleveland, 1,003,650 tons. The Lake Shore and the Pennsylvania are now jointly making extensive improvements at this harbor. On the accompanying plan, the heavier lines show the present shore line and piers, and the dotted lines indicate the new shore line and breakwaters. The railroad companies are to build the government breakwaters, the Lake Shore doing the work on the eastern ones and the Pennsylvania finishing the others. As the plan shows, the present slip is entered by a channel from the mouth of the Ashtabula river. Cribbing will be built across both ends of this channel, and out into the lake for 1,655 ft., enclosing a space 900 feet wide, which will be filled in. This will need 1,500,000 cu. ft. of earth for the fill and 100,000 tons of stone for the crib work. The new entrance, 250 ft. wide, to the slip will be to the east of this fill and will be protected by a crib breakwater. All of the new channels and slips on both sides of the river will be dredged to a depth of 21 ft.; this will mean, in places, a 10 ft. cut in solid rock. West of the river the Pennsylvania is reclaiming two sections of ground, leaving between them a new slip 170 ft.




Ashtabula Harbor Improvements.

wide. The fill nearer the river is 1,500 ft. long on the east side and 2,000 ft. on the west side, and will be 650 ft. wide. The present pier extending out from the mouth of the river is to be removed when the new concrete dock, extending the entire length of the new fill, is completed, thus making the extended river channel 60 ft. wider. The extreme western fill will be 1,200 ft. long and 450 ft. wide. There are at present 1,000 men at work and it is expected that the improvements will be completed in three years. The total cost is estimated at $7,000,000.

### Foreign Railroad Notes.

Among the first results of the new railroad from Orenburg to Tashkend is the supplying of European Russia with fruit. Turkestan (where there is any water) being a sort of Asiatic California. Last July it was reported that one car daily loaded with apples and pears and another loaded with peaches and grapes were despatched from Samarcand to Moscow daily. The time on the road was six to eight days.

The Austrian State Railroads have raised the minimum pay of a permanently appointed employee from $280 to $320 a year, and dated back the time for receiving this pay to July 1 last. It has also promoted a large number of old and approved employees from the class which receives $560 to $640 a year to the next highest class, which for most of them will be their final promotion, in which the pay is $720 to $880. This also dates from July 1. The railroad men had been complaining for years that their pay and promotions had not kept pace with conditions in other employments.

### Exhibits at Street Railway Convention.

The following is a list of the makers of steam railroad specialties exhibiting at the American Street and Interurban Railway Convention, Columbus, Ohio, Oct. 15 to 19:

Adams & Westlake Co., Chicago.—Signal lamps, headlights, car-trimmings, brake-handles, switch-lamps, electroliers.

Allis-Chalmers Co., Milwaukee, Wis. Machinery and large framed photographs illustrative of complete electric railway equipments—for power houses, sub-stations, cars and lines, including Christensen air-brake apparatus; supplemented by bulletins; also model showing the stationary and movable blading of an Allis-Chalmers steam turbine.

American Brake Co., St. Louis.—Exhibit with Westinghouse.

American Brake Shoe & Foundry Co., Mahwah, N. J.—Brake-shoes and brake-heads.

American Car Co., St. Louis.—Exhibit with J. G. Brill Co.

American Locomotive Co., New York.—Motor trucks built for the New York Central & Hudson River Railroad to be equipped with two motors of 200 h.p. each, to be supplied by the General Electric Co.; load on center plate, 40,000 lbs.; weight of motors, 15,300 lbs.; weight of truck and motors, 27,700 lbs.; one trailer truck for the same company, load on center plate, 38,000 lbs.; weight complete, 11,000 lbs.

American Mason Safety Tread Co., Empire Safety Tread Co., Boston. Mason safety tread for car steps, Empire carborundum safety tread.

American Railway Supply Co., New York.—Badges for conductors and motormen.

American Sewer Pipe Co., Pittsburg.—Sewer pipe.

American Steel & Wire Co., Chicago, Ill.—Rail bonds, wire, trolley wire, wire fence and a complete line of rail-bonding tools.

American Water Softener Co., Philadelphia, Pa.—Working model of water-softening plant and photographs of plants that have been installed.

Atha Steel Casting Co., Newark, N. J.—Titian gear wheels.

Atlas Railway Supply Co., Chicago, Ill.—Atlas supported and suspended rail joints for tee and girder rails. Atlas compromise or step joints, special rail joints, plain braces and tie-plate braces, tie-plates, switch-stands and primer and surfacer for passenger cars.

Baldwin Locomotive Works (Burnham, Williams & Co.), Philadelphia, Pa. One truck in this space, four trucks under cars in Niles exhibit and two trucks under cars in Jewett exhibit.

Baldwin Steel Co., New York.—Hudson high-speed steel, twist drills, gear cutters, milling cutters, taps, reamers, end mills, metal-slitting saws.

Baldwin & Rowland Switch & Signal Co., New Haven, Conn.—A recording signal operated automatically.

Berry Bros., Detroit, Mich.—Panels finished with inside and outside coach varnishes.

Bird & Son, F. W., East Walpole, Mass.—Paroid roofing, Neponset waterproof papers for sheathing purposes, special papers.

Blake Signal & Manufacturing Co., Boston, Mass.—Blake signal.

Bowser & Co., S. F., Ft. Wayne, Ind.—Oil storage systems, oil tanks and pumps, self-measuring oil tanks.

Brady Brass Co., Jersey City, N. J. Motor bearings for electric railways.

Brill Co., J. G., Philadelphia.—G. C. Kuhlman Car Co., Cleveland, American Car Co., St. Louis, and Stephenson Car Co., Elizabeth, N. J. Various styles of cars made by these companies, among them two "Pay as you enter cars" built for the Montreal Street Railway Co.

Brown, Harold P., New York.—Plastic rail bond, plastic plug rail bond, solid copper rail bond, Brown electrical contact alloys, hand-power rail grinders, flexible shafts, high-speed electric rail drill, pneumatic rail drill, magnetic drill clamp, electrical testing bureau with 3,000 amperes capacity, insulated third rail, amalgamated switch contacts.

Buckeye Engine Co., Salem, Ohio.—Engine model.

Bunne Metal Packing Co., New York.—Fibrous Babbitt steam packing.

Burroughs Adding Machine Co., Detroit.—Adding machines.

Cambria Steel Co., Pittsburg, Pa.—100 per cent. rail joint, 100 per cent. insulated rail joint, T-rail guards for street railway use.

Capital Lock-Nut & Washer Co., Columbus.—Lock-nuts, bolts, nuts and structural rivets.

Carnegie Steel Co., Pittsburg, Pa.—Girder-rail branch-off, mounted on complete set of steel switch ties, steel cross-ties.

Cary Automatic Coupler Co., Chicago.—Cary automatic car couplers and Cary automatic train-pipe couplers.

Chase Foundry & Mfg. Co., The, Columbus, Ohio.—Express and baggage wagons, factory and railroad trucks and industrial cars.

Chicago Pneumatic Tool Co., Chicago.—Electric drills and grinders for rail-bonding wound for line voltage, and a complete line of pneumatic drills and hammers.

Cleveland Frog & Crossing Co., Cleveland.—Mate switch and frog; steam frog, rigid center; derailing switch, ground stand, double spring frog, sample rail, also mechanism operating the derailing switch.

Climax Stock Guard Co., Chicago, Ill., and Canton, Ohio.—Climax "Clay" cattle guards, farm crossing gates.

Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.—Armature pinion puller, armature buggy, broom-filling table, snow-sweeper broom, babbitt moulds.

Consolidated Car Heating Co., New York.—Electric car heaters, portable vestibule heater, switches for electric heaters, switches for car lights, switchboards.

Cook Manufacturing Co., C. Lee, Louisville, Ky.—Cook's metallic packing for piston rods and Corliss valve stems for both saturated and superheated steam.

Cook's Railway Appliance Co., Kalamazoo, Mich.—Standard track and automatic car-lowering jacks, cattle guards, rail drills, tool grinders.

Cooper-Hewitt Electric Co.—Exhibit with Westinghouse.

Crouse-Hinds Co., Syracuse, N. Y.—Imperial arc headlights and combination, arc and incandescent headlights. Syracuse changeable incandescent headlights, Harpoon guy anchors, Norbitt porcelain specialties, conduits.

Curtain Supply Co., Chicago.—Curtains for closed cars equipped with Forsyth No. 86, Ring No. 88, eccentric, Acme cable and Climax cable fixtures; also ring fixture No. 49, adapted for semi-convertible cars, curtains for open cars equipped with Acme, Climax and Forsyth cable fixtures and ring fixture with projecting pins and metal-retaining strip.

Davis Pressed Steel Co., Wilmington, Del. Davis brake-beam bar, solid truss, solid truss brake-beam with vertical strut, especially adapted to electric railroad service, solid truss high-speed brake-beam.

Dayton Manufacturing Co., The, Dayton, Ohio. Car trimmings, brake handles, arc headlights, sash locks, incandescent headlights, Simmons Moore sander.

Dearborn Drug & Chemical Works, Chicago, Ill.—Water purifying preparations, lubricating oils and greases.

Dixon Crucible Co., Joseph, Jersey City, N. J.—Silica graphite paint, pipe joint compound, American graphite pencils, commutator compound, Ticonderoga flake graphite lubricants, graphite greases, plumbago crucibles, foundry facings, motor brushes.

Duff Manufacturing Co., The, Allegheny, Pa.—Barrett lever jacks, includ

ing trip jacks; automatic lowering jacks and geared ratchet jacks. Barrett motor armature lifts, Duff roller-bearing screw jacks, Duff cone-bearing screw jacks, traversing jack bases.

Edwards Co., O. M., Syracuse, N. Y.—Models showing 25 designs of window fixtures and nine designs of extension trap-door fixtures, exhibit of the barrel spring rollers, sash balances and window fixture hardware.

Electric Storage Battery Co., The, Philadelphia, Pa.—Two type R cells—one containing 55 plates, the other 83; carbon regulator, compensating hydrometer, signaling hydrometer, recording hydrometer, automatic cell filler, several Manchester positive and box negative plates mounted on boards.

Fay, J. A., & Egan Co., Cincinnati.—Ho low chisel mortiser, special square common band saw, both electrically driven.

Fetz & Tarant Manufacturing Co., Chicago, Ill. Latest model "1907 Improved" Duplex comptometer.

Gehnia Signal Oil Co., Franklin, Pa.—Samples of lubricating oils.

General Electric Co., Schenectady, N. Y.—Quadruple GEA-605 single-phase car equipment complete with type "M" control for operation on DC-AC circuits, mounted on frame and representing the under side of a car body, complete emergency straight air brake equipment for motor car and similar equipment for trail car mounted on rack and operated together, GE 100 railroad motor; GE 80 railroad motor, operating exhibit of K2S and "P" controller arranged to show operation of contactors on rack, mercury arc rectifier, complete and operating incandescent lighting circuits of the exhibit space, portable air compressor outfit with CP 22 compressor, full exhibit of latest type catenary and standard direct current overhead line railroad material, new type high candle-power Gem units and tantalum lamps, standard railroad supplies and line materials.

General Systems Co., Dayton, Ohio.—Egry system of train despatching. Egry system of railroad way billing, special systems devised for use in the operating, constructing and maintenance of the various departments of railroad service.

Gibbs Counting Machine Co., Zanesville, Ohio. Counting machines for railroad offices.

Gold Car Heating & Lighting Co.—Gold's improved electric heaters for car heating and other purposes, panel heaters, riser board heaters, cross-seat heaters, temperature regulating devices, systems of hot water circulation for use in interurban cars.

Goldschmidt Thermit Co., New York. Thermit and appliances used in welding; also rare metals made by the alumino-thermic process; daily demonstrations of compromise joints.

Griffin Wheel Co., Chicago, Ill. Car wheels.

Grip Nut Co., Chicago.—Grip-lock nuts.

Hale & Kilburn Manufacturing Co., Philadelphia. Rattan in large rolls, also as a panel on three sides of exhibit, four styles of seats with pressed steel seamless pedestals, small chairs used on private street cars and interurban cars, four steam railroad seats showing the latest design for street railroads which are similar but smaller.

Harrison Safety Boiler Works, Philadelphia, Pa. Cochrane feed-water heater, Cochrane separator, framed photographs of Cochrane heaters and separators.

Heywood Bros. & Wakefield Co., Wakefield, Mass., and New York. Interurban Wheeler car seat upholstered in green figured plush showing detachable back feature, Wheeler seat upholstered in rattan showing grab-handle and brass back-hand, woven-rattan car seat webbing, section of Wheeler mechaoism operated by electric motor.

Home Rubber Co., Trenton, N. J. "N. B. O." sheet packing valves, hose and tubular gaskets; O. I. M. high and low pressure diagonal rod packings, flax packings, hydraulic packing.

Indianapolis Switch & Frog Co., Springfield, Ohio.—Crossing of steam track with electric or interurban railway.

International Sprinkler Co., Philadelphia, Pa.—Complete exhibit of the devices entering into the construction of an automatic sprinkler system.

Jenkins Automatic Fender Co., Toronto.—Automatic fender.

Jewett Car Co., Newark, Ohio.—New semi-convertible car, one Brooklyn Rapid Transit car, one Winona Interurban 60-ft. combination passenger and smoker.

Johns-Manville Co., H. W., New York. Overhead line material, third-rail insulators, asbestos transite doors for transformers, "Noark" enclosed fuses, blocks, service and subway boxes, car cut-out boxes, electric car heaters, trolley wheels and brass goods, transite asbestos for fireproofing electric cars.

Jones & Laughlin Steel Co., Pittsburg, Pa.—Cold-rolled axles.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Root railroad spring snow scrapers, Root railroad spring fender, tower hand car, pressed steel wheels, ratchet jacks, friction jacks, three different styles of Moore track drills, Smith curve lining gage.

Kennicott Water Softener Co., Chicago.—Photographs and drawings of installatioos of water-softening plants.

Keystone Brake Shoe Co., New York.—Keystone brake-shoes and heads.

Kinnear Manufacturing Co., The, Columbus, Ohio.—Car-barn doors.

Kuhlman Car Co., Cleveland, Ohio.—Exhibit with J. G. Brill Co.

Lorain Steel Co., The, Philadelphia, Pa.—Special track work, girder and high tee-rails.

Lord Co., George W., Philadelphia, Pa.—Lord's boiler compounds.

Lumen Bearing Co., Buffalo, N. Y.—Axle bearings, truck bearings.

Magnus Air Brake Co., Detroit, Mich., and Toronto, Canada.—Motor and chain-drive tandem-compound air compressor with automatic starter and pressore regulator, floor framing of car with trucks, showing brakes in operation, automatic cut-off charging valve, hose couplings, rubber-seated ball check valve.

Massachusetts Chemical Co., Walpole, Mass. Insulating specialties; Armalac, special Armalac, M. C. No. 50 insulating compound, M. C. waterproof paints, enamelac, cable and transformer waxes, friction tapes and splicing compounds, M. C. weatherproof tape, rubber-moulded specialties, field tape, field-coil cushions.

Masury & Son, John W., New York, Chicago, St. Louis, Minneapolis.—Panels decorated with seals of 11 States.

Matthews & Bro., W. N., St. Louis, Mo.—Stombaugh guy anchors, Kearney cable clamps, Lima jack boxes and plugs, O. K. steel cutters, holdfast lamp guards, Hargis cable splicing joints.

McGuire Cummings Manufacturing Co., Chicago.—One Romunder single-truck semi-convertible car, a McGuire snow sweeper, solid steel Columbian truck, one No. 39-A, short wheel-base truck, one No. 10-A, M. C. B.-type truck.

Miller Anchor Co., Norwalk, Ohio.—Miller anchors, augers and hollow-stem tamping bars.

National Brake Co., Buffalo, N. Y.—Peacock brakes.

National Brake & Electric Co., Milwaukee, Wis. Complete straight air-brake equipment, complete straight air-brake equipment with emergency feature, one new type air compressor, sectional air compressor, sectional slide valve, sectional emergency valve, supply parts for air brake equipments.

National Car Wheel Co., Pittsburg, Pa.—Steel-tired wheels with cast-iron centers and cast-iron wheels for electric railroad service.

National Lock Washer Co., Newark, N. J.—Car window models showing operation of curtains equipped with National cam curtain fixture and National balance curtain fixture, with protected grooves, National sash locks, National sash balances and samples of National lock washers, plain nut locks and other patterns.

Newman Clock Co., Chicago. Night watchman's clocks, employes' time recorders, electric signaling clocks and other new time-recording devices.

New York Switch & Crossing Co., Hoboken, N. J. Special track work.

Nernst Lamp Co.—Exhibit with Westinghouse.

Niles Car & Manufacturing Co., Niles, Ohio.—Two 67 ft. cars for Columbus, Delaware & Marion Railway, one 53-ft. car for Aurora, Elgin & Chicago Railway.

Novelty Incandescent Lamp Co., Emporium and St. Marys, Pa.—Elk new incandescent lamps, Novelty renewed incandescent lamps.

Ohio Brass Co., Mansfield, Ohio.—Nichols-Lintern sanders, in operation on Christensen, Westinghouse and General Electric types of engineer's valves; Tomlinson car couplers; Aikman pressure annunciators; Armstrong journal oilers, headlights, hose bridges, bell-metal bearings, complete single-phase brackets, standard pole brackets, overhead material and all-wire rail bonds installed on rails and Lintern's electric marker and classification system.

Pantasote Leather Co., New York and Chicago.—Pantasote upholstery and car curtain materials.

Peerless Rubber Manufacturing Co., New York. Perfected air-brake, steam and pneumatic tool hose, Rainbow sheet packing, Peerless piston and valve-rod packing, Eclipse gaskets, trolley dodgers, rubber step mats, matting.

Pennsylvania Steel Co., Steelton, Pa., and Maryland Steel Co., Sparrows Point, Md.—Tee and girder rails, special track work, tongue switches, mates, frogs, split switches, switch stands, crossings.

Perry Side Bearing Co., Chicago.—Roller side bearings for steam and interurban cars.

Peter Smith Heater Co., Detroit, Mich.—Hot-water heaters for electric cars.

Phillip Carey Manufacturing Co., Cincinnati, Ohio.—Carey's magnesia flexible cement roofing and all kinds of asbestos materials.

Pittsburg Steel Co., Pittsburg, Pa.—Electrically welded wire fence.

Power Specialty Co., New York.—Foster superheaters, Duval metallic packing, corrugated bronze gaskets.

Pressed Steel Car Co., Pittsburg, Pa.—Electric steel passenger car.

Quincy, Manchester, Sargent Co., Chicago, and Wallace Supply Co., Chicago.—Q. & C. Stanwood steps.

Rail Joint Co., New York. Standard T rail joints of the continuous, Weber and Wolnaupter types, girder joints of the continuous and Weber types, insulated joints of the Weber and continuous types, compromise joints of the continuous type and continuous joints showing their use with various types of bonds.

Roanoke Iron Works, Hilburn, N. Y., and Niagara Falls, N. Y. Automatic return switch stands, split switches with patented solid-rolled steel riser plates, general track equipment.

Roebling's Sons Co., John A., Trenton, N. J.—Practical exhibition of application of rail bonds, car cables, electric wires and cables, armature and field coils.

Ryerson & Son, Joseph T., Chicago, New York, Pittsburg.—Working model of Cumberland boiler with Morrison corrugated furnaces, Ryerson portable automatic key seating machine, Simplex car and track jacks.

St. Louis Car Wheel Co., St. Louis, Mo. Chilled cast iron street car wheels (loose) for both local and interurban service, chilled cast iron street-car wheels mounted on axles for interurban service.

Sherwin-Williams Co., Cleveland, Chicago, Montreal, Newark, London. High-potential testing machines showing practice tests of insulating varnishes, exhibit of panels showing standard colors used by leading railroads, car-end exhibit showing the various coats as applied in Sherwin Williams system of car painting, varnish exhibit, handcraft stain exhibit, pole paint exhibit, rattan seat exhibit.

Standard Brake Shoe Co., Aurora, Ill.—Steel-back brakeshoes, composition-inserted shoes, coil-inserted shoes, Congdon shoes, plain shoes of special brake-shoe mixture.

Standard Paint Co., The, New York.—P. & B. tape, electrical compound and insulating varnishes, Rhberoid roofing.

Standard Steel Works, Philadelphia, Pa.—Tires, cast iron spoke wheels, cast iron plate wheels, rolled steel wheels, rolled wheel, section cut-out, 33-in. cast iron plate wheel, M. C. B. section, M. C. B. motor axles, etchings illustrating cross sections of tire and rolled wheel, electric truck for Ocean Shore Railway Co.

Standard Varnish Works, New York.—Sections of field and transformer coils impregnated under vacuum with solid insulating compounds; solid compounds, both oil and waterproof, for use in connection with vacuum impregnatiug apparatus, voltalac and insulating varnishes.

State Manufacturing Co., Cleveland.—"Metla-Cota," a preparation for painting and coating the interior of water tubes and steam boilers.

Stephenson Car Co., Elizabeth, N. J.—Exhibit with J. G. Brill Co.

[illegible] Co., Pittsburg, Pa.—Insulating compounds.

Symington Co., T. H., Baltimore, Md.—Symington journal boxes for standard M. C. B. electric trucks of various designs, special journal boxes for special conditions, Baltimore ball-bearing center and side-bearings for electric service.

The International Fence & Fireproofing Co., Columbus, O.—American concrete mesh fence.

United States Metal & Manufacturing Co., New York.—Perfect car replacers, Victor car replacers, Columbia lock nuts.

Van Dorn Co., W. T., Chicago, Ill.—Automatic car couplings, draft riggings, model of steel box car.

Van Dorn & Dutton Co., Van Dorn Elliott Electric Co., Cleveland, O.—Gears and pinions.

J. H. Wagenhorst & Co., Youngstown, O.—Machine for making blue prints by electricity.

Wallace Supply Co., Chicago and New York.—Wallace double-door fixtures, Stanwood steel steps, steel gongs, automatic couplers, draft rigging, bending tools (hand power).

Watson-Stillman Co., New York and Chicago.—Hydraulic railroad tools.

Westinghouse Companies, Pittsburg.—The apparatus displayed is that made by the Westinghouse Air Brake Co., Westinghouse Traction Brake Co., Westinghouse Automatic Air & Steam Coupler Co., American Brake Co., Westinghouse Electric & Manufacturing Co., Nernst Lamp Co., and Cooper Hewitt Electric Co. The exhibit of the Westinghouse Air Brake Co. and Westinghouse Traction Brake Co. is composed of air brakes for light and heavy surface traction, also air brakes for elevated, underground and interurban traction. They also exhibit a blowing outfit for commercial purposes. The exhibit of the Westinghouse Automatic Air & Steam Coupler Co. consists of a working model of the automatic air and steam coupler. The American Brake Co.'s exhibit consists of various styles and sizes of brake slack adjusters. The Westinghouse Electric & Manufacturing Co. shows in operation a set of Westinghouse electro-pneumatic control, operating two No. 121 motors mounted on one truck. The set also operates two motors mounted on one shaft and arranged with Prony brake, such as is used in factory tests. Display is made of stationary and portable instruments, watt meters, voltmeters, ammeters, power factory meters, various kinds and sizes of both desk and ceiling fans; different designs of copper arc lamps; A. C. and D. C. railway motors of different horse power; high tension line material; also a number of separate armatures, fields and motor parts. The exhibit is lighted by Nernst lamps and Cooper-Hewitt lamp.

Western Electric Co., Chicago and New York. General railway material. Electrose Manufacturing Co.'s line.

Wheel Truing Brake Shoe Co., Detroit, Mich.—Abrasive brakeshoes.

William Wharton, Jr., & Co., Philadelphia, Pa. Manganese steel special track work of improved types, including switches, mates and frogs of "Easy Renewable" center construction, Trail switches, both in girder and T-rail, solid Manganese steel girder rail tongue switch, solid manganese steel tongue switches, mates and frogs of T-rail construction, Dunham spring throws and switch locks, Wharton unbroken main-line switch for trolley road; manganese steel funnel castings for bridge guides, manganese steel center steam crossings, manganese steel split switch, ground throws and switch stands as well as models of the Wharton switch for steam roads, U. M. L. derailing switch, steel railways; section of a frog of "Easy Renewable" center construction, butt end of an H. T. switch, showing manganese steel tongue besides enlarged photographs and black and white prints showing work furnished, worn manganese frog that has been in use in Broad Street Station, Pennsylvania railroad, for six years.

Wilson, Jas. G., Manufacturing Co., New York.—Rolling steel doors, rolling wood doors, sliding swing doors.

Yale & Towne Manufacturing Co., New York.—Electric hoists, chain blocks and trolleys.

## Setting Line Stakes on Existing Railroad Curves by Middle Ordinates.

BY G. W. SNYDER,
Assistant Engineer, Pittsburg Division, Pennsylvania Railroad.

Those who are responsible for the maintenance of railroad tracks cannot always procure the services of the engineer corps when line stakes are needed. In the case of compound curves the results from the efforts of the corps are not always as satisfactory to the passenger as is desirable. The following method of setting stakes by middle ordinates was devised some six years ago. It has been thoroughly tested by a number of different persons since, and is now published for the information of those who may be disposed to try it.

Let A, B, C, D and E be five consecutive equi-distant points on a curve. Now, if the track is thrown outward at C the middle ordinate at that point will be increased by the distance thrown; while the middle ordinates at the adjacent points, B and D, will be diminished by half the distance C is thrown. If the track is thrown inward at C the effect is reversed; that is, the ordinate at C will be diminished by the throw and the ordinates at B and D increased by half the throw. The statements as to the ordinates at B and D may not be mathematically accurate, but the error is not material. A diagram will make this clearer.

If C is thrown to C′ the middle ordinate CX wil be increased by CC′.
If C is thrown to C′ the middle ordinates By and Dz will be diminished by ½ CC′.
If C is thrown to C″ the middle ordinate CX will be diminished by CC″.
If C is thrown to C″ the middle ordinates By and Dz will be increased by ½ CC″.

In short, having a list of stations and ordinates the effect of any throw that seems appropriate upon the ordinates affected can be written, and experiments on paper can be made until any desired variation in the ordinates shall be made.

The following process is suggested:

Measure the curve, making station marks on the rail, usually 50 ft. apart, carrying the stations out upon both tangents.

Measure the middle ordinate at each station using the chord between the two adjacent stations.

Tabulate the stations and ordinates.

Determine by inspection of the ordinates where the curve is flat or sharp. At the middle of each flat spot figure on throwing the track out as much as seems practicable or appropriate. At the middle of each sharp spot figure on throwing the track in as much as seems appropriate. Note the effects of the throws on the ordinates and continue the process until the ordinates are uniform or as nearly so as practicable. Then set a stake at each station with a tack so placed as to guide the track gang to throw the track the amount determined upon. Test the ordinates of the tacks and make any needed adjustments. Then have the track lined.

At first it will be found that a good deal of throwing—on paper—is necessary; and it will not be surprising if part of the track is so thrown, first out and then back again. However, such labor—on paper—is not very expensive, and practice greatly reduces it. Indeed, it is pretty well demonstrated by experience that

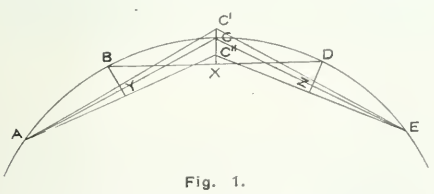



Fig. 1.

the method is very much cheaper than that of the engineer corps and just about as satisfactory to the passenger.

The following table will show what was done at the Red Bridge Curve, Altoona Yard, in September, 1900. The records had this a three-centered curve. It had been staked out by the corps. The results were not satisfactory. The application of the method of ordinates produced results that were satisfactory both from the aesthetic and utilitarian standpoints. The curve is now eliminated. The table indicates some quick estimating of the proper throws, but the original notes, now lost, did not look so well.

Columns 1 and 2 show the data taken on the ground. The figures in column 3 represent the application of experience and some mental arithmetic to those in column 2. Those in column 4 are the results of the application of the principle before explained to those of column 3. For example, as it has been decided to throw the track one-half an inch outward at Station 103 the increase of that amount in the ordinate at Station 103 and the simultaneous decreases in the ordinates at Stations 102 plus 50 and 103 plus 50 are noted opposite the stations. The form in which this is done has been found convenient by experience. Column 5 contains the algebraic sums of the figures in columns 2 and 4. Those who are not pretty expert at mental arithmetic may prefer to make it wider and note some of the partial results in order to better keep track of the experimentation. Column 6, the net throws, represents the algebraic sums of the figures in column 3. From column 6, the stakes are set—on one or the other side of the present center line as the case may be.

We had an interesting case a few years ago on a private siding flanked by buildings. The middle ordinates were very irregular and the curvature very sharp. Several derailments occurred on account of irregular curvature. The presence of a number of fixed points in the shape of corners of buildings made the curve the despair of the corps. The notes are lost, but the ordinates were

TABLE.

| 1 | 2. | 3. | | 4. | | | 5. | 6. |
|---|---|---|---|---|---|---|---|---|
| Stations. | Original middle ordinates to 100 ft. centers. | Proposed throws— | | Effect of throws on ordinates— | | | Final ordinates. | Net throws. |
| | | + out. | — in. | | | | | |
| 102 | 0″ | .... | .... | ..... | ..... | ..... | 0″ | 0 |
| + 50 | ½″ | .... | .... | —¼ | ..... | ..... | ¼″ | 0 |
| 103 | 1¾″ | + ½ | .... | ..... | +½ | ..... | 2¼″ | + ½ |
| + 50 | 4″ | .... | .... | —½ —¼ | ..... | —¼ | 3″ | 0 |
| 104 | 4¼″ | + 1 + ½ | .... | —⅞ | + 1 + ½ | ..... | 4⅜″ | + 1½ |
| + 50 | 5¼″ | + 1¾ | .... | —⅛ + ⅝ | + 1¾ | —¼ | 6¾″ | + 1⅝ |
| 105 | 8″ | + ¼ | —1¼ | + 1¼ | + ¼ —1¼ | —⅞ | 7⅝″ | —1 |
| + 50 | 8¾″ | .... | —2½ | + 1¼ | —2½ | —⅛ + ⅝ | 8″ | —2½ |
| 106 | 8¼″ | .... | —2½ | + 1 | —2½ | + 1¼ | 8″ | —2½ |
| + 50 | 8¼″ | .... | —2 | + ½ | —2 | + 1¼ | 8″ | —2 |
| 107 | 8⅛″ | .... | —1 | —⅝ | —1 | + 1 | 7⅝″ | —1 |
| + 50 | 4⅜″ | + 1¼ | .... | ..... | + 1¼ | + ½ | 6½″ | + 1½ |
| 108 | 6″ | .... | .... | — ⅛ | ..... | — ⅝ | 5⅛″ | 0 |
| + 50 | 4½″ | + ½ | .... | —¼ | +½ | ..... | 4¾″ | + ½ |
| 109 | 4½″ | + ½ | .... | ..... | + ½ | —¼ | 4¾″ | + ½ |
| + 50 | 5″ | .... | .... | + ¼ | ..... | —¼ | 4⅞″ | 0 |
| 110 | 5¼″ | ... | —¼ | — ⅛ | —¼ | ..... | 4⅞″ | —¼ |
| + 50 | 4½″ | + ¼ | .... | ..... | + ¼ | + ⅛ | 4⅜″ | + ¼ |
| 111 | 5″ | .... | .... | — ¼ | ..... | — ⅛ | 4¾″ | 0 |
| + 50 | 4½″ | + ¼ | .... | ..... | + ¼ | ..... | 4¾″ | + ¼ |
| 112 | 5¼″ | .... | .... | — ⅜ | ..... | — ⅛ | 4¾″ | 0 |
| + 50 | 2½″ | + ¾ | .... | — ¼ | + ¾ | ..... | 3″ | + ¾ |
| 113 | ⅝″ | + ½ | .... | ..... | + ½ | — ¾ | ⅞″ | + ½ |
| + 50 | ½″ | .... | .... | ..... | ..... | — ¼ | ¼″ | 0 |
| 114 | 0″ | .... | .... | ..... | ..... | ..... | 0″ | 0 |

Fig. 2.

made pretty regular without interference with the clearance by a throw not over ten inches. After the siding had been thrown to the stakes, there was no further trouble.

Be sure to test the ordinates of the tacks before leaving the stakes.

## Automatic Signals on P., B. & W.

"The very latest" would seem to be the proper designation of the new electro-pneumatic automatic block signals which have just been put in service on the Central division of the Philadelphia, Baltimore & Washington (Pennsylvania Railroad system) from a point near West Philadelphia to Morton, Pa., 8¼ miles. Every signal post has two blades. All are three-position and the proceed indication is given by inclining the blade upward from the horizontal. The two lamps on an automatic signal post are staggered, one being on one side of the post and the other on the other, and the interlocking signals are all so arranged as to indicate three speeds.

This installation has been under construction for several months, under the direct supervision of Mr. A. H. Rudd, Assistant Signal Engineer, and the signals were put into service on September 26.

The line is double tracked, and there are 22 block sections, making the average length of sections about 4,000 ft. There is only one interlocking within the signaled territory. This is at Morton and is a mechanical machine with electro-pneumatic signals. All interlocking signals in the main line are so controlled by the relays of the track circuit that the signals always go to the stop position when a train or engine passes them in the normal direction, the signals thus being semi-automatic. Two of the automatic block signals are controlled from telegraph offices, so as to be used as train order signals but all of the others are simple automatic block signals.

Each interlocking signal has two full size blades, one 6 ft. below the other, and one small blade 12 ft. below the lower full size blade; thus provision is made for full speed on a main line; for a limited speed, as through a No. 20 cross-over, and a speed under full control, as in entering a side track. Any blade in such a signal for which there is no route is fixed in the stop position. The signal posts are of iron, tubular, with the connections to the

blades inside the posts. On interlocking and train order signals the lamps are fixed one above another as in ordinary practice, but on the automatic signals they are staggered, as before stated. These lamps are 6 ft. apart, measured vertically, and 2 ft. apart measured horizontally. The compressed air is conveyed from the compressor at Media through a 2½-in. pipe. In emergencies air pressure can be supplied from West Philadelphia. Batteries for most of the automatic signals are kept in the bases of the signal posts, but at three places they are in boxes on signal bridges. Isolated switches, when turned off from the main track shunt the track circuit by means of a switch box in the usual manner. In connection with each switch there is a derail in the side track, this and the switch being moved by a single lever.

At cross-overs both switches are worked by one lever through a switch and lock movement. This lever must be locked before the signal for that section can go to the clear position, and the lever is fixed in the middle of the track of the cross-over so that in case an engine is standing on the cross-over its presence will make it impossible to get at the lever to move the switch.

The relays are 5-ohm universal polarized type.

The track circuits are worked by storage batteries, as are also the controlling circuits of the signals themselves. The batteries are charged in series from the power plant at Media, through a No. 6 copper line extending throughout the signaled territory, and by means of a 500-volt generator, as has been the custom on Pennsylvania Railroad signal work for several years past. The voltage is about 500, and the effective charging current about 5 amperes.

The night color indications in these signals conform to the Pennsylvania standard; white for proceed, green for caution or distant and red for stop. In the automatic signals the upper blade works precisely as on the Fort Wayne and other roads where the three-position signal has been used. On the passage of a train the blade goes to the stop position; on the passage of the rear of the train out of that block section the blade takes the 45-degree position (upward), and when the train clears the second block in advance, the blade goes to the 90-degree position (vertical, upward). The lower blade on an automatic signal, which is a "dummy," fixed in the horizontal position, has a light always showing red.

The signal material and apparatus, except the wire and pipe, were furnished by the Union Switch & Signal Company, Swissvale, Pa.

### The Grand Trunk Station at Battle Creek.

The new passenger station of the Grand Trunk at Battle Creek, Mich., occupies the whole block fronting on East Hill street, between East Main and Beach streets. The walls of the building are of Maine granite and the roofs are made of semi-glazed red Spanish tile. On the first story is the entrance lobby, general

New Grand Trunk Passenger Station at Battle Creek, Michigan.

waiting room, smoking room and ladies' parlor. In the southeast corner is the lunch room, with a capacity of 50 persons, and in the northeast corner the baggage room. The express building is 200 ft. from the main building, with which it is connected by a wide veranda. On the second story of the main building are offices. The platforms and walks are all concrete. The floor of the waiting room is of mosaic tile, and the walls are wainscoted 9 ft. high with ivory enameled tile, above which is a gilt frieze. This room is two stories high and the ceiling is vaulted with groined arches. The station was built by Lewis & Sons, Battle Creek, and the architects were Spier & Rohms, Detroit, Mich.

### Steel Passenger Cars Built by the Pressed Steel Car Company

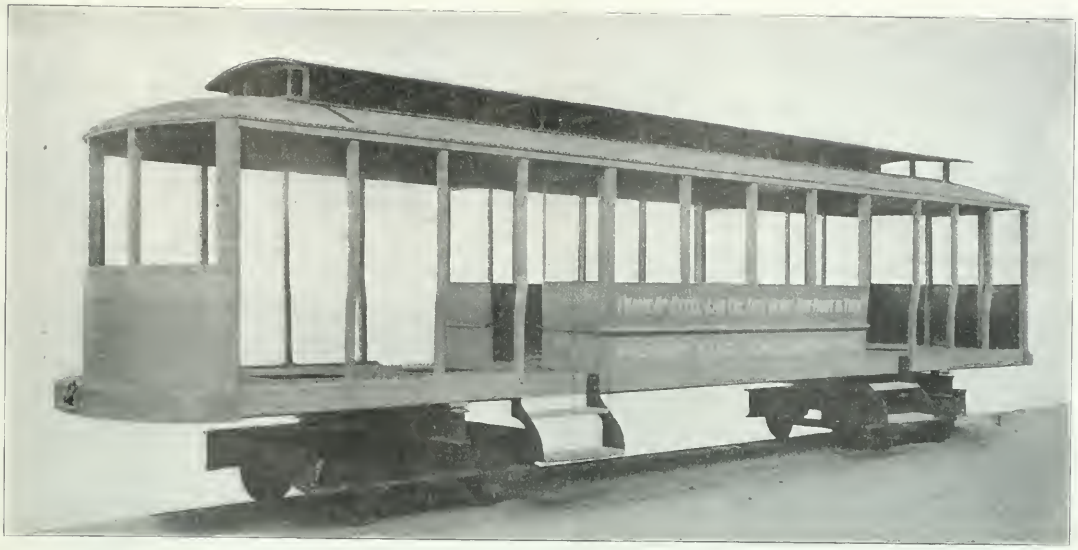
In the spring of 1905 the Pressed Steel Car Company, of Pittsburg, announced that it would build a plant to be devoted exclusively to building steel passenger cars for both steam and electric railroads. Since that time work has been pushed on the new buildings. Contracts for all-steel passenger cars covering several months' operation of the plant have already been taken. The first car turned out at the new plant was completed early this year for the United Railways of San Francisco—an all-steel street car of the "California" type. The aim has been to preserve the external contour and general inside and outside appearance of the wooden passenger car, at the same time building the car for the greater part of steel plates, pressed shapes and commercial sections. This form of construction gives rigidity, which means resistance in collisions with lightness. It has been possible to build cars of this sort which, with dimensions corresponding to wooden cars of the same type, are difficult to distinguish from the wooden cars. In carrying out this idea the rivets on the outside of the car body are covered with special drawn moldings and all steel parts and the steel posts, panels, etc., are grained to conform to ordinary wood finish. The "California" type of car is one adapted to the climatic conditions of that state. It has open sections at each end with a closed section in the middle, thus forming an arrangement suited for service the year round. The accompanying photograph gives a general view of the framing of the car and the general dimensions are as follows:

| | |
|---|---|
| Seating capacity | 40 |
| Length over all | 40 ft. 6 in. |
| Length over closed part of car | 13 " 2 " |
| Distance from center to center of trucks | 23 " 6 " |
| Width over side sills | 7 "10½ " |
| Width over side sheets at belt rail | 8 " 2¼ " |
| Height from top of rail to top of roof | 11 " 3½ " |

The underframe and side sheets together with the outside finish up to the eaves of the closed section of the car and the platform posts on the open sections are made of rolled or pressed steel plates. The doors, window sashes, floor mats and deck moldings are wood. The floor is $^{3}/_{32}$ in. steel plate, with one course of wood above. The lower and upper deck ceilings are made of steel sheets. The carlines and purlins are of rolled angles and the center sills are 6-in. channels. The side sill is built of Z bars and pressed angle plates, and the bumper is made of 8-in. rolled channel, pressed to shape. In order to carry the weight of the car entirely on the side it was necessary to provide openings for the steps between the trucks next to the closed car section without weakening the car at these points. This was done by placing reinforcing angles, extending past the body bolster, alongside of the openings for the steps. In the closed part of the car the longitudinal seat supports are built up of steel plates and angles. The body bolsters are steel trusses to be used with Peckham trucks having 33-in. wheels. The car is fitted with Wood's patent standard gates; in the open part of the car with "Walkover" cross seats, and in the closed part with longitudinal rattan seats and backs.

After this "California" car, the next ones built in the new plant were three passenger cars now being used on the Southern Railway and 40 all-steel passenger car bodies, most of which have been built for the Philadelphia Rapid Transit. The car for the Southern Railway was exhibited at the Atlantic City conventions in June and illustrated in the *Railroad Gazette* on June 22, 1906. The framing of the car is of steel throughout; the vestibules are of steel and the outside sheathing up to the window rail is made of steel plate. To meet the wishes of the railroad company wood finish was used above the window rail.

The cars for the Philadelphia Rapid Transit are to be used on the Market street elevated and subway. They are illustrated in the accompanying photographs. These cars are of steel throughout with non-combustible flooring composition, making them practically collision and fire proof. The outside sheathing is of cold rolled steel and the underframe is made up of deep, fishbelly side sills, with cross-bear-



Skeleton Body Framing for "California" Type Street Car, United Railroads of San Francisco.

Interior of Southern Railway Steel Passenger Coach.

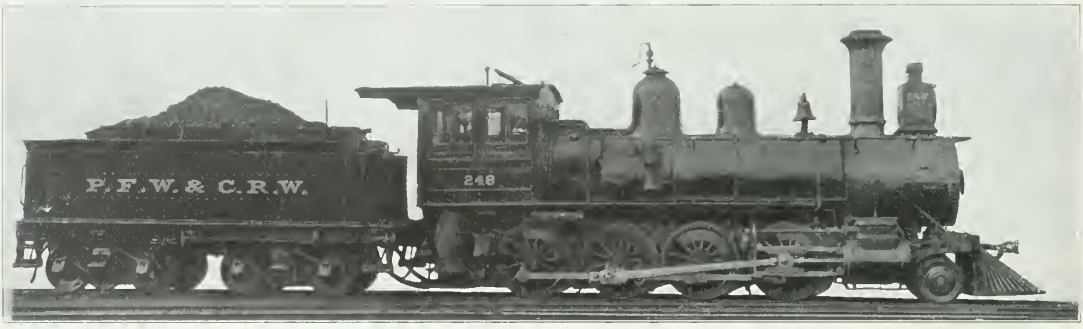
Interior of Philadelphia Rapid Transit Steel Car.

Steel Car for Market Street Elevated and Subway, Philadelphia Rapid Transit Co.

ers and connections in girder form. The general dimensions of these cars are as follows:

| | | | |
|---|---|---|---|
| Seating capacity | | | 52 |
| Length over all | 19 | ft. | 7¼ in. |
| Length over door posts | 40 | " | 6¼ " |
| Length inside of car (end line) | 39 | " | 6¼ " |
| Distance from center to center of trucks | 34 | " | 6 " |
| Width outside side sheets | 8 | " | 7 " |
| Width inside | 7 | " | 7¾ " |
| Height from rail to top of floor | 3 | " | 10 " |
| Height from floor to ceiling-center | 8 | " | 6½ " |
| Height of rail from top | 12 | " | 7 " |
| Opening bet. door posts for vestibule side-door | 2 | " | 9 " |
| Width of opening for end door | 3 | " | 2½ " |
| Width of side opening for center door | 3 | " | 4 " |
| Width over eaves, upper deck | 5 | " | 6¾ " |
| Width over eaves, lower deck | 8 | " | 8⅝ " |
| Width of vestibule and door opening | | | 2 ft. |

The cars have automatic air-brakes with automatic air couplers; the side and center doors are arranged for opening and closing by pneumatic devices from either end of the car. The underframe is covered with corrugated steel sheets and Monolithic flooring composition. On the right-hand side of each end of the car there is a motorman's cab. The roof is of ½-in. poplar covered with 8 oz. cotton duck. There are four longitudinal seats holding nine persons and eight cross seats in the center of the car for two persons each. The cars are painted Tuscan red, with gold stripes.




Consolidation Freight Locomotive of 1880, Pennsylvania Lines West.

## The Development of American Freight Locomotives.

BY GEO. L. FOWLER.

In the previous article on the development of the American passenger locomotive that appeared in the *Railroad Gazette*, June 15, 1906, an outline was given of the work that had been done by which the capacity of the passenger locomotive had been increased three-fold. The progress in freight locomotive construction was along much the same lines. There was the same lifting of the boiler and placing of the mud ring on the top of the frames; and, later, the widening of the firebox and the introduction of a trailing truck to carry it. The service demanded from freight locomotives is so different from that demanded of passenger locomotives that, of course, there have been some variations between the two.

Twenty-five years ago there were three types of locomotives in use for freight service on American railroads. These were the American, or eight-wheel type, which, with the exception of a difference in the diameter of the driving wheels was similar to the same type as used for passenger work; the mogul and the consolidation. It may be remarked here that many of the names now used technically to describe certain features on, or types of locomotives, originated in a nickname given by the men in the shop or the roundhouse.

The mogul locomotive, or, according to the present Whyte nomenclature, the 2-6-0 type, had a pony truck with a single pair of wheels in front followed by three pairs of driving wheels. The consolidation had the same arrangement of pony truck with four pairs of driving wheels. In 1880 these two types of locomotives were rapidly coming into general use. The cylinders were small and the locomotives were comparatively light. The cylinders of the mogul locomotives averaged about 17 in. in diameter with a piston stroke of 24 in., while the boilers had fireboxes about 35 in. wide and 5 ft. 6 in. long, and a total heating surface of about 1,200 sq. ft. The total weight of these locomotives was from 75,000 to 80,000 lbs., of which 65,000 lbs. were on the driving wheels.

The consolidation locomotives were heavier and had an average cylinder diameter of 18 or 19 in., though as early as 1876 some locomotives of this type were built for the Pennsylvania Railroad with cylinders 20 in. in diameter and a total weight of 114,000 lbs., of which 100,000 lbs. were on the drivers. These locomotives had a firebox 42⅞ in. wide and 8 ft. 7⅜ in. long, and the total heating surface was 1,871 sq. ft. They were, however, exceptional for the time and far in advance of the practice on a majority of roads. All through the discussions of the Master Mechanics' Association during this period, one can read the underlying doubt and hesitation as to the advisability of using the mogul and consolidation locomotives, and it was well along in the eighties before their position was firmly established. In 1879 the *Railroad Gazette* referred to the mogul as "a type which is now coming into such general use." As to which was the better for level roads, there was also doubt, and it was only after years of service in which it was demonstrated beyond all question that the heavy locomotive was suited for the long hauls of through traffic, that the consolidation won its spurs and came to be the acknowledged standard for freight work. Meanwhile, as in the case of the passenger locomotives the cylinders crowded the boiler capacity until the introduction of the Class K locomotives in passenger service on the Pennsylvania Railroad opened the way for a wide firebox and greater boiler capacity.

Prairie Type Freight Locomotive, Chicago, Burlington & Quincy.

From 1880 to 1900 there were spasmodic increases of size to meet special conditions, and the record was repeatedly broken. For example, in 1882 a 12-wheeled locomotive was built for the Central Pacific which, at that time, was the largest and heaviest locomotive in the United States and probably in the world. It had

cylinders 19 in. in diameter, with a piston stroke of 30 in., and weighed 123,000 lbs., of which 106,500 lbs. were on the driving wheels. For the times this was excessive weight and high cylinder capacity, but the heating surface was only 1,258 sq. ft., an amount sufficient, however, for the slow speeds at which the locomotive was worked on grades of about 2¼ per cent. Such variations from accepted standards were of frequent occurrence in early American practice and serve, in a way, to indicate what usually followed provided the experiment proved to be a success.

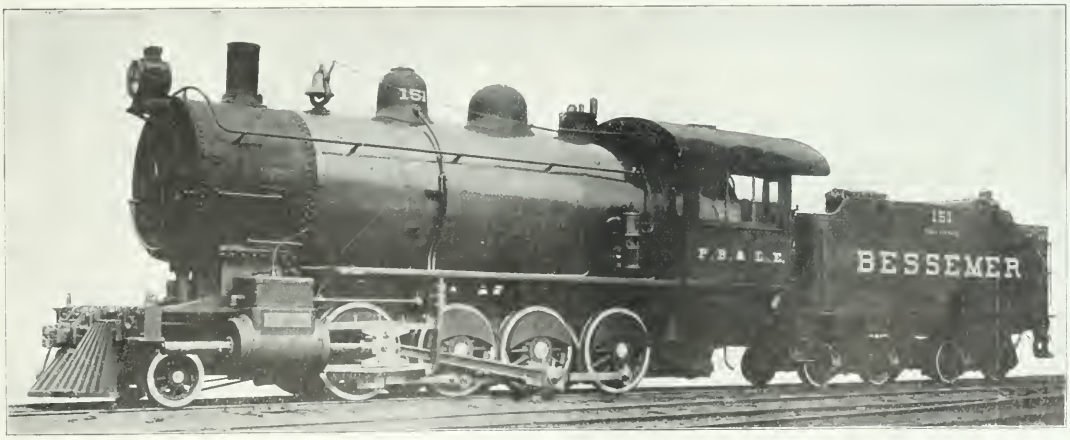
In 1882 the most advanced general practice was that presented by the Pennsylvania Railroad in what is now known as the H3a class. This was a consolidation locomotive having cylinders 20 in. in diameter with a piston stroke of 24 in.; a boiler with 1,498 sq. ft. of heating surface and a total weight in working order of 128,740 lbs., of which 112,610 lbs. were on the driving wheels.

Since that time the size of cylinders and the weights of locomotives for general road service have not been increased in anything like the ratio that has obtained in passenger service. Heavy freight locomotives of the present day have cylinders 22 in. in diameter, with a piston stroke of 28 in.; a total heating surface of from 2,500 to 2,600 sq. ft., and a total weight of 174,000 lbs., of which about 156,000 lbs. are on the drivers.

It has, however, become a common practice on all of the main lines, especially where there are heavy grades, to use engines of special design or size for working in such places. An example of this is the consolidation locomotive built by the American Locomotive Co., Pittsburg Works, in 1900 for the Pittsburg, Bessemer & Lake Erie, which had cylinders 24 in. in diameter, with a piston stroke of 32 in., a heating surface of 3,805 sq. ft. and a weight of 250,300 lbs., of which 225,200 lbs. was on the drivers. This locomotive was designed for hauling ore trains from the wharves at Conneaut Harbor, on Lake Erie, up a grade of 0.14 per cent. for a distance of 14¾ miles. The trains regularly hauled in this service consist of 36 loaded cars of 50 tons capacity, with a 10 per cent. overload, so that the total weight behind the tender amounts to about 2,600 tons. Such a load is too much even for these monsters, and they are assisted by a 10-wheel pusher, weighing about 140,000 lbs. At the top of the grade the train is taken by the regular road locomotive. Large as these locomotives are they were exceeded by some compounds built later for the Atchison, Topeka & Santa Fe, known as the Santa Fe type.

Within the past four or five years the high tractive power required and the great weights needed have led designers to adopt for freight locomotives the wide firebox and trailing truck to carry a part of the weight, a design so successfully employed in passenger service in locomotives of the Atlantic and the similar types. This modification has produced the Prairie or 2-6-2 type, the Calumet or 2-8-2 type, and the Santa Fe or 2-10-2 type. The first is a mogul with the trailer truck added. The second holds the same relationship to the consolidation, while the last is the old decapod with the same addition. Naturally, as the number of driving wheels are increased the weight increases also, and usually the total amount of additional weight is carried on the drivers, that on the two trucks remaining approximately the same. On the other hand, the addition of the trailing truck to any of the older types has not usually involved any increase of weight on the drivers, but the change has been made in order to obtain a larger boiler than would otherwise be possible.

Mogul Freight Locomotive, New York Central & Hudson River.




Heavy Consolidation Freight Locomotive, Bessemer & Lake Erie.

We thus find the Prairie type, brought out in 1900, having cylinders 19 in. in diameter with a piston stroke of 24 in., with 1,950 sq. ft. of heating surface and a total weight of 138,000 lbs., of which 94,000 lbs. were on the drivers. This does not differ essentially from the moguls of the same date with the exception of the heating surface. These locomotives were intended for service where the capacity of the boiler governs the load hauled, and were first used on the Chicago, Burlington & Quincy on lines where the grades were low, in heavy freight service at slow speeds or in high-speed stock trains.

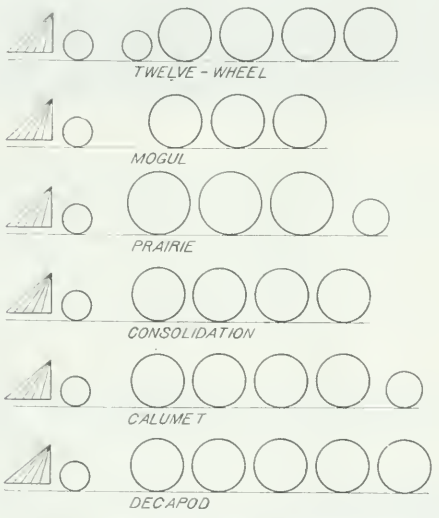
Where the work to be done has exceeded the possible tractive power of the consolidation locomotive even with the heavy driving

wheel weights now imposed, the decapod has been resorted to. But this only for special service, and the type cannot, as yet, be regarded as a typical road locomotive.

Perhaps the most striking example of the growth of the American freight locomotive in the matter of weight is afforded by the history of the Kinzua viaduct. This viaduct, at the time of its construction in 1882, was the highest and longest in the world. The rails were laid 301 ft. above the stream surface in the valley below and it was 2,053 ft. long between abutments. It is on one of the spurs of the Erie Railroad south of Bradford, Pa., and was originally designed and built to carry, with an ample factor of safety, a continuous train of the heavy consolidation locomotives of the time reaching from end to end; locomotives that weighed 103,400 lbs., with 88,700 lbs. on the driving wheels. In 1898, inspection showed that the structure had not deteriorated in strength in any way, and yet it was torn down to its foundations and replaced by another structure capable of sustaining the heavy traffic of to-day, for which the original viaduct was no longer suited; a traffic in which trains consisting of cars of 100,000 lbs. capacity are hauled by consolidation locomotives weighing 190,000 lbs., of which 170,000 lbs. are on the drivers.

This growth in size has been accompanied by modifications of practice all along the line, to touch upon all of which would be quite impossible. In order, however, to give some idea of the way in which the work has developed, two details will be treated briefly, the boiler and the frames.

It was shown in the previous article how the steam pressure




Wheel Arrangements of Modern Types of American Freight Locomotives.

in passenger locomotives has risen from 125 to more than 200 lbs. per sq. in., with an average of about 180 lbs. The same holds true for freight locomotives, and this increase has naturally called for a corresponding improvement in boiler practice.

It may not be greatly to the credit of the former railroad officers, but it is well within the truth to say that the boilers of the seventies were not designed but were built, for the most part, along lines that had been found to "do." Horizontal seams were of the lap joint type with two rows of rivets at the most, and frequently with only one. Grooving was a common source of trouble, and on the majority of roads the reason was not even guessed. In fact, as late as 1882 the President of the Master Mechanics' Association thought it necessary to show by diagrams to the convention how the bending of the common lap seam, when at work, would tend to produce grooving.

At the same convention a report on boilers was presented in which it was said that:

"Our English friends are far ahead of us in the strength of their boilers. We think they go to the extreme in using butt joints, outside and inside welt pieces, drilling and reaming all rivet holes, . . . and perhaps, to a certain extent they do, yet I am satisfied that if we imitated them a little nearer . . . it would be a paying investment in the matter of durability and lessening the cost of repairs."

This opinion gained credence rapidly after 1879 and the use of welt seams soon became universal.

Closely allied with this improvement is the change from hand to machine riveting. Of course, in the building shops, machine riveting for the shells was in use long prior to the period under consideration. But, in the railroad shops, the deep gap riveter was almost unknown and all work was done by hand. The increase in thickness of the sheets from ⅜ in. to ⅞ in. called for work entirely beyond the capacity of the hand hammer and the pneumatic riveting hammer has taken its place at all points except where the gap riveter is available. Inside and outside welts with sextuple riveting is the accepted practice for all horizontal seams and the circumferential seams are always double riveted.

The old crownbar method of holding the crownsheet has gone out of use and in its stead has come the radial stay or the Belpaire type. Radial staying, however, may be regarded as the standard practice, the general use of the Belpaire boiler being confined principally to the Pennsylvania Railroad, though there are scattering and increasing exceptions.

Staybolts and interior bracing have been subjected to a wide range of experiments with the result that the screwed bolt cut away at the center on an easy curve so as to distribute the bending strain evenly throughout its whole length has met with the widest approval. Flexible staybolts are also extensively used.

In the case of frames, to the casual observer, the frame of to-day would seem to be exactly like that of 25 years ago except in the matter of size. It consists of two bars, the upper one nearly

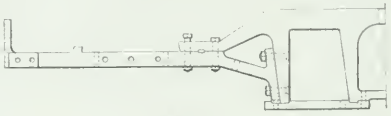


Fig. 1.

Fig. 2.

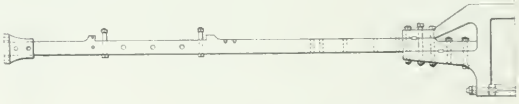


Fig. 3.

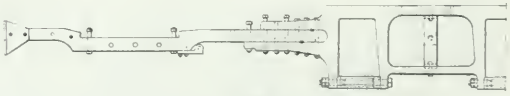


Fig. 4.

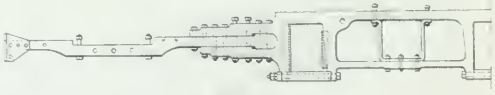


Fig. 5.

square and the lower one of the same width as the upper but narrower in vertical dimensions. These frames have always been made in two pieces, the back part containing the pedestals for carrying the axle boxes, and the front rail or rails to which the cylinders are fastened.

It is at the splice between these two pieces that the study for improvement has been directed. This was brought out by Mr. Vauclain, of the Baldwin Locomotive Works, in an address before the New York Railroad Club sometime ago. In order to show how these details have been worked out step by step a series of illustrations are given showing the various changes in detail that have been made in the development of the fastening.

Fig. 1 is the type of fastening used in the late seventies. The frame was of wrought iron, and the front rail was joined to the main frame by a T foot whose upper arm was jumped on and held by countersunk bolts. All welds were made by hand and the work was correspondingly expensive. In addition to the countersunk bolts through the pedestal, there were two vertical bolts holding the front rail to the drop of the main frame, and these bolts were supposed to be relieved of shear by the key that is shown between them. With the small cylinders in use at that time this frame gave little trouble, but with an increase in the diameter of the cylinders the repeated stresses would draw the countersunk bolts

down and the nuts would come loose. Then the side pull would tend to turn the key and the vertical bolts would be sheared off.

This form was followed by that shown in Fig. 2, wherein the front rail ran between two arms of the main frame and ended in a T foot held as before. Again these countersunk bolts gave trouble by breaking, because the whole load would be carried by them in consequence of the springing of the two parts of the main frame.

This construction was abandoned for that shown in Fig. 3, in which the lower portion was raised and made horizontal with the front rail laid flat upon it and held by bolts; some of which went through the upper section of the frame, to which a key was added. This form gave excellent satisfaction, with cylinders up to 18 in. diameter.

Heavier engines, however, required a stronger fastening, and a direct outgrowth of the form shown in Fig. 3 is that shown in Fig. 4, in which both upper and lower jaws of the main frame are horizontal, with the front rail between them and having a key on each side. This gave excellent service for a time but again the increase in cylinder dimensions necessitated a change. The keys, which had but a half bearing in each of the two parts between which they were placed, would twist and throw the entire stress upon the bolts. To obviate this trouble the lower frame was given a T head, as in Fig. 5, and keyed against the lips on the arms of the main frame.

Where double rails were used they were at first attached, as shown in Fig. 6, in which the lower rail had the same T head as in Fig. 1, while the upper rail was simply laid on and bolted to an extension of the upper frame. It was the standard method of construction for many years, and the only trouble experienced with it was an occasional breaking off of a T head.

When this method of fastening became too weak for the increasing diameter of cylinders, the lower arm was made horizontal, but an upward bend of the front rail still left an opportunity to use the countersunk bolt through the pedestal leg, as shown in Fig. 7. This form was short lived and yielded to that shown in Fig. 8, in which the T head was dispensed with and the front lower rail laid on like the upper one and bolted fast. This, in turn, gave way to that shown in Fig. 9, in which the upper front rail was extended back over the jaw of the forward axle, while the upper arm of the main frame was run out to abut against the cylinder casting. The lower arm was lipped up into the lower rail so as to form a bearing there for all back thrust of the cylinders.

This in turn was followed by that shown in Fig. 10, in which the front upper rail was lipped down over the upper arm of the main frame, as in the case of the single rail frame of Fig. 5. Strong as this construction was, the stresses imposed by the cylinders were too great and, on the latest type of heavy engines, we find the form shown in Fig. 11 in use. Here the two front rails have been united in a single deep slab, to which the cylinders are bolted. These parts are no longer cast solid with a half saddle but are separate with a saddle between. The first frames of this sort that were built had the fastenings to the main frame as in Fig. 11, but they have been followed by that of Fig. 12, in which the upper rail has been carried back over the top of the jaws and keyed as shown.

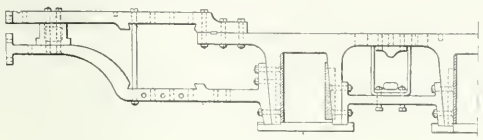


Fig. 6.

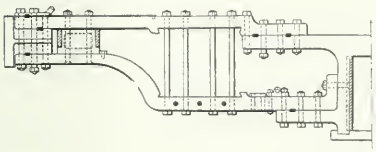


Fig. 7.

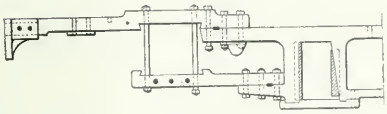


Fig. 8.

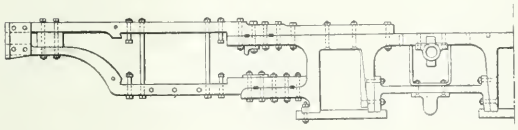


Fig. 9.

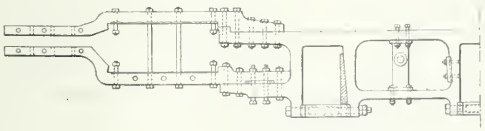


Fig. 10.

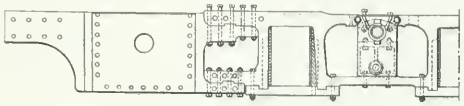


Fig. 11.

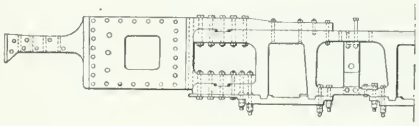


Fig. 12.

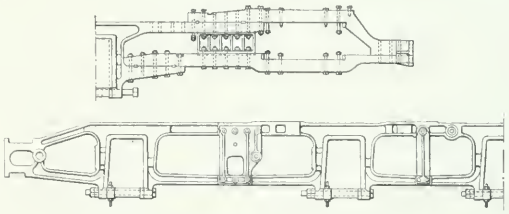


Fig. 13—Cast Steel Locomotive Frame.

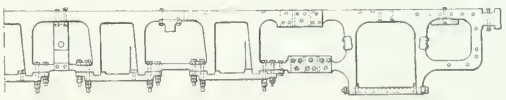


Fig. 14.

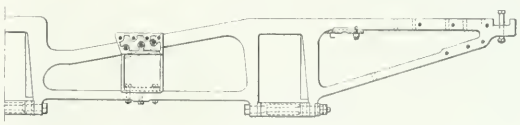


Fig. 15.

During all this period of development there has been more or less activity in attempting to produce a cast-steel frame. First efforts were not altogether successful, but the desirability of securing such a frame, on account of the facility with which provision could be made for the attachments, together with the probable decrease in the cost of machining encouraged makers to persist in the work until now cast-steel frames like that shown in Fig. 13 are made, which can be made complete for less than the cost of finishing a frame of the older type. The result is that, though these frames are far from having come into general use, they may be considered to represent the latest type of the frame of the American locomotive.

But a word need be said regarding the back part of the frame. It has changed but little in form. That of the early engines is shown in Fig. 14, and this still holds with such modifications as may be required to accommodate the trailing truck of the later

classes of engines or to add to the depth of the firebox by the use of the drop in the upper rail, as shown in Fig. 15.

From what has been said it will be readily understood that it is quite impossible to deal even with equal brevity upon all points in the locomotives that have been subjected to this critical handling and remodeling during the past quarter of a century, but enough has been said in this connection to show the tremendous amount of tentative work that has been required in order to develop the locomotive to its present condition, and the end is not yet.

## Metal Cross Ties.*

During the fall of 1900 there was furnished to the Bessemer & Lake Erie about 1,100 steel ties; these were the Carnegie M-14 trough section. During November and December about 750 intermediate ties were placed south of Osgood under 100-lb. rails, where the alinement was a compound curve of 6 deg. 30 min., reducing to 3 deg. 30 min., followed by a 9 deg. reverse curve. During the following March and April, after the slotted angle bars were received, the joint ties were put in. The track was then ballasted in the usual manner with furnace slag. About one-half of these ties had an angle riveted on the under side at the center, and the balance had an angle riveted on the under side just ontside of each rail. The object of the angle was to hold the track in line. They caused some inconvenience in the final lining of the track after it was surfaced. At the time the ties were put in all trains ran over this track, but after May 1, 1902, southbound ore trains and a portion of northbound freights were handled over a new line running to the east, but the rest of the trains continued using this track. Trains were operated over the 9 deg. curve about four years without resurfacing. On acconnt of the soft roadbed, portions of the compound curve did not run so long. These ties are still in and are giving good service, but are not as satisfactory as those used since.

During September, 1904, there were received about 1,200 Carnegie I-beam steel ties. During November and December, 1904, and January, 1905, 1,000 of these were put in the track about two miles north of Euclid station, where the track was laid with 100-lb. rails on white oak ties about six years old and ballasted with 6 or 8 in. of slag. The ties were put in by the regular section gang and without any special provision for placing track in better condition than it was before. Additional ballast was not furnished, and as the space occupied by the steel ties was so much smaller than that occupied by the wooden ties, there was not sufficient ballast to half fill the track. Between November, 1904, and June, 1905, the road at this point was single track, and carried the entire tonnage of the B. & L. E. R. R. On this section southbound trains are assisted by pushers, and during a portion of the time pushers with 180,000 lbs. on the drivers were used. Since June, 1905, southbound traffic only has been handled over these ties. The supervisor reports that after the steel ties were put in on this curve he had much less trouble in keeping the track in line than he did before, notwithstanding it was hardly half filled with ballast. Considering that from November to June the pushers were backing up aronnd this curve, that this track held its line is very significant.

Since then we have received 105,000 of these ties, about 70,000 of which have been placed in the track, to give them a thorough test under conditions existing on the B. & L. E.

Substantially all the freight of this road is handled on that part of the line between Conneaut Harbor and North Bessemer, which is 146 miles long. The freight tonnage is about 10,000,000 net tons per annum, with an average haul of about 120 miles; the line crosses eight watersheds, and as southbound 30-ft. grades and over are operated with pushers, it has seven pusher districts, covering about 33 per cent. of the road. The curves generally are from three to four degrees, though there are a number running from six to eight degrees. On the north 15 miles of this line engines with 225,000 lbs. on the drivers and on the south end engines with 160,000 and 180,000 lbs. on the drivers are used in handling freight trains. About 8,000,000 tons of freight is ore and coal, loaded, so that the gross weight of the carload runs from 136,000 to 144,000 lbs., producing a load of 34,000 to 36,000 lbs. on the axle, and as 60 per cent. of this line is still single track, the service is very severe.

This year we have made two changes in line, one-half a mile long and the other $3\frac{1}{2}$ miles long. In this work and on all second track work we have used steel ties. On a portion of this work the track was laid with steel ties across a creek bottom and blocked up, and afterward raised to grade by running on it the necessary filling in 80,000 to 100,000 lbs. capacity cars, loaded to their full capacity, which was unloaded and used in raising the track. We are using these ties in new work under all conditions where wooden ties have been used, and find that, taking everything into consideration, it can be done with the same facility and convenience as with wooden ties. In maintenance work either steel or wooden ties, whichever happens to be on hand, are distributed. Steel ties are used in renewing, whether there be one, two or more ties in a place to be renewed; that is, they are used in the main tracks under all conditions where wooden ties have been used.

We have observed where steel ties are used that there is less wear and a more uniform wear of rails. This is accounted for by the better fastening, securing a better connection between rail and tie, preventing the rail from rolling and producing a lateral rigidity in the track structure independent of the ballast.

The steel tie maintains its section, and the bed under the tie does not have to be disturbed on acconnt of tie becoming soft, nor on account of the effective thickness of the tie becoming less due to rail or tie plate bedding into the tie. The steel tie up to failure retains the same dimensions and efficiency, reducing the work required for surfacing and lining, and it is possible throughout the life of the tie to maintain track of the same excellence as with all new ties. Up to the present time we have only had one broken rail on steel ties, and the report attributes this break to a flaw in the rail.

We have not used steel ties long enough to determine their life under our conditions, but an examination of a broken tie after six years' service does not indicate that rusting under ordinary conditions should cause any anxiety.

We have stretches of track laid with all-steel ties up to 4.4 miles in length, and find that after the track is filled with ballast there is a very appreciable reduction of noise in general and at the joints below what can be obtained with wooden tie track.

*Extract from a paper by H. T. Porter, Chief Engineer, Bessemer & Lake Erie, read at the September meeting of the Railway Club of Pittsburg.

## Early Government Ownership in Pennsylvania.

The following extract is from an article in the *Wall Street Journal* describing an early trial of government ownership of railroads in the state of Pennsylvania. The information is taken from the "History of the Pennsylvania Railroad" by William B. Wilson. It will be recalled that a five-page illustrated article entitled "The First Railroad Owned and Operated by a Government," describing in detail the history of the Philadelphia & Columbia and the Alleghany Portage railroads, which were owned by the state and are now part of the Pennsylvania, was published in the *Railroad Gazette* of August 24, 1906. The quotation follows:

The following were some of the evils developed in this trial of government ownership. Millions were squandered in construction; the public were punished or rewarded as they denounced, or sided with, those in position; employees were plundered by so-called assessments; the ballot-box was polluted for the purpose of perpetnating power; all the avennes of government were completely corrupted; the state credit collapsed, and the public improvements of Pennsylvania became public scandal. The officials in charge frequently clashed while lobbying in the legislatures for appropriations for their different departments, and these appropriations, when received, were applied in a way to advance the fortunes of the political faction to which the officials belong. Ten per cent. of the pay of employees was deducted from the pay-rolls by the paymasters and put in bags labeled "Political Assessments." Passengers and freight were carried in cars of individual transporters who were charged a wheel toll for motive power, and a rate per mile on passengers and a rate per ton mile on freight. These individnal transporters were obliged to dance when the politicians in charge of the road piped. Free passes abounded. All the public officers demanded free transportation, not only for themselves, but for their political hangers-on. This became a potent factor in political corruption. The state debt grew until bankruptcy stared the people in the face. It was conditions such as these that finally drove the people to elect a legislature that would sell the public works. The price obtained was more than their valne, but only one-quarter of the amount of public money expended on them. The system, when sold, was in such a condition that it had to be rebuilt at once.

Such were the results of the first extensive experiment in government ownership and operation of railroads in this country. It is a record that does not constitute a potent argument in favor of Mr. Bryan's scheme. Compare that record with the history of corporation control of railroads, and the latter, with all its evils, is infinitely to be preferred. It is fearful to contemplate what would be the political consequences of government ownership of the great railroads of this country even under a better system of civil service than that which now prevails. Even admitting that government ownership might now be conducted on a much higher plan of efficiency and honesty than that which prevailed in Pennsylvania over half a century ago, is it reasonable to believe that government operation of railroads would be as efficient and economical as that which now prevails?

The ideal solution of the railroad problem is that towards which we are now rapidly approaching. It is ownership and operation by private capital subject to rigid government supervision. This secures the benefits of private enterprise and control and at the same time the advantages of public regulation in the interest of equitable rates.

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

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VOL. XLI., No. 17. FRIDAY, OCTOBER 26, 1906.


The reported action of the Harriman lines in refusing to grant through rates to points west on shipments of freight received from the Denver & Rio Grande at Ogden will probably have an effect in hurrying along the construction of the Western Pacific, the Gould outlet to the Pacific coast. Construction work has been hampered by scarcity of labor and has not made as much progress as was anticipated. About 74 miles of track have been laid west of Salt Lake City and some has been laid outside of Stockton, Cal. No work has yet been done in Nevada but the first contract for 106 miles has been awarded. This section begins at the Great Mud Desert and extends northwest along the sand hills of the Great Salt Lake basin to Silver Zone Pass in the Toano range, where an elevation of 5,860 ft. is reached, the highest point on the road. From the summit the line runs southwest into the Gosiute valley. From the crossing of the Nevada Northern in this valley, the Western Pacific ascends nearly to the summit of the Pequop range, which will be pierced with a 6,000-ft. tunnel at Flower Lake Pass. The line then follows the Humboldt river, west for 18 miles, to Deeth, on the Southern Pacific. About 200 miles of the remaining 230 miles in Nevada have been surveyed through the Southern Pacific land grant. The Spring Garden tunnel in California is in 1,403 ft. at the west end and 529 ft. at the east end, and the Beckwith tunnel is in 418 ft. at the east end. Large deliveries of ties are being made from Oregon for use in California and Utah. The completion of the 937 miles of road from San Francisco to Salt Lake City by the summer of 1908 will hardly be possible unless weather conditions are exceptionally favorable and big inducements are given to laborers, who are flocking to San Francisco where wages are more than double the prevailing rates elsewhere.

The New York Central & Hudson River Railroad Company and one of its traffic officers has been heavily fined for granting rebates to the American Sugar Refining Company with the result that during the year 1904 a net charge of 18 cents per hundred pounds from New York to Detroit was granted, instead of the regular tariff of 23 cents. The judgment is a just one. In imposing the fine Mr. Justice Holt described the case accurately as follows:

"Such a violation of the law, in its essential nature is a very much more heinous act than the ordinary common, vulgar crimes which come before criminal courts constantly for punishment which arise from sudden passion or temptation. The crime in this case was committed by men of education and of large business experience and whose standing in the community was such that they might have been expected to set an example of obedience to law, upon the maintenance of which alone in this country the security of their property depends."

Aside from the law, the moral responsibility may well be considered. The indictment of the New York Central was made under the provisions of the Elkins Law of 1903, and its violation occurred during the year 1904. Every railroad officer knows that the mere enactment of the Elkins Law had no effect *per se* on the transactions of the traffic officers of most of the more than one thousand operating railroads in this country. Any one railroad competing for business and relying upon the enforcement of this law would immediately have lost money for its stockholders, and yet every decent railroad officer was anxious that that law should be enforced, knowing that it would be profitable to his company if the law could be enforced. Ever since 1887 the railroad companies have been trying to make and maintain agreements among themselves by means of which the iniquitous rebate system could be killed. It is probable that they could have succeeded in this if they had not been prevented by law from making and enforcing pooling agreements. The question, therefore, before the New York Central traffic officers, and most other railroads in this country in 1904, was: Shall we immediately obey a law which the government gives no indication of enforcing and which we know our competitors will not obey until the government so enforces it? We are forbidden to maintain rates by agreement among ourselves. We are forbidden to cut rates in order to meet our competitors. They decided, as other companies in like cases generally decided, to protect their stockholders as well as they could and disobey a law that was not enforced. Few men in active life will consider that an ethical question is involved in their decision at that time. In paying the penalty justly imposed upon them, they are paying for a lesson both to themselves and to all other railroad companies. The primary fault lies rather with the then Interstate Commerce Commission and with the Attorney General's office; for, inasmuch as the companies were forbidden to enforce rate maintenance by pooling, they felt bound to pursue the old methods until those entrusted with the enforcement of the law showed some indication of a willingness to enforce it and at the same time protect those who were anxious to obey it.

Among the many committees of dissatisfied security holders which have been formed there is one representing the owners of a majority of the $7,000,000 debenture B income bonds of the Green Bay & Western Railroad, a 214-mile road which runs from Green

Bay, Wis., on Lake Michigan, west to the Mississippi river at Winona. The road was reorganized in 1896 under an arrangement by which these bonds are entitled to all the surplus earnings of each year after 5 per cent. each has been paid on $600,000 debenture A bonds and $2,500,000 capital stock. Nothing has ever been paid on the B bonds. Like the committee of Wabash debenture B bondholders, this committee was formed in the belief that surplus earnings which should be applied to payments on these securities were being spent on the improvement of the road. The plan worked out by the committee, however, is quite different from the Wabash plan which was approved this week. In brief, it is to have the committee buy the capital stock, take over the road, reorganize the company and extend the line. The committee has an option on a majority of the stock and has issued a circular calling on the "B" bondholders to subscribe $400 for every $1,000 held to provide funds for its purchase. The purchase price of the stock still has to be settled by negotiation. First mortgage 4½ per cent. bonds of the new company, limited to the rate of $25,000 a mile, are to be issued at 90 per cent. of their face value to subscribers in return for their subscriptions, and enough of these bonds are to be set aside to provide for taking up the outstanding "A" debentures. The road is to be reorganized under the name Green Bay & St. Paul and the 120-mile extension northwest along the Mississippi necessary to bring it to St. Paul is to be built. This will give it in all some 400 miles of line and increased opportunity for through traffic. The Green Bay & Western over a controlled line exchanges traffic for the East at Kewaunee by car ferry with the Detroit, Toledo & Ironton-Ann Arbor system, and although the proposed through line would compete with the North-Western Line, the Chicago, Milwaukee & St. Paul and the Wisconsin Central for traffic from Lake Michigan ports to the Twin Cities, it would undoubtedly be able to secure some share of this—enough, probably, to make the reorganization plan profitable. The plan to take over the road and extend it is interesting both as bearing on the local traffic situation and as an example of a rather unusual means of protecting the interests of holders of a junior and debenture bond issue.

## LIBELING THE PENNSYLVANIA.

The evidence concerning the rear end collision at Eddington, on the New York division of the Pennsylvania Railroad on September 29, all of which we have had a chance to examine, shows quite positively that the failure to stop the six-car train, No. 107, which hit a stalled train was due to the accidental closing of an angle-cock between the third and fourth car. Air-brakes rarely fail to work, but they occasionally fail to be properly worked. The accidental closing of the angle-cock, shutting off brake power in the cars behind, is unusual; nevertheless it has several precedents, and some of the ascertained causes were discussed in this column last week. In this case the engine brakes and the brakes throughout the train were found to be in order, but the closing of the angle-cock put out of service the brakes on the three rear cars and their stored energy pushed the rest of the train along to the collision point.

The angle-cock handle was in the correct position when the train started from Jersey City, and at some point between there and Croydon the handle was pulled or knocked around to the wrong position. Inasmuch as this handle is on top of the angle-cock and is in the form of a curve parallel to the air-brake hose and about 1 in. from it, there is, of course, the minute chance that a stone thrown by some one may have hit it and turned it around. There is more chance that a piece of rock ballast may have been thrown up from the wheel flanges and hit it. There is also another equally probable cause; namely, that a three-link safety chain, not coupled up, was hanging from the car within reach of this turned handle. Of course, it is difficult to imagine what sort of pendulum motion, or whip-cracking caused by a lurching of the train, may have lifted one of these links so as to catch the end of the valve handle and knock it about, but the fact that this could have happened leads one to consider the dangling safety chain as a possible cause of the accident. Those who have happened to observe, as has the writer, the occasional freakish and violent action of a few yards of bell cord flying loose from the rear car at high speed will not be inclined to deny the possibility of this diversion of the safety chain from its intended function. The angle-cock handle did not have the locking device, which we have heretofore described. This device in a form that is practically available is new for passenger car service, nevertheless the Pennsylvania Railroad had ordered and has been equipping its passenger cars with it.

In two other respects the Pennsylvania officers have been improperly criticised, and they probably feel the injustice keenly, as other officers do under like circumstances. Reference to it seems proper here rather for the information of the public and editors than as containing anything new to the railroad man. It has been said by many, and by some who should know better, that the Pennsylvania's requirements of its enginemen are such that they run recklessly past distant signals. It is also said that their enginemen are overworked. In this case Engineman Van Arsdale, of train 107, has been an engineman on the Pennsylvania road for 40 years and has been running passenger trains on the New York division for the past 20 years. His present daily trick is a two hours' run from Jersey City to Philadelphia, a three hours' wait in Philadelphia and a two hours' return to Jersey City; seven hours a day on duty; four hours a day in driving. Before this accident he had had the usual full night's sleep at home, and it is a matter of fact that he is a thoroughly trained man, physically and mentally well equipped for his duty. His experience in attempting to stop his train, fully corroborated by his fireman, is given in his own words as follows:

"When I saw the green, or distant, signal, at Croydon my train was running about 65 miles an hour. I shut the throttle off as soon as I saw the warning signal and applied the air. The air did not take hold like it ought. I could not feel it at all on the first application, and then I used the emergency, as I saw the red or stop signal. This did not work, and for probably 700 or 800 yards I used sand on the track."

The Croydon distant signal stands 3,480 ft. from the home signal, and the standing train with which No. 107 collided was 1,170 ft. beyond the home signal. The grade was nearly level. Van Arsdale saw the distant signal, shut off his steam and began to apply brakes when he was considerably more than 4,600 ft. from the rear end of the standing train. If the brakes had been operative on the three rear cars, considering the fact that the brakes were, after the accident, found to be in good order, he could have easily brought his train to a full stop within 1,500 to 1,800 ft. from the point where he moved his handle. He was therefore doing his whole duty and was properly cautious in feeling for his brakes at the distant signal. Under ordinary conditions he would have been perfectly safe in keeping up his 65-mile-an-hour gait for a quarter of a mile farther, for he knew his lengths from distant to home and knew his grades and curves; but he was cautious, wanted to be sure the brakes were working, so he began early. His good record of 20 years' passenger running on this division is a sufficient warrant for this assumption.

The other cruel criticism, to the effect that the Pennsylvania insists upon its enginemen making time, and to this end running recklessly, is especially wicked. In addition to ordinary inspection and watchfulness the road uses the method of surprise checking, and has been doing it with increasing thoroughness during recent years. The engineman who overruns his red, or home signal at danger, is promptly punished. Surprise checking is watching the signals unknown to the engineman, and a list showing surprise tests of 1,071 trains, 1,000 enginemen are recorded as exactly complying with the rule; that is, not to allow the point of the pilot to pass the danger signal. Seventy-one disobeyed the strict letter of the rule, but did not pass to any dangerous position. Not a single one of these 1,071 secretly observed cases involved any danger whatever; nevertheless, the few who made a technical error were promptly disciplined, usually by suspension.

## AN AMERICAN RAILROAD SIGNAL SYSTEM.

"A complete system of signaling for the proper handling of traffic" is the title of the most important subject presented at the Railway Signal Association in Washington last week, which is reported on another page. The committee making the report, on which are some of the strongest men in the association, has well complied with the terms of the title. Not only that; it has broken away from tradition, and the system devised is original as well as complete. In important features it is so different from present universal practice that it will not for a long time be generally accepted, both because of conservatism and the cost and inconvenience of changing fixtures. This, probably, is its greatest fault; the transition period, with its violations of uniformity, constantly tempting inventive minds to introduce something different, will be long drawn out. But the new scheme probably will not succeed at all unless it is acceptable to the Pennsylvania Lines both east and west; and it seems quite possible, perhaps probable, that the New York Central Lines will act with the Pennsylvania; so that if the

change is made, over 20,000 miles of road may be favorable at the start, including the lines of heaviest traffic in the country.

This comprehensive signaling scheme follows closely the recommendations of Messrs. A. H. Rudd and Frank Rhea in the "Rudd, Rhea and Revolution" report which has been kept so carefully locked up during the past year; and it has been thoroughly discussed by prominent officers of the Pennsylvania. It has also been much discussed on the New York Central and some other roads; and the fact that the conservatism of these men has not killed it is good evidence of its merit.

The new plan is revolutionary in only two of its features: the upward inclination of the semaphore arm, and the abolition of distant signals. The upward inclination is adopted simply to get rid of the counterweight and of the clumsy arrangements necessary, with the downward inclination, to insure return of the arm to the stop position in case of failure or breakage, or overloading by snow, when the arm is in the "proceed" position. The abolition of distant signals does away with a venerable inconsistency, now made tolerable in one way in England and in another way in America, but it does not do away with the distant indication. Instead, it makes an important increase in its usefulness. The committee simply returns to the pure semaphore principle of having a different position of the arm for each different indication. Unfortunately no better word than "caution" was found for the adverse distant indication. If we must forever use this word it is important to limit its meaning, arbitrarily, as narrowly as possible. To say "proceed cautiously," as the committee prescribes for five essentially distant indications, leaves too much to be decided by the runner as to what "cautiously" means. What these indications really say to the engineman is "Proceed, expecting to find the next signal against you," and the rule may as well say so. It should make very clear the fact that the signal does not require him to be cautious about anything else except the necessity of obeying the next signal.

The committee appears also to have lapsed from the strict requirements of its theory in using the term "home" signal. "Distant" signals are abolished, every signal being capable of giving a distant indication; and "home" becomes equally useless. No signal can be properly called "home," in the sense of a signal which means stop, because each one gives both the stop and the caution indication. There seems at first glance to be another inconsistency under the new plan. If the runner has green and vertical, indicating a clear road for two blocks, why cannot the upper arm remain horizontal? Obviously, because he has not yet reached the diverging track and can proceed only on authority from the upper arm. There will be criticism because there is no provision here for equally high speed on both the straight line and the diverging line, as is desirable at some junctions; but the advantage of consistency is great and it will be well worth while to make the tracks and the practice at all junctions conform to the arrangement shown in the diagram, rather than try to modify signals to suit "local conditions."

As to the four main features of the new scheme—the universal two-light arrangement, the use of green for clear and yellow for caution, the upward inclination and the three-position principle for daylight, the action of the association on the last three was intelligent and decided. The votes, it is to be remembered, were those of the senior active members only; all of them railroad officers and probably all of them men who have had time to consider the question many months. But only a few of them are operating officers; and the views of superintendents, trainmasters and men who control appropriations are yet to be heard. How soon we shall have this additional expression of opinion remains to be seen. The Maintenance-of-Way Association will discuss the subject, but there are few operating men in that association. The subject has hardly been digested sufficiently to be taken before the American Railway Association. As operating officers have no national association in which a question like this can be satisfactorily dealt with, it is much to be desired that they attend more freely the meetings of the Signal Association. At this last meeting the signal men said a good many things that it would be profitable for most superintendents and trainmasters to hear, but the speakers were naturally restrained from saying everything that they wished on matters pertaining to another department. A dozen enterprising operating officers could have added greatly to the value of the meeting.

We have spoken of the committee's scheme as "complete." Some paragraphs will be rearranged and modified, in the light of the criticisms made at the meeting, and the definitions of the 24 indications may be found to need changing, by consolidation or otherwise; but the term "complete" is not unwarranted, for every needed indication is provided for and every apparent or probable conflict of indications has been considered with care. Indeed, we are inclined to think that too much has been attempted, and that the arrangement which finally prevails will have fewer indications. As was well said by a prominent member at the meeting, if the signal engineer tries to tell the locomotive engineer everything that he needs to know, some superintendent will next propose a still further enlargement of the requirements. The signals will not only have to tell the engineman to take the next siding, but also what to do after he gets into it—"set out a couple of cars," perhaps; or wait thirty minutes for extra west. On the whole, however, in spite of minor objections, we believe this report to be a long step in advance in the development of American railroad signaling. The system which it proposes has been long and well considered. Adoption of its recommendations, though it will of necessity come slowly, would result in a simplicity and a uniformity which would greatly increase the efficiency of American signal practice.

## THE ILLINOIS CENTRAL CONTROL.

President Stuyvesant Fish gained a temporary victory over the Harriman interests in the fight for control of the Illinois Central at the annual stockholders' meeting held last week in Chicago, but he widened the breach between the factions and has possibly placed himself in a precarious position for re-election as President of the road when the directors meet in November to elect officers. Mr. Harriman has had his eye on the Illinois Central for five or six years—ever since the Union Pacific leased the Southern Pacific. Two things were essential to his plans for the development of the western roads which he controls: to make his position on the gulf secure and to obtain an entrance into Chicago. The Kansas City Southern offered a means to one of these ends, and the Alton promised to achieve the other. The Kansas City Southern scheme failed because the stockholders of that road insisted on being heard from and the Rock Island obtained an equal share in control of the Alton. The Illinois Central, with its direct line from Chicago to the gulf and an entrance from Omaha, together with its magnificent credit, promised to fulfil both of the requirements of Mr. Harriman, and he began a quiet but determined effort to attach it and weld it into his vast system on the other side of the Mississippi river, the dividing line between the railroads of the East and the railroads of the West. But he did not bargain on the resistance of President Fish, who was not afraid to openly refuse to yield to the wishes of the man "who moves in a higher sphere into which we cannot enter." Mr. Fish is reported to have said eight months ago, when Mr. Harriman made an offer to buy out his holdings of Illinois Central stock: "I have been President of the Illinois Central for nearly twenty years, and I hope to be President for many years longer, but I never have been and never will be a Harriman president of the Illinois Central." In his characteristic way, Mr. Harriman set about to undermine the position of the guardian of the small stockholders' interests. Through Kuhn, Loeb & Company he began to solicit proxies to be voted at the annual meeting, and in June last Mr. Fish also began a canvass for proxies. At a meeting of the Board on July 18, Mr. Peabody, one of the Harriman directors, introduced a resolution that a committee of five directors be appointed to collect proxies. The five directors named in the resolution were all so-called Harriman men, and Mr. Fish, scenting danger, refused to agree to the proposition and left the meeting, breaking the quorum and preventing further action. A week later Mr. Fish met Mr. Harriman and Mr. Peabody and, as he claimed, was assured by them verbally that there was no intention of turning over control of the Illinois Central to any other corporation and that the successor to W. Morton Grinnell, who had died during the year, would be a man of character, representing all the stockholders, and a man personally satisfactory to Mr. Fish. On the strength of this verbal assurance Mr. Fish signed the following agreement:

1. Three out-going directors to be re-elected.
2. Mr. Grinnell's successor to be selected by a majority of the several directors acting.
3. Mr. Peabody's resolution of July 18 to be withdrawn and not to be revived this year.
4. The Harriman-Kuhn, Loeb proxies to be given to Mr. Fish.

This much was in writing. On October 10 a special meeting of the board of directors was called, and after the meeting the question of the successor to Mr. Grinnell was discussed. Mr. Fish's version of the meeting is as follows:

"I was surprised at being presented by Mr. Harriman with written com-

mittments, previously procured by him from certain directors, without notice to me and others, of the selection of Mr. Henry W. DeForest, a director of the Southern Pacific Company, which is a subsidiary corporation of the Union Pacific. This, in contravention and utter violation of the understanding and agreement, that an independent man not affiliated with Union Pacific interests should be brought into the board."

At the stockholders' meeting last week the name of Mr. DeForest was presented and he received the votes of 2,100 shares. Mr. Fish nominated James DeWitt Cutting of New York and, by virtue of the proxies in his hands, voted a total of 613,703 shares for his candidate, who also received some 16,000 votes of small stockholders. At the same time, instead of voting his overwhelmingly controlling proxies for his own personal supporters, he carried out the compromise agreement by voting for the re-election of the three outgoing directors—Messrs. Beach, Harahan and Cornelius Vanderbilt—who were re-elected without opposition. In voting these shares he said:

"The issue thus presented is whether I shall vote as proxy for the stockholders of the Illinois Central Company in favor of turning over their property, in effect, to the control of another company when such proxies have been entrusted to me with the full knowledge that I would oppose such action. I notified Mr. Harriman and his associates that I would not vote any of their proxies in opposition to their expressed wishes, but at the same time I would not become a party to their scheme, nor vote for it the other proxies confided to me. As the tellers' report shows, I hold proxies entitling me to vote upwards of two-thirds of the entire capital stock of the company, but in this matter I am acting solely in the interests of the shares I represent or own."

As the board now stands, seven of the 13 directors—Messrs. Harriman, Peabody, Luttgen, Auchincloss, Goelet, Vanderbilt and Harahan expressed themselves as opposed to the choice of Mr. Cutting. The other six directors, including Governor Deneen, ex-officio member of the board, side with Mr. Fish. If this division is maintained unbroken at the directors' meeting next month, and Mr. Harriman decides to force the issue, Mr. Fish can be retired as the head of one of the most conservative and well-managed railroads in the country; a road which is one of the few remaining landmarks in the West of the passing era of independent railroads operated for the benefit of the individual shareholders and not for the benefit of a favored few in control. Whether a change in the control of the road will benefit the future interests of the stockholders is beside the point in the present controversy. The fight, as it appears, can be summed up by saying that Mr. Fish, relying on a verbal agreement, was willing to sign an unqualified written agreement. Mr. Harriman ignored the context, and "there you are."

## THE RAILROAD TERMINAL PROBLEM

About a third of a century has passed since what was then the "great" railroad station on Forty-second street, New York, was opened for joint occupancy of the New York Central, New York & Harlem and New York, New Haven & Hartford railroad companies. Succeeding the meager and crowded area of the earlier station on Twenty-seventh street the Grand Central Station of that day seemed big, and was big. Men not yet very far past middle life gazed at the empty spaces and the lofty arching spans, and were free in their prophecies that they would never live to see the structure fully utilized. Yet the Grand Central Station has had to be enlarged twice, must be enlarged again and in "rush" hours before holidays, is on account of its space limitations, the target of anathema of waiting multitudes. It was not many years after the Grand Central was opened that the large station of the Boston & Providence was built in Boston. That, too, was deemed by railroad men ample for the far future, and its size and architectural graces were themes of eulogistic comment. Yet how few years went by before it was relegated to the limbo of real estate dead for railroad uses! And those who see the throngs which pour during the rush hours through the entrances of the great South Station at Boston, lineal successor of the old Boston & Providence terminal, may well doubt whether even its vast spaces fully provide for the future passenger traffic of the two proprietary corporations.

These two examples of expanded passenger terminals of two eastern railroad companies—and the station of the Pennsylvania shifted from West Philadelphia to the center of the city is another past instance—illustrate strikingly enough the familiar fact of the deep importance that terminals in great cities are reaching as a form of railroad evolution. But the general fact, while it expresses a result to be charged primarily to the growth and intensive centrality of urban populations, has some components not so quickly seen, or, if seen, not adequately measured and realized. Not only is the great passenger station of a great railroad company in a great city a thing vital in that railroad's operation, but it must nowadays be evolved under peculiar conditions of high cost. We do not refer merely to the high price of the acquired realty, but to other factors. The station must be congruous with times in which the luxuries of the past spell the necessities of to-day. The public demand for so-called "conveniences" applies not less to the great railroad station than to the up-to-date hotel or modern college dormitory and the American home. Luxury sets a new pace in the railroad station as elsewhere, and public demand is not only more exacting, but far more censorious if the demand is not conceded. Even the poor man asks from the public service corporation accommodations undreamed of at his own home. Nor, by the way, is it the big terminal station alone that imposes this burden? It rests on the railroad corporation only in less degree on the line at every city of considerable size. Here the rivalry of cities and large towns, each craving the newer or better station of a sister municipality, is apt to come in as a cogent force.

It is a condition, not a theory, that confronts the great railroads in this construction and reconstruction of important passenger stations, and especially of huge terminal stations in the great cities. As to the latter class of stations each corporation faces the unpleasant economic necessity of a vast outlay of money to the interest charge on which the company must grow up slowly and count its returns in fiscal vantages more or less remote from the station itself. This is not true in all cases. If, for example, a railroad by building a new terminal of its own can escape a heavy annual terminal charge for trackage, as well as station privileges, paid to another company, the case is decidedly modified. If, on the other hand it gets satisfactory terminal facilities for an annual payment which is a low interest rate on less than cost, it is a deterrent. But, in general, the dictum of high immediate expenditure and distant returns holds good. The nature of those remote but sure returns in the case of a great passenger terminal therefore becomes interesting and, while situations considerably vary, we may take for illustration the epoch-making instance of the Pennsylvania's immense new passenger terminal in New York, with its sub-river tunnel annexes, a scheme so great, fiscally, that it has even affected the credit—as measured in borrowing power on bonds—of that mighty railroad corporation.

The actual cost of this record-breaking terminal scheme for construction may be roughly estimated at $100,000,000. On that sum the interest charge alone may be fixed at $4,000,000 with additions, for operation, taxes, maintenance and the like of, say, $1,500,000 more. The total of $5,500,000 is an expansive sum, and it runs in both good and bad traffic periods. But when we come to the *net* charge there are important offsets. First, there are some tens of millions by which cost and consequently fixed charges are reduced by transfers from surplus earnings to construction of the terminal. There are rents and station privileges sold. There is the rental to be paid by the Long Island Railroad. There are potential economies in the great ferry service of the company either direct or by new development in the line of suburban travel; and, incidentally, the company will thus cover both central and downtown business, advantage owned by no other corporation in any considerable degree. There is the possibility of an increase of a few cents per passenger on an immense volume of passenger traffic. There is the high bid for what we may call "long-distance" business by a road with its terminal in the heart of a metropolis which ere many decades will be the greatest city in the world. There is the ascertained fact that the Pennsylvania traffic doubles within each ten years. Finally, there is the prospective New England connection, with its rents, its trackage charges and its possibilities of diversion of New England business to Pennsylvania routes. The scope of this connection has never been fully recognized. It may be suggested by the annual charge paid by the New Haven to the New York Central for trackage and rents below Woodlawn, a sum which reached about $1,000,000 several years ago and is greater now; and by the New Haven's costly Harlem improvements and their forecast of electric suburban service along the line of the great city's most rapid advance. One can expand the omen to the point where it includes the complete union of the New Haven and Pennsylvania systems as promoted by the great terminal; an event not likely to come to pass in President Mellen's time, or in any time while New Haven stock remains scattered in small holdings throughout New England.

Here, then, are some ten specific offsets to the burden and risks of the great fixed charge to be incurred by the Pennsylvania in

centralizing its New York terminal. They will undoubtedly leave a considerable margin that may have to be met, perhaps for a good many years. The components in the particular problem are, of course, indeterminate. They rest on unknown variations of value the attempt to measure which must be guesswork. But it must be said that, after the subtractions are made, the Pennsylvania's large equities, including net earnings, over dividends, easily provide for the balance; and beyond is the prospect of net earnings waxing and doubling in much less than ten years.

When we come to apply this overshadowing Pennsylvania case to the large passenger terminal problems of other railroad corporations we do not, to be sure, find subtractions from the terminal fixed charge in the same number or of the same values. But, in practically all cases, some of them exist. Even if they did not exist there is in present day railroading the same sort of compulsion to provide for the far future in passenger terminals that has obtained in the earlier past when the trunk lines have sought railroad outlets to the great cities. Where, for example, would the Pennsylvania itself have emerged had it failed to take over at a fixed charge exceeding net earnings the United Railroads of New Jersey, or under like conditions had the Delaware, Lackawanna & Western refused the then directly unprofitable lease of the Morris & Essex? This is the nub of the whole terminal problem. Had the railroads foreseen that problem a third of a century ago they would have forestalled the future by great purchases of urban real estate even at somewhat of the same fiscal perils that attended President Gowen's taking up of the Reading coal lands. But if railroad foresight in the matter of great terminals was then too dim, it is clarified now, and fortunately for the shareholders, at a time when the great accumulated resources of the roads enable them to front the problems without any serious risk of impaired dividends.

## September Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of September, printed in another column, contains accounts of 20 collisions, 23 derailments and three other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | September | Killed. | Injured. |
|---|---|---|---|---|
| 1. | Sea Cliff, Cal. | 10th | 2 | 25 |
| 2. | Ringgold, Ga. | 12th | 6 | 0 |
| 3. | Dover, Okla. | 18th | 2 | 19 |
| 4. | Pulaski, Wis. | 19th | 2 | 11 |
| 5. | Cut Bank, Mont. | 20th | 4 | 0 |
| 6. | Rock Cut, Ohio. | 23d | 3 | 9 |
| 7. | New Prague, Minn. | 24th | 5 | 3 |
| 8. | Catlin, Ill. | 26th | 9 | 46 |
| 9. | Eddington, Pa. | 29th | 3 | 20 |
| 10. | Clarksville, Tenn. | 29th | 2 | 0 |

The most sensational accident in this list was that at Dover, Okla. Its cause seems to have been like that of the similar wreck at Eden, Colo., in August, 1904, in that it was due to an unusual flood and probably to a large mass floating down stream. The vigilance, or lack of it, of the engineman or the officers of the road is a question which, in Oklahoma as in Colorado, remains in the dark, because of the lack of any unbiased investigating authority.

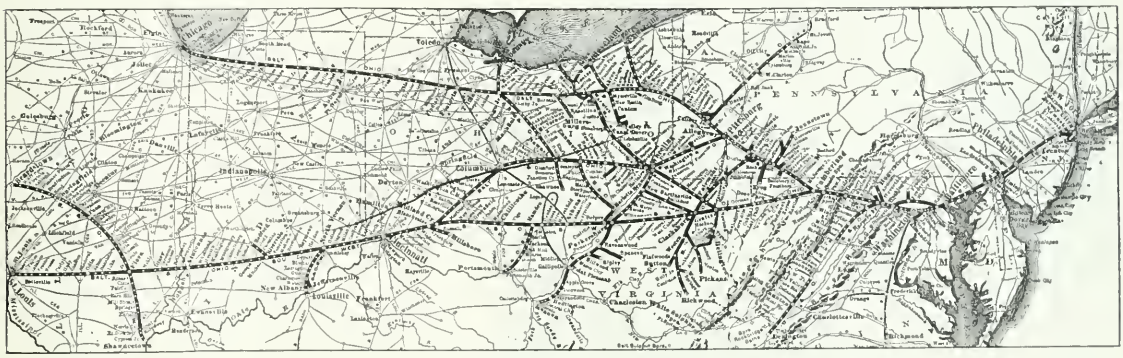
The rear collision at Eddington, Pa., when looked at in this list loses some of its prominence, since six or eight others are as bad or worse. It was, however, exceptional and a discussion of its cause will be found in the editorial columns of this and last week's issues.

Though Eddington was exceptional it occurred in the same month with another of the same class, that near Sudbury, Ont., where 12 persons were killed, and three others subsequently died of injuries. Canada had also in September a disastrous freight wreck (reported from Port Arthur on the 18th), and Mexico a collision of freight trains on the 26th in which eight were killed.

The number of electric car accidents reported in the newspapers of the United States in the month of September was 21; number of persons killed 10, injured 102.

## Baltimore & Ohio.

The Baltimore & Ohio is a trunk line with a soft coal business more important by far than any other item of its traffic. From West Virginia it ships coal east to the Atlantic seaboard markets and west to the Pittsburg, Ohio, Chicago and St. Louis territory. It is notable that bituminous coal and coke make up 51.5 per cent. of the entire tonnage carried during the year. This is an increased percentage of these products over the year 1905, in spite of the fact that bituminous coal accounts for only 39.8 per cent. of the total as against 42.5 per cent. in 1905. Coke shipments, however, which made up 8 per cent. of the total in 1905, amounted to 10 per cent. last year, an increase of 45 per cent. in this one item of traffic. It must not be supposed, however, that there was an actual decrease in the tonnage of bituminous coal shipped because its proportion of total shipments decreased. On the other hand, bituminous shipments amounted to over $22,000,000 as against some $20,100,000 in 1905, a gain of 9 per cent. The average earnings per ton on soft coal were slightly above four-tenths of a cent as against 0.56 cents average earnings on all traffic. The large coal tonnage was also responsible for the high average train load, which was 420 tons of revenue freight as against 399 tons in 1905.




Baltimore & Ohio.

The trunk line character of the road is reflected in the large grain tonnage; this amounted to 1,594,971 tons, which is less by 100,000 tons than the highest figure for grain tonnage in the history of the road, reached in 1900. In 1905 the Baltimore & Ohio carried 1,107,789 tons of grain. Besides this notable increase of 487,182 tons in grain, other large increases were: ores, 402,216 tons; stone, sand, etc., 586,906 tons; forest products, 359,021 tons; cement, brick, lime, etc., 421,876 tons, and ore and steel products, including machinery, 1,546,000 tons. The last figure is an evidence of the tremendous prosperity of the iron and steel trade which the Baltimore & Ohio reaches in the Pittsburg, Cleveland and Chicago districts. There were few decreases in traffic, the most striking ones being one of 140,000 tons in anthracite coal and another of 30,000 tons in packing house products other than dressed meats, the latter an echo of the Chicago packing house investigation.

With all these large increases in traffic, there was, of course, a great gain in freight earnings, amounting to $9,395,000. A decrease of $115,000 in earnings from passenger traffic, due to comparison with the St. Louis Exposition year was more than overcome by a gain of the same amount in earnings from miscellaneous sources and an increase of $297,000 in express earnings, which is, according to the report, the gratifying result of improvements made in that service. The gain in miscellaneous earnings was largely due to increased elevator earnings at Baltimore from the much larger traffic in grain.

Perhaps the most striking feature of the year's operations is the apportionment of the expense increase, which amounted to over $4,800,000. Of this amount $1,478,000 was in maintenance of way; $1,578,000 in maintenance of equipment and $1,655,000 in conducting transportation. It will be noticed that these amounts are roughly about the same. As the total maintenance of way cost was something over $9,000,000 and maintenance of equipment $12,500,000, as against over $26,000,000 for conducting transportation, it will at once be seen that proportionately much larger amounts of the in-

creased expenses went into maintenance than into the actual cost of carrying traffic. This, of course, is a desirable result, for it means that operation is becoming more efficient and increased expenditures are going into the improvement of the road.

There are many other evidences of the large and general improvement of the property. From the income of the year, $1,077,975 was appropriated for certain miscellaneous improvements and betterments, and expenses of topographical and right-of-way maps, and $3,000,000 for extraordinary additions and improvements, a total of $4,000,000 appropriated out of net earnings. Construction charges and miscellaneous improvements are listed in great detail, with the cost set opposite each item. These expenditures amounted to something over $9,000,000, which, less the $3,000,000 appropriated out of surplus income, left $6,000,000, which was charged to capital account. Of the miscellaneous improvements all but $120,000 were charged to income account. The analysis of these charges occupies 14 pages of the report, which suggests the general thoroughness of the document's presentation of the company's financial situation and operations.

Many of the improvements are also mentioned by the President in considerable detail. They include, in particular, double tracking, relocation of the lines and consequent grade and curve reduction. For example, on the Baltimore division there has been under construction during the year a new standard double track line, three miles long, where except for half a mile which will be raised and straightened the present roadbed is being entirely abandoned and relocated. This improvement is to eliminate 542 degrees of curvature, reduce the maximum curvature from 12 to 7 degrees, shorten the distance by over half a mile, reduce the maximum grade westbound from 0.9 per cent. to 0.5 per cent., and put the roadbed well above high water. The longest stretch of double track under construction is 25.7 miles; this involves grade reduction to the Baltimore & Ohio standard of 0.3 per cent. and reduction of curvature to a maximum of 1½ degrees. When this is finished there will be, with the exception of one tunnel, a continuous second track from Pittsburg to Hamler, on the Chicago division, 278 miles. Both of these pieces of work are to be finished during the present fiscal year.

After considerable public agitation and negotiation with the state of Maryland, the 5,500 shares of stock of the Washington Branch Railroad held by the State and also a number of shares held by individual interests were acquired. This is the Baltimore & Ohio line into Washington. It was alleged that funds were being diverted from net earnings of this branch to improvements to such an extent that the stockholders, including the State, were not receiving their fair share of surplus, no dividends having been paid since 1896. They contended that they should receive some return particularly in view of the great importance of a line into Washington to the Baltimore & Ohio. The interest of the state of Maryland in the stock entitled it to two representatives on the board of directors. By the purchase this privilege was terminated and the road brought entirely under the control of the Baltimore & Ohio.

The new general office building to replace the one burnt in the Baltimore fire was occupied on September 12, 1906, an event of considerable importance to the road after the great disorganization of its facilities at the time of the fire. During the year, two of the distinctly Pennsylvania Railroad directors have left the board of directors, one by death, the other by resignation.

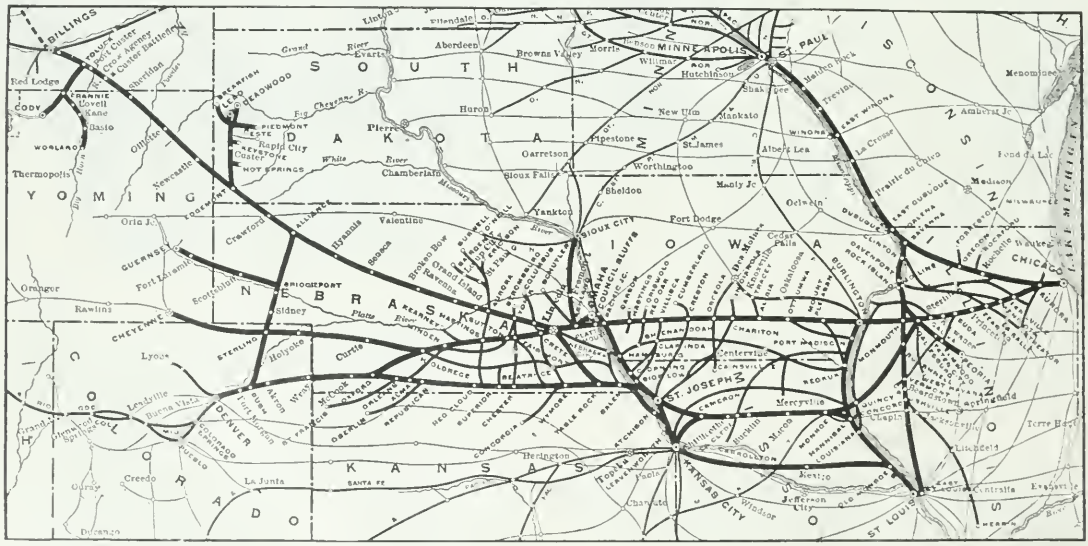
The most striking event, of course, as it affects the Baltimore & Ohio, has been the sale by the Pennsylvania of about $40,000,000 of its B. & O. stock, or about one-half its interest in the road, to Kuhn, Loeb & Co. These shares are reported to have already come into the possession of the Harriman interests. As the eastern end of the Harriman system the Baltimore & Ohio would be a still more important railroad than it is to-day. The great gain made since receivers were appointed in 1896 is typified by the raising of its dividend during this, the eighteenth year of its history, from an annual rate of 5 to 6 per cent.

The principal results of operation of the system, including the Baltimore & Ohio Southwestern, but excluding 456 miles of controlled or affiliated lines not worked directly, are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 4,030 | 4,026 |
| Freight earnings | $60,002,204 | $50,607,087 |
| Passenger earnings | 13,701,698 | 13,817,141 |
| Gross earnings | 77,392,956 | 67,689,997 |
| Maint. way and structures | 9,330,859 | 7,852,636 |
| Maint. of equipment | 12,514,984 | 10,937,106 |
| Conducting transportation | 26,198,469 | 24,543,341 |
| Operating expenses | 49,515,221 | 44,710,604 |
| Net earnings | 27,876,835 | 22,979,394 |
| Net income | 19,142,275 | 14,159,775 |
| Betterments and improvements | 4,077,975 | 3,092,196 |
| Year's surplus | 8,926,898 | 5,667,194 |

## Chicago, Burlington & Quincy.

There are, since the acquisition of the road by the Great Northern and Northern Pacific in 1901, two Chicago, Burlington & Quincy companies. The road is owned by the Railroad company of that name, which leases it to the Chicago, Burlington & Quincy Railway Company. The Railway company pays as rental dividends at the rate of 7 per cent. yearly on the stock of the Chicago, Burlington & Quincy Railroad Company. Most of the Railroad company's stock is deposited as collateral security for the Northern Pacific-Great Northern joint C., B. & Q. collateral 4 per cent. bonds, and the dividends paid on this stock are applied directly to the payment of interest on these collateral bonds. There is at the same time outstanding a small amount of the Railroad company's stock not deposited as collateral on which the same rate of dividend (7 per cent.) is paid. Although the lines are operated by the Railway company, the annual report—the 52d of its kind, by the way—is made by the Chicago, Burlington & Quincy Railroad Company.


BILLINGS
Red Lodge
CODY
Basin
WORLAND
Thermopolis
YOMING
Orin Jc.
Orchard
Rawlins
CHEYENNE
Lyons
Longmont
DENVER
Creede
Durango
SOUTH DAKOTA
Aberdeen
Pierre
Huron
Chamberlain
Mitchell
Yankton
Sioux Falls
Worthington
Madelia
Albert Lea
Austin
Rochester
Winona
La Crosse
Prairie du Chien
Madison
Milwaukee
CHICAGO
MINNEAPOLIS
ST. PAUL
Hutchinson
New Ulm
Mankato
St. James
Tracy
Redfield
Sioux City
Fort Dodge
Cedar Falls
Dubuque
Rock Island
Galesburg
Peoria
Ottumwa
Burlington
Quincy
Hannibal
St. Louis
NEBRASKA
Valentine
Hyannis
Broken Bow
Grand Island
Kearney
Hastings
Fairbury
Beatrice
Nebraska City
Omaha
Council Bluffs
Lincoln
Plattsmouth
Scottsbluff
Sidney
Ogallala
North Platte
Holyoke
Sterling
Curtis
McCook
Oberlin
Atwood
Goodland
Burlington
Limon
Denver
Colorado Springs
Pueblo
La Junta
KANSAS
Hutchinson
Wichita
Newton
Emporia
Topeka
Atchison
Kansas City
Leavenworth
St. Joseph
Chillicothe
Trenton
Mercer
Princeton
Centerville
Creston
Shenandoah
Red Oak
Clarinda
Missouri Valley
Harlan
Avoca
Logan
Woodbine
Dunlap
Denison
Jefferson
Carroll
Manning
Audubon
Atlantic
Griswold
Council Bluffs
Omaha
Fremont
Blair
Tekamah
Decatur
Sioux City
Le Mars
Sheldon
Worthington
Albert Lea
Austin
Rochester
Winona
La Crosse
Prairie du Chien
Madison
Milwaukee
Chicago
Aurora
Galesburg
Peoria
Ottumwa
Burlington
Quincy
Hannibal
St. Louis
Mendota
Amboy
Rockford
Freeport
Dixon
Sterling
Fulton
Clinton
Davenport
Muscatine
Iowa City
Grinnell
Marshalltown
Waterloo
Cedar Rapids
Oskaloosa
Ottumwa
Centerville
Chariton

turned back on the road, with the result that very large improvements have been made.

The past year's operations are a most striking example of this policy. Gross earnings of all roads operated and controlled, a total mileage on June 30 of 8,927 miles, were over $74,000,000, against less than $66,000,000 in 1905. An increase of $8,000,000 would under normal conditions represent an increase of at least from $2,000,000 to $3,000,000 in net earnings. Net earnings for 1906 were, however, smaller by $1,000,000 than in the previous year. The larger net earnings which would otherwise have been shown were turned into the maintenance account. Although no detailed table of operating expenses is given, the simple ratios of the different expense accounts to gross earnings mark clearly the large maiutenance costs. In the first place, operating expenses as a whole were 69.4 per cent. of gross, as compared with 64 per cent. in 1905. In that year maintenance of way was 13.8 per cent. and maintenance of equipment 14.8 per cent. of gross earnings. Last year maintenance of way was 15.2 per cent. and maintenance of equipment 18.4 per cent. of gross. There was a decrease of one-half of 1 per cent. in the proportion of general expenses and an increase of a little less than one per cent. in the proportion of conducting transportation to gross earnings. Thus of the increase of 5.4 per cent. in the ratio of operating expenses to gross earnings, 5 per cent. was in the two maintenance accounts. This undoubtedly reflects a raising of standards. It is not possible to determine unit figures for maintenance of equipment, but there is no doubt that they were unusually high. Maintenance of way figures out at $1,287 per mile against $1,063 in 1905, both high figures in view of the large amount of branch line mileage and the freight density of only 737,000 ton miles per mile of road. With the large increase in traffic, the small rise in cost of the two non-maintenance accounts is at the same time proof of operating efficiency.

Aside from the statement of earnings, there is little information of operations given except in a table of traffic statistics. No further proof of the expanding business of the road is needed than the statement that the revenue ton mileage increased by over 1,100,000,000. Growing operating efficiency is also shown by a rise in the revenue train load from 327 tons in 1905 to 365 tons, or over 10 per cent. As a result, although there was a decrease of 0.03 cents in the average ton mile rate received, earnings per freight train mile rose from $2.73 in 1905 to $2.94 last year. Earnings from freight traffic were larger by $7,300,000 than in 1905. Owing, no doubt, to comparison with a year ago, which included most of the St. Louis World's Fair travel, there was a decrease of 8,900,000 in number of passengers carried one mile. Although there was a decrease in passenger mileage, the number of passengers carried increased from 14,900,000 in 1905 to 15,500,000 in 1906, and passenger earnings, by about $500,000, due to a gain of 0.09 cents in the average passenger mile rate received. Instead of furnishing 24 per cent. of the gross earnings as in 1905, passenger earnings, not including mail and express, made up only 22 per cent. of the total.

The principal new construction of the year was an extension in Wyoming to reach the Wind River or Shoshone Indian Reservation, opened to settlement this summer. This line, which is 91 miles long, runs from Frannie, Wyo., a point on the Cody branch near the Montana boundary, south to Worland. Cody, which is about 50 miles east of the Yellowstone National Park, is the westernmost point reached by the Burlington lines. A 60-mile extension from Centralia, Ill., to Herrin, now the southernmost point reached by the Burlington, was opened to business March 5, 1906. Although not mentioned in the report, there has been another important piece of new building by the road. This is a connection between the Burlington lines in the neighborhood of Omaha and the Great Northern line reaching southeast to Sioux City. This line, which runs from Ashland, Neb., to Sioux City, 108 miles, was opened for traffic in August, 1906. By its means traffic can be sent from the network of Burlington mileage in Nebraska to St. Paul, Minneapolis and Duluth, and in return from the eastern part of the Great Northern's territory to the Burlington. The new line is in particular a competitor of the Chicago, St. Paul, Minneapolis & Omaha line of the North-Western. The year's construction and equipment account was charged with $1,274,725 for the Frannie-Worland line and $943,162 for the Centralia-Herrin line. There was also a small charge for work already done on a new line from Lincoln, Neb., including a new yard at Lincoln, west to Milford, 20 miles, which amounts to a second track.

More important, possibly, in its bearing on future policy, than anything else in the report is a charge of $82,000 to construction account for a new line to be built from Newark, Neb., northwest along the Platte and North Platte rivers to Bridgeport. Bridgeport is the eastern terminus of the Burlington's line which runs to Guernsey, Wyoming. To reach this line it is now necessary to carry traffic either south around by way of Sterling, Col., or north by the Alliance, Neb., line. As the main line of the Union Pacific parallels the route of this new line for 100 miles from Newark to North Platte and the Harriman road is building a branch from North Platte, the remaining 125 miles to Northport, which is across the river from Bridgeport, it hardly seems as though the Burlington could be planning this new construction for the sake of local traffic. Nor does it seem probable that this 225 miles of road would be built for the sake of reaching more conveniently a 100-mile branch. But such a line would be of great importance if the Guernsey branch ever came to be the outlet for a large amount of Burlington mileage, as yet unbuilt, in southern Wyoming, and of the greatest importance as part of a through line to Salt Lake City or the California coast; an ultimate event by no means beyond the bounds of possibility.

The principal results of operation for the last two years are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 8,896 | 8,871 |
| Freight earnings | $51,168,339 | $43,863,893 |
| Passenger earnings | 16,409,101 | 15,898,243 |
| Gross earnings | 74,146,661 | 65,973,046 |
| Maint. way and structures | 11,312,712 | 9,090,499 |
| Maint. of equipment | 13,639,942 | 9,788,194 |
| Conducting transportation | 22,354,707 | 19,352,056 |
| Operating expenses | 51,463,642 | 42,230,333 |
| Net earnings | 22,683,029 | 23,742,713 |
| Net income | 12,742,430 | 13,804,778 |

## NEW PUBLICATIONS.

*Catechism of the Electric Headlight.* By J. W. Johnson. Indianapolis: Published by the Brotherhood of Locomotive Firemen's Mazagine. 3 in. x 5 in.; 94 pages.

This booklet consists of 296 questions and answers covering the operation, repairs and maintenance of Pyle National headlights and generators. The catechism is a reprint, revised and brought up to date, of a series of articles written by Mr. Johnson for the *Locomotive Firemen's Magazine* in the early part of 1905.

## Convention of the Superintendents of Bridges and Buildings.

The sixteenth annual convention of the Association of Railway Superintendents of Bridges and Buildings was held at the American House, Boston, Mass., October 16, 17 and 18. There were 77 present out of a total membership of 348. Mr. Lucius Tuttle, President of the Boston & Maine, delivered the address of welcome. The Secretary reported the addition of 35 members since the last meeting and a balance of $1,103 was reported in the treasury. The officers elected for 1907 are: President, J. H. Markley (Toledo, Peoria & Western); First Vice-President, R. H. Reid (L. S. & M. S.); Second Vice-President, J. P. Canty (B. & M.); Third Vice-President, H. Rettinghouse (Wis. Cent.); Fourth Vice-President, F. E. Schall (Lehigh Valley); Secretary, S. F. Patterson (B. & M.); Treasurer, C. P. Austin (B. & M.); Members Executive Committee, W. O. Eggleston (Erie); A. E. Killam (Intercolonial); J. S. Lemond (Southern); C. W. Richey (Penna. Lines); B. J. Sweatt (C. & N. W.), and H. H. Eggleston (Chicago & Alton). Salt Lake City, Utah, was selected as the next place of meeting.

Only four of the seven special committees submitted reports. The first of these was on Concrete Bridges, Arches and Subways. The subject was freely discussed and created a good deal of interest. All of those who spoke were in favor of concrete construction. A number of instances were cited by members where concrete had been used for whistle posts, mile posts, fence posts, ash pits, bridge bearing blocks and abutments, arches, culverts, buildings, etc. The discussion developed that the best results were obtained with wet concrete. Concrete can be put in in winter with as good results as in summer provided the forms are allowed to stay in place until the concrete is thoroughly dry. This in some cases may take from two to three months. Mr. R. H. Reid (L. S. & M. S.) stated that on his road, where stone is easy to get, concrete is cheaper to put up than masonry, and in some cases it can be put in where it would be impossible to use stone on account of traffic conditions interfering with the handling of large stones. In using reinforced concrete it was the general opinion that the reinforcing bars of from 1 inch square and up should have at least from 12 in. to 15 in. lap in order to be effective.

There were no reports on subjects No. 2 and 3: Experience and Use of Concrete and Tile Piles and Concrete Building Construction. Several members, however, witnessed a demonstration of the driving of some concrete piles by the Simplex Concrete Piling Co. at the new freight house of the N. Y., N. H. & H. in Boston, where the company is driving about 200 piles to an average depth of 30 feet.

A printed report was submitted on subject No. 4: Method of Watering Stock in Transit. The discussion of the subject was short.

On subject No. 5, Recent Practice in Cofferdam Work, a printed report was submitted. Little discussion was offered further than that steel piling in many cases cannot be recovered. Mr. Reid said that in one case he had pulled 1,000 tons without moving a pile. He said it was an open question whether it paid to use steel in place of wood piling when the cost of re-covering was taken into consideration.

The next subject, No. 6, was on Modern Coaling Stations and

Concrete Pits. A printed report was submitted and discussion was mainly on the cost of handling coal. No definite conclusions could be arrived at, as it was evident from the great variations in cost of handling per ton (from 1½ cents to 17 cents) given by the members as the cost on their various lines that some of them had included only the actual handling of the coal at the coaling station, whereas others had included the cost per ton, interest on the investment, maintenance of plant, etc.

A printed report was submitted on subject No. 7: Bumping Blocks for Passenger and Freight Use. It was the unanimous opinion that 95 per cent. of breakages of bumpers were due to lack of discipline among the train crews. A number of the members thought spiral springs preferable to rubber in bumpers. The cost of maintenance of bumpers fitted with springs is less and bumpers so fitted have proved to be more efficient.

The standing committee subjects, of which there were eight, were next taken up. There was a printed report on the first subject: Pile and Frame Trestle Bridges. One of the members stated that he had had excellent results from the use of gravel deck trestles. These, it was stated, are good for from 10 to 12 years without repairs. Mr. Cummin (L. I.) exhibited a piece of a creosoted pile which had been in Jamaica Bay for over 20 years. It was in a state of perfect preservation. He also exhibited a piece of pile which had not been treated, but which had been in service, for a much shorter time, next to the creosoted pile. This was badly decayed and eaten by the teredo. There were no reports on subjects Nos. 2, 3, 4, 6 or 8, namely: Steel Bridges, Buildings, Water Supply, Fences, Road Crossings and Cattle Guards, Records and Accounts. Printed reports were submitted on subjects No. 5, Fire Protection, and No. 7, Preservatives for Wood and Metals. A short discussion was given to subject No. 4, Water Supply. This was principally on hoops for water tanks and the cause of their failing. Most of the members thought that the hoops should be made a trifle larger. They also found that it was rare for wrought iron hoops to fail; the majority of failures had been with steel hoops. The question was asked as to whether the kind of wood used had any effect on the lasting quality of the hoops. J. B. Sheldon (N. Y., N. H. & H.), said that hoops on tanks made from white pine lasted longest and that hoops on cedar and cypress tanks did not wear as well. Galvanized wrought iron hoops give good results, it was said by one member. Others had used round hoops, but with poor results, as they cut into the wood and break the fiber, and at the same time leave a recess for the water to accumulate which in time tends to rot the wood around the hoops.

A short discussion was given to subject No. 7, Preservatives for Woods and Metals. Mr. Reid stated that carbolineum is an excellent material for preventing outside rot. The majority of the members seemed to think that the application of almost any oil would tend to prolong the life of timber. J. F. Parker (A., T. & S. F.) said that his road had used crude oil extensively and with good success for painting all of its trestle work and wooden bridges. It prevented the timber from checking in the hot sun and also prolonged its life. There was no report on Records and Accounts, and it was decided to drop this as well as subjects Nos. 2 and 3—Steel Bridges, and Buildings—from the list of standing subjects of the Association, thus leaving five standing subjects in place of eight.

The subjects for next year are: (1) Concrete Bridges, Arches and Subways; (2) Concrete Building Construction; (3) Expansion and Contraction of Long Concrete Walls, either Reinforced or Plain Concrete; (4) Action of Sea Water on Concrete; (a) Made in Air and Sunk in Sea Water, (b) Concrete Deposited Direct Into Sea Water; (5) Wooden and Asbestos Smoke Jacks for Engine Houses; (6) Combination Fastenings and Locks for Rolling and Sliding Doors on Freight Houses and Other Buildings; (7) Construction of Towers and Guides for Lights on Draw-Bridges; (8) Protecting Steel Railroad Bridges Against the Action of Salt Brine from Refrigerator Cars.

The following is a list of the exhibits at the convention:

American Hoist & Derrick Co., St. Paul, Minn.—Photographs of hoists and derricks.

The American Track Barrow, Lowell, Mass.—Models of timber track trucks, and pony cars.

Barrett Mfg. Co., New York. Barrett "Specification" pitch, and Barrett "Specification" coal-tar felt.

F. W. Bird & Son, East Walpole, Mass.—"Paroid" roofing, "Neponset" waterproof papers; "Paroid" sill covers. "Neponset" and "Kosat" insulating papers, coated building paper and "Parine" paint and cement.

J. A. & W. Bird & Co., Boston, Mass. Samples of "Rex Flintkote" roofing, "Ibex" building and insulating papers; model house showing application of roofings.

Philip Carey Mfg. Co., Cincinnati, and New York.—"Carey's" roofing and "Carey's" roofing paint.

Paul Dickinson, Inc., Chicago.—Cast-iron smokejacks for engine houses; ventilators and chimneys for freight houses and signal towers.

Joseph Dixon Crucible Co., Jersey City, N. J. Photographs of structures protected with Dixon's "Silica-Graphite" paint.

Easton Granite Roofing Co., New York.—Granite roofing.

Fairbanks, Morse & Co., Chicago.—Gasolene inspection cars in operation on track, also Barrett jacks.

Ideal Concrete Machine Co., South Bend, Ind.—The Ideal concrete block machine in operation.

H. W. Johns-Manville Co., New York.—Asbestos "side," asbestos roofing asbestos "Transite" smokejacks, and asbestos packings, pipe coverings, etc.

The Lebon Co., Chicago.—Samples of "Roofrite" roofing material.

Lowe Bros. Co., Dayton, Ohio.—Films of Lowe's "Red Lead Lute" paint.

McCord & Co., New York.—Model of "Gibraltar" bumping post.

The National Roofing Co., Tonawanda, N. Y.—Sample rolls of "National" mineral asphalt roofing.

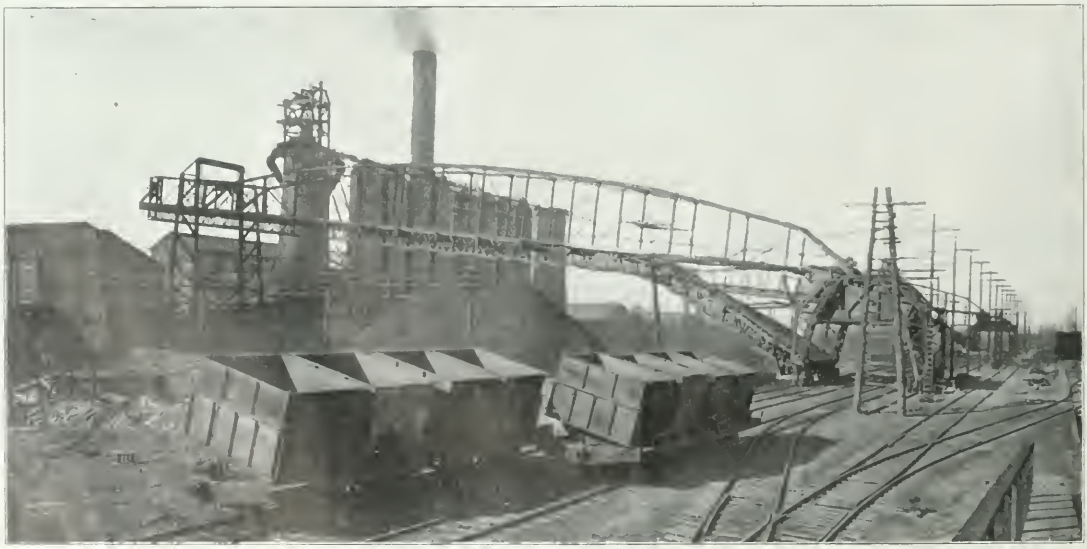
A. O. Norton, Boston, Mass.—Ball-bearing, lifting jacks, and sure-drop jacks.

Standard Paint Co., New York. "Ruberoid" colored roofing, "Flexite" paints and "P. & B." insulating paper.

United States Graphite Co., Saginaw, Mich. Graphite paint and lubricants.

## Hulett Car Dumping Machine.

The use of mechanical unloaders and conveyors at the ore receiving ports on the Great Lakes has so reduced the time and cost of unloading cargoes that similar labor saving devices are being installed on an extensive scale at some of the larger inland plants for emptying the cars and placing the material on the stock pile. For removing the contents of the cars as they arrive by rail the Hulett car dumper is in service at several works. The loaded cars are moved by a gravity track to the edge of the incline approach to the machine. Here the car is engaged by a mule car usually propelled by a cable. The mule car runs on a pair of narrow gage tracks between the rails of the standard gage track, and after pushing the loaded car on the cradle, runs back down the incline, dis-



Hulett Ore Stocking Bridge Showing Bridge Cars in Position on Transfer Cars; Carnegie Steel Co., Youngstown, Ohio.

appearing into a pit at the foot of the incline, so that loaded cars can pass over and in front of it. It is provided with a strong friction stop to relieve the impact when it drops into the pit, and hence allows greater speed of manipulation as it requires less attention from the operator and automatically stops itself in the pit. After the loaded car is placed on the cradle of the machine it is automatically moved over to the side against suitable supports

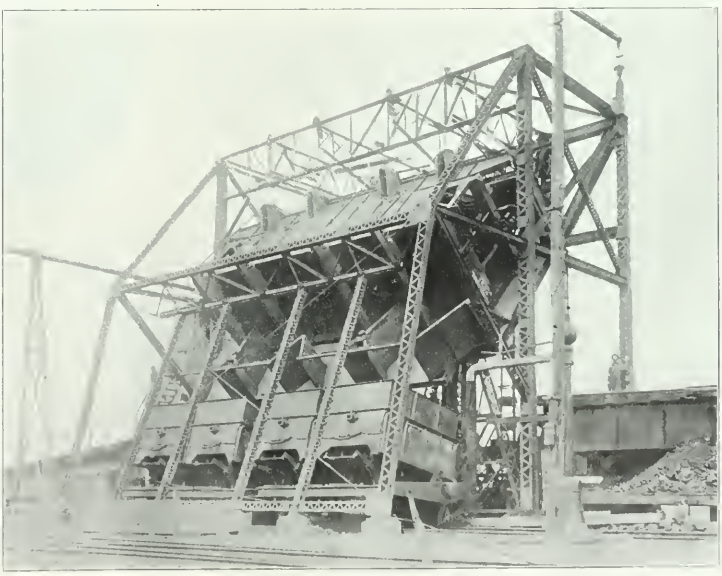
Bridge Car Discharging Load over Stock Pile.

on the cradle. It is not necessary to clamp the car independently as this is automatically done by counterweight clamps which operate simultaneously with the inverting mechanism of the car dumper. The cars are inverted to an angle of 70 deg. so that all the contents run out freely, and when the car is emptied and revolved back the clamp beams release and the car stands entirely free. The next incoming car bumps the empty and starts it down the discharge track. It leaves the machine and yard by gravity tracks having spring switches. These dumpers have a capacity for handling from 140 to 170 loaded cars in a day of ten hours or for emptying over 7,500 tons. They are operated by steam or electric motors requiring two 80 h.p. motors for the tipping mechanism.

For transferring the ore to the stock pile a conveyor bridge of the Hulett type has been designed for stocking and reloading which operates in direct connection with the railroads entering the works, so that the locomotive of the ore train is utilized as well as the car dumper described. As the ore arrives at the furnace in either gondola or hopper bottom cars, the car dumper empties the ore from the railroad car into four bridge-cars which are mounted on tracks on a transfer car, the tracks on the transfer car being at right angles to the standard gage tracks on which the transfer car travels. After the railroad car has been inverted in the car dumper, and the ore dumped into the bridge cars, the transfer car is pushed out from under the car dumper by the locomotive, which at the same time pulls in another transfer car with empty bridge cars. The locomotive then leaves the empties and shoves the loaded cars up to and opposite the incline approach of the ore bridge. It is not necessary for the locomotive to spot the car accurately as the bridge is provided with a shifting gear which moves the transfer cars until the tracks on the bridge incline coincide with the short tracks of the transfer car. The operator by dropping a lever connects the rails on the transfer car with the rails on the bridge, and a continuous track for all four cars is obtained. Another operator attaches a haulage rope to each bridge car in succession and it is pulled up the incline and out over the stock pile by a cable.

The bridge cars are side dumping and can be automatically dumped at any point desired by means of a movable trip placed on the track. After dumping the car automatically closes and latches itself and is returned down the incline to its original position on the transfer car. The contents of each bridge car are equivalent to 20 gross tons of iron ore, so that four of them will receive the contents of the largest railroad cars, or the contents of two ordinary 40 ton cars. The capacity of each of these conveyor bridges is about 400 to 500 gross tons per hour, under ordinary working conditions. The conveyor bridge is built with a separate track hung underneath the floor beams. On this track runs the trolley wagon operated by cables on separate drums located in the main tower of the machine. The trolley wagons and machinery are designed to operate either an automatic bucket or a drag bucket. The capacity of the drag bucket is 10 tons, while the automatic bucket for the same bridge will hold 6½ tons of ore. By the use of either one of these buckets, the ore is picked up from the stock pile and carried back. The cantilever of the bridge extends over the bins of the furnace, and the ore from the bucket is dumped direct into the bins or into a bin filling the car as desired.

These bridges are operated electrically by two 130 h.p. reversible open type motors which actuate the bridge car haulage and bucket-operating drums. The car haulage drum is of two diameters, 5 ft. and 8 ft. respectively, so arranged that the haulage rope is wound on the smaller drum while the car is being pulled up the steeper part of the incline; and when the car reaches the more level part of the track, the rope, by means of a spiral groove, runs on the 8-ft. diameter, which gives greater speed throughout the bridge. For moving the bridge back and forth along the stock yard, power-driven mechanism is supplied, connecting both the machinery tower in front and the shear leg at the rear. The driving gear for this moving mechanism is located on one end of the intermediate shaft. The connecting gear is operated by a jaw clutch and is bronze bushed for running loose on the shaft. Branch shafts for connecting all the trucks of machinery tower and shear legs are driven from this gear.



Hulett Car Dumper Inverted.

## The Lumber Business of the Government.

A natural feeling among lumbermen toward the forest work of the Government is that the Government is not in the lumber business and cannot, therefore, take the lumberman's business point of view. Hardly a greater misconception could exist. As a

dealer in stumpage, the Government is the largest lumber dealer in the country. Further, it applies to its sales the practice of scientific forestry, requiring the removal of the timber under the same sort of instructions which it advises for private operators. Thus the Forest Service, in its reserve work, is giving an object lesson on a huge scale to enforce its teachings that conservative management and profit may go hand in hand. In the year 1905 the total sales reached a value of $273,660.

The restrictions governing the timber sales, while effective, are simple. Application is made to the local officer in charge of the reserve from which the timber is desired, who executes small sales on the ground. In case of large sales, the application is forwarded to the Forest Service, from which the advertisement of the sale is made. Applicants for timber are required to send sealed bids to the Forest Service. Small bidders enjoy exactly equal opportunities with large, and monopolization is effectually forestalled. The highest bid fixes the price. Should the first applicant desire to begin cutting immediately he may (except in California) do so, on condition that he pay in advance at a price already fixed by the Forest Service, and that he obligate himself to pay the full amount named in the highest bid. Thus delay is avoided and the Government is protected. Speculation in reserve timber is made impossible by the provision that the timber must be removed within a specified time, and that when a contract extends over several years a proportionate amount of timber must be removed each year. Five years is the extreme limit of a sales contract.

That these restrictions are not onerous is shown by the numerous sales made under them. A single sale of 50,000,000 ft. of lodgepole pine for railroad ties is pending on the Montana division of the Yellowstone Forest Reserve. It is estimated that 165,000,000 f. B.M. of lodgepole pine can be taken from one watershed in the Medicine Bow Forest Reserve, still leaving a large percentage for future crops. Much timber is sold in small lots; 50 applications for such sales are made to each single application for 1,000,000 board feet or more; the prompt, businesslike consideration accorded such applications standing in marked contrasts with the slow methods once prevailing, when all applications had to be made through Washington.

*Forests as Revenue.*—During the year 1905 the sales of timber from the national reserves were as follows:

The largest sales so far made are 71,466,537 board feet from South Dakota, 68,255,916 from Wyoming, and 5,327,443 from Utah.

In sales of wood for fuel South Dakota led with 29,844½ cords; Arizona followed with 16,649, and Colorado with 10,795½. The total number of cords sold was 74,120.

In sales of posts and poles Montana led with 119,500, followed by Wyoming with 30,750, and Colorado with 13,988. The total number sold was 188,740.

The largest timber sales were made in Wyoming, where they reached $143,895. South Dakota's sales ranked second in value, amounting to $78,958, and Colorado's to $23,937. The total sales for 1905 reached $273,600.

Nor are the receipts from these sales swallowed up by the cost of administration. The entire property of the forest reserves, worth $250,000,000 in cash, is now being administered at a cost of less than one-third of 1 per cent. of its value, while increase in that value of not less than 10 per cent. a year is taking place. As the use of the reserves increases, the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The time is not far distant when the forest reserves will become self-sustaining. Later they may confidently be expected to become a source of public revenue.—*The National Geographic Magazine.*

## The Railway Signal Association.

The annual meeting of this association was held at the New Willard Hotel, Washington, D. C., October 16, 17 and 18, and it was by far the best attended and most enthusiastic meeting that the association has ever held. Two hundred and twenty-eight members and about three hundred guests of members registered their names with the secretary, a good many members having brought their wives. The membership of the association is now over 600. The supply men have formed an organization, the Signal Appliance Association, and 45 firms, members of the association, were represented in the exhibits. These were displayed in a large room on the same floor with the meeting room, except some full-size automatic electric signals, in operation, which had to be left outdoors. On the same floor (the tenth) a luncheon was provided each day, by the hotel, at the instance of the executive committee, thus doing away with the inconveniences and delays which arise when the members scatter to a number of different places to eat. So well had the local committee done its work that at the close of the meeting there was a strong sentiment in favor of having the next annual meeting held in Washington; but advocates of a more central location finally prevailed, and Milwaukee was selected.

The annual election of officers for the ensuing year resulted in the choice of Messrs. Peabody and Rosenberg for president and secretary, respectively, and their portraits, with that of the retiring president, are given herewith.

J. A. Peabody.

Mr. J. A. Peabody, Signal Engineer of the Chicago & North-Western, the newly-elected President of the Railway Signal Association, was born in Chicago in 1870. He began his railroad service on the Baltimore & Ohio in 1888. He was in the Maintenance of Way Department, west of the Ohio, until 1892, and then for two years was in the Engineering Department, serving both on the eastern and the western lines. In 1894 he left the road and went to the Paige Iron Works, of Chicago, where he remained four years. In 1896 he became roadmaster on the Chicago & North-Western and in 1902 was appointed to the position which he now holds.

Charles H. Morrison, the retiring President of the association, is Signal Engineer of the Erie. He was born in 1870 at Dayton, Ohio, and after leaving high school took a special course in mechanical engineering. He began railroad work in 1892 as a draftsman on the Chicago, Milwaukee & St. Paul and, in 1893, was appointed signal inspector of that road. In 1901 he went to the Railroad Supply Company, Chicago, as Assistant Signal Engineer. The next year he returned to railroad service as special inspector, reporting to the General Manager, of the Chicago, Rock Island & Pacific; and later in the same year was appointed to his present position of Signal Engineer of the Erie. On November 1, 1905, he was made also Secretary of the Electric Traction Commission of the Erie.

C. H. Morrison.

The new Secretary of the Association, Mr. C. C. Rosenberg, is a former president of the association and is one of its best known members. He has just retired from the position of signal engineer of the Lehigh Valley and had intended to devote himself to his private interests. These, however, will not take the whole of his time, and his election to the secretaryship is due to the decision of the executive committee that the office needed to be filled by a man having more time to devote to its work than can be spared by any one engaged in active railroad service. Mr. Balliet could no longer give the necessary time. Mr. Rosenberg's whole railroad service has been on the Lehigh Valley, where he began in November, 1875, as a carpenter's helper. He was promoted successively to the positions of foreman and master carpenter, and in the latter position had charge of the mechanical signaling of the road when it was in its infancy. While in the bridge and building department he had charge of that part of the work in the construction of the Easton & Amboy Railroad, now the main line of the Lehigh Valley from Easton to Jersey City. For one year he was in charge of the company's creosoting works at Perth Amboy, N. J. When the signals of the road became sufficiently important to be put into a department by them-

C. C. Rosenberg.

selves, Mr. Rosenberg was made signal engineer, which office he has held until this year.

A full report of the proceedings of the Association will be given in the *Railroad Gazette* next week.

## Acworth on Pennsylvania Railroad Finances.

W. M. Acworth, the eminent English railroad expert who was recently in the United States, made an investigation of the Pennsylvania Railroad. He has summed up the information he obtained and the conclusions he reached in an article published simultaneously in the *London Statist* and the *Wall Street Journal*. Mr. Acworth says:

Since I have been in this country I have been trying to form for myself a definite opinion whether the Pennsylvania Railroad is still, as I have always believed, an ultra-conservative company, or whether, as many people in England and some in America believe, it has abandoned its old traditions, been badly bitten with megalomania, and gone in for a policy of reckless extension which may end in imperiling the modest 6 per cent. dividends of its common stockholders. With this object I have been traveling over the road, poring over figures and eliciting the opinions of a number of railroad men and financial experts. As a result, I am inclined to agree with one friend, a man of great experience in railroad matters both on the operating and on the financial side, that, so far from having spent too fast and too freely, the Pennsylvania Railroad might well spend faster and more freely and yet have no fear of even catching up with its available traffic.

Of one thing I am fully satisfied. The Pennsylvania Railroad is not yet overcapitalized. The total capital is roughly 500 million dollars, 300 millions stock and 200 millions bonds. And its gross earnings from operation are 136 million dollars. In other words, the company turns over its capital once in every four years. English railroads are capitalized at about six billion dollars and their gross earnings are about $550,000,000 per year. In other words, they take not four but eleven years to turn over their capital. But this comparison by no means shows the full strength of the Pennsylvania Railroad position. For of the 500 millions of capital, 236 millions* are represented by securities of other companies in the Pennsylvania Railroad treasury. These securities earned last year 4¼ per cent. on their cost and as, apart from their indirect value, they are rapidly increasing in profitableness every year, they may clearly be treated as worth the price at which they stand on the Pennsylvania Railroad books. So that the real capital on which dividends have to be earned by railroad operation is not 500 but only 230 million dollars, the price at which the road and equipment stands in the company's books.† In other words, if we regard railroad capital proper, the company earns the whole of it in about a year and three-quarters.

But let us see what its railroad assets are. It owns in all by direct ownership 1,256 miles of line, but these 1,256 miles of line represent no less than 4,142 miles of track—that is, nearly 3½ miles of track for every mile of route. That the road is the main highway from the whole south and west of America to the Atlantic is common knowledge; that its construction is of the most solid and modern type, with masonry viaducts, stone ballast, 100-lb. rails, etc., is plain to be seen; that the land comprises thousands of acres in the heart of the great towns of Philadelphia and Pittsburg is equally certain; yet railroad and land stand in the company's books at, roughly, $130,000 per mile. What they are really worth no man can say. But the engineer who puts his name to an estimate for duplicating the Pennsylvania Railroad at twice the figure would be a bold man. In fact, so long as the axiom that two bodies cannot at the same time occupy the same space remains true, a great part of it, the several railroads along the river fronts in and around Pittsburg, for instance, or the innumerable freight terminals in the heart of Philadelphia, could not be duplicated at any price.

The other large expenditure of capital has been on equipment. This stands in the company's accounts at 62 million dollars. The equipment comprises 3,000 locomotives, 2,000 passenger cars and 63,000 freight cars. It would certainly not be excessive to value the locomotives at $12,000 apiece, the passenger cars at $5,000 and the freight cars at $700. This would work out a real value of 90 million dollars against a book valuation of 62 millions. And even beyond this the company has an equitable ownership of many millions worth of cars which still remain legally the property of its car trusts, though a large part of their cost has already been paid off out of current revenues.

These figures seem to prove sufficiently that what I may call the original undertaking of the company is pretty sound financially. But what about the recent developments? Here is the situation in broad outline. In the last seven years the company has increased its capital, stocks and bonds, by $265,000,000. By this issue of this capital it has obtained $300,000,000 in cash. But it has paid during this period for investments in other companies (which, as I have said, are remunerative per se) $140,000,000; on enlargement of existing accommodation, new shops, etc., $200,000,000. In addition it has bought millions of dollars worth of land in the heart of New York and spent many millions more on its terminal works. In other words, though only $300,000,000 has been raised, at least $370,000,000 has been spent. Revenue has provided not less than ten million dollars per year for capital purposes. Had it seemed good to the company to keep its account that way, it need not have charged any portion of the New York expenditure to capital, and yet it would have had another five millions of annual revenue to spare for other capital purposes. This does not look like reckless finance.

But admitting the conservativeness of the company's method of raising money, it still might be the case that the money was not well spent. Two hundred million dollars is a large sum to spend in seven years on improving an existing line. But compared to the traffic, which already reaches on the main line the phenomenal figure of over $150,000 per mile per year and which over a series of years doubles itself every decade, it cannot be thought too large. Further, it has already resulted in enabling the company to handle its traffic properly and so not only to give a proper service to the public, but also to save millions of dollars that were being wasted in congested and therefore extravagant operation. As for New York, the company is committed to an expenditure of something like $100,000,000. A large sum doubtless. But a good many years ago the chairman of our own Midland Railway stated that his company had spent $45,000,000 in getting into London. New York is already nearly as big as London (3½ against 4½ million inhabitants) and will be bigger before many years are out. And while there is—and as far as can be seen always will be—only one company besides the Pennsylvania entering New York from the entire continent except the New England corner, there are five other companies to share with the Midland the traffic from the north of England into London. And for its twenty millions the Pennsylvania gets not only access to New York with a passenger terminus of 31 acres in the heart of the city, but secondly, the only rail connection with Brooklyn, which has a million and a quarter of inhabitants, and the whole of Long Island, and thirdly, an unapproachably convenient access from the whole south and southwest of the country to New England. The New York Central, which nowadays is admittedly an excellently managed company, is committed to an expenditure of $70,000,000 for the electrification of its existing line and the reconstruction of its existing terminus. If it is worth while for the New York Central to spend seventy millions to remain where it is, it surely must be at least as well worth while for the Pennsylvania to spend a hundred millions to get there.

Still, a hundred millions does sound a large sum. But it must be remembered that ten millions of this have been already formally written off out of income. At least five millions more are expected to be recouped by the sale of superfluous land. Unless the company alters its habits it is safe to say that out of the profit realized by its recent sale of securities or in some other way, five or ten millions more of the cost will be written off before the work is finished. This leaves, say, $75,000,000 as the capital cost of the New York developments. Of this more than half has already been raised and the interest on it is at present being provided out of the Pennsylvania revenue, so that all that remains to be provided is the interest on another thirty-seven and a half millions, or, say, $1,500,000 per annum. It cannot be that the New York extension will earn no net revenue. Even on the wild supposition that this were to happen, $1,500,000 a year would not be a very serious burden to a company which had last year $12,000,000 over after providing for its normal 6 per cent. dividend.

It is perhaps worth while to add one more fact which a study of the accounts discloses, as it is a good instance to show how the position of the company is usually better in fact than it appears at first sight. In the general balance sheet credit is taken for the sum of $5,789,000, in hands of the managers of a sinking fund trust created in 1878. Further examination, however, shows that this amount is merely the sum of the total payments into the fund. But during the quarter of a century of its existence the fund has naturally been growing all the time at compound interest and it now amounts not to six, but to nearly fourteen million dollars.

On the whole, I can find no reason to doubt that the position of the Pennsylvania is stronger and sounder to-day than it has ever been. The timidity of English investors has caused them in many cases to lose their fair share of the vast profits that have been made owing to the enormous appreciation in recent years of the value of a great many American investments. It is now too late to cry over the milk that has been spilt. But it will be, in my judgment, a thousand pities if English investors allow themselves to be frightened out of their holdings in a stock which has been known on the London market for fifty years and which wise and conservative management has built up year by year into an ever more and more valuable property.

*This figure of $236,000,000 is stated in the company's report to be the "entire cost." In fact, it appears the true phrase should be "so much of the entire cost as has been charged to the capital." For where stocks have been bought for control without prospects of dividends they have been written down at the expense of income to an almost nominal figure.

†The balance of $34,000,000 is more than covered by assets of current assets.

## Convention of the American Street and Interurban Railway and Affiliated Associations.

The twenty-fifth annual convention of the American Street and Interurban Railway Association and its affiliated associations, which include the American Street and Interurban Railway Engineering Association, American Street and Interurban Railway Accountants' Association and American Street and Interurban Railway Claim Agents' Association, was held at the Ohio State Fair grounds, Columbus, Ohio, October 15 to 19, inclusive. The Engineering Association, formerly the Mechanical and Electrical Association, but now also embracing the maintenance of way department, held its fourth annual meeting on the 15th to 17th, President H. H. Adams presiding. In his address, after referring to the reorganization which has been successfully effected, and the benefits to accrue therefrom, some important features of the association's work were taken up in detail, among others the construction of buildings to minimize the fire risk. The work of the Standardization Committee was alluded to. This committee at the present time has under consideration the brake shoe, wheel tread, flange, journal, journal box and rail section. It is hoped that future work will include certain parts of the electrical equipment and motor parts such as commutators, brush-holders, brushes, gears, pinions and axle bearings. Referring to the engineers' duty to the traveling public, this was declared to be of the greatest importance, since with them lies the question of reliability of service. Nothing is more aggravating to the traveling public than interruptions to service. Explanations are not what it wants, but continuity of service.

Other addresses were delivered by E. C. Spring, President of the Central Electric Railway Association; James H. McGraw, President of the Manufacturers' Association, and W. Caryl Ely and John I. Beggs, respectively President and First Vice-President of the "American" Association.

The following papers and reports were presented at the meetings: Control Apparatus (committee report); Ties, Poles and Posts, by C. A. Alderman, Chief Engineer, Cincinnati Northern Traction Co.; Ballast, by C. H. Clark, Engineer M. of W., Cleveland Electric Ry. Co.; Maintenance and Inspection of Electrical Equipment (committee report); Standardization (committee report); Gas Engines, by Paul Windsor, Chief Engineer M. P. and R. S., Boston Elevated Ry. Co.; Underground Cables, by H. G. Stott, S. M. P. Interborough Rapid Transit Co., New York; Relative Economy of Turbines and Engines at Various Percentages of Rating, by W. Goodenough, with Stone & Webster, Boston; Economy in Car Equipment, Weights and Schedules, by E. H. Anderson, Schenectady, N. Y. Also a "Question Box" of 55 questions.

Some of the points brought out in the discussions of these subjects are of interest to our readers and will be alluded to briefly. The committee report on "Control Apparatus" noted the increased use during the year of multiple-unit control apparatus for heavy service, its use for new equipments being the rule rather than the exception. Discussion was asked regarding its application to single car units.

Mr. G. J. Smith said that the Metropolitan Street Railway of Kansas City, Mo., has had in service for three months past 30 cars, 30 ft. long, with the Type M multiple-unit control operating as single units, and from present indications the results will be so far superior to the platform controller that the management is considering the installation of this control on 120 of the same type of equipment, and doing away with the platform control. Multiple-unit control is favored because it avoids panics caused by the blowing-out of controllers operated on platforms. In Kansas City the grades are quite steep so that at times the motors take 800 amperes at 575 volts. The average amperage on the Troost avenue division is 153 amperes on 10-second readings. Such currents are too heavy to handle on the platform without danger of having not only the automatic breakers opening, but the controllers short-circuiting and causing a panic on the car.

Mr. Case, of the General Electric Co., said that below 200 h. p. the cost for multiple control is relatively higher than when it is installed in larger capacities. From an engineering standpoint he would much prefer this type of control for all cars.

Mr. Wm. Cooper (Westinghouse Co.) thought the limit of 200 h. p. a little high, not seeing any reason why there should not be as successful operation or control on smaller equipments, provided the controller is small enough to meet the conditions. The Westinghouse Company has a controller small enough to go on almost any car, with capacity of two 100 h. p. motors, or more, up to about 300 h. p. total.

Mr. Smith, of Kansas City, described a scheme used on cars there for operating the reverser mechanically. There have been five occasions when collisions or other accidents have been avoided by the action of the device.

Coming to the paper on "Ties, Poles and Posts," Prof. Richey, of Worcester, Mass., said the figures given therein were significant and indicated that the timber used will soon have to be treated to increase life, or some other material used. He said that Mr. S. H. Kelsay, of the Indiana Union Traction Co., has proposed the use of a steel-lattice pole about 42 ft. 6 in. long to carry the trolley brackets that are used for telephone and alternating current wires, the pole being built as a three-legged tower. Such poles weigh about 500 lbs. and cost about $20. Professor Richey thought it probable that some such construction as that will be more economical than the use of wooden poles at the rate at which the price of wooden poles is going up, and considering the relatively short life of wood as compared with such a steel tower set in concrete.

Mr. F. G. Simmons stated that in Milwaukee, on the interurban lines as well as on all other places where poles are used for lighting purposes, all poles are set in solid concrete. The concrete is brought to, or a little above, the ground line and a collar or a thread 2 or 3 in. deep and about 1 in. thick is placed around the pole where it projects above the ground, forming a channel which is filled with a paving cement of tar mixture.

Mr. Thomas Hawken, of Rockland, Me., said he had seen a pine pole that had been set in cement, which had been in use for 30 years. It was badly decayed at the top, but when cut down was found to be sound at the bottom.

Mr. Paul Windsor stated that in Boston his company is reinforcing 700 poles with ferrules spaced $\frac{1}{4}$ or $\frac{3}{8}$ in. from the pole, and filling the space with liquid concrete for strengthening the poles that have rotted out.

On the subject of "Ballast," Mr. C. A. Alderman, of Cincinnati, speaking as the representative of an interurban road, said that of late they had been inclined to the belief that concrete under ties was not the best material to use. For heavy interurban cars, weighing 70,000 lbs., and going at a high rate of speed, it was difficult to make so it would not break up, and when it broke up it disintegrated and was not much better than so much ashes under the track. He believed it very difficult to get a track laid with as little as 6 in. of concrete under the rail and have it so that it would stand the traffic of interurban cars. Several cities in Ohio had specified gravel and broken stone for ballast, and had discarded concrete. He considered there were many arguments in favor of loose ballast instead of concrete. It made a better riding track, was more easily repaired, and it did not break to pieces; it could be laid in cold weather, and if properly laid, it would answer requirements.

Mr. F. G. Simmons, Milwaukee, said he believed the efficacy of a concrete ballast was a matter of workmanship. The Milwaukee standard construction had in some cases been in nine years and had not yet required attention. A 1: $2\frac{1}{2}$: 5 mixture was used. The foundation under the concrete must be adequate.

On "Maintenance and Inspection of Electrical Equipment," Mr. Paul Windsor, Boston, said that his company had gone recently on to a mileage basis for inspection, both for surface and elevated cars. For the surface cars the night starters at the various stations kept the mileage, using the register sheets for that purpose. The fare register sheets were made up by car numbers, following a car through the various routes that it ran during the day, so that by knowing the number of trips it ran on each route and referring to a mileage table of routes, the starter could very easily make up the figures. This inspection replaced that formerly made every three days, of the brake-shoes, controllers and such things as were apt to give the first trouble. The general overhauling was also done on the mileage basis, but at much longer intervals.

Mr. Doyle, New York, stated that on the Interborough equipment the motor armature bearings were oiled every 1,000 miles, irrespective of time, and the motor axle and journal bearings were oiled every 10,000 miles. It was believed that the latter figure might be made 15,000 miles.

President Adams said his company was oiling motors once every five days, also the armature bearings; other bearings every ten days. On a mileage basis the amount of oil used and the cost of labor could be reduced.

The committee report on "Standardization" received considerable discussion. Speaking on the desirability of standardization, Mr. E. W. Olds, of Milwaukee, said that ten years ago 17 kinds of brake-shoes were in use there, though of late years it has not been necessary to order very many of them.

Mr. F. W. Sargent (Amer. B. S. & F. Co.) said that there are a number of roads, principally in the West, which are following closely steam road practice and are using the M. C. B. standard separable head and shoe.

In a communication the Central Electric Railway Association recommended the following standards:

*Brake-Shoes.*—The Master Car Builders' standard type of brake-shoe, brake-head and key.

*Journal and Journal Boxes.*—The Master Car Builders' standard so far as applicable to motor trucks for axle journals, including $3\frac{3}{4}$ in. x 7 in., $4\frac{1}{4}$ in. x 8 in., and 5 in. x 9 in. Also for these different sizes of axle journals the Master Car Builders' standard journal boxes, journal bearings and journal bearing keys.

*Wheel Tread and Flange.*—A wheel tread 3 in. wide with flange $\frac{7}{8}$ in. high and 1 in. thick at the throat for both city and interurban work

*Rails for Street and Interurban Railways.*—The T section rail for both city and interurban work.

These recommendations were referred to the committee.

Mr. Olds considered the matter of wheels a pretty hard proposition. Ten years ago the Milwaukee standard was 1¾ in. x ¾ in. flange. That was supposed to be as large as could be used. The treads have grown little by little. At the present time they are using for interurban work a 2¾ in. tread with flange 1 7/16 in. deep by 1⅛ in. thick. For the city the flanges are the same dimensions except that the tread is 2½ in. That is growing and will be larger. He hoped within the next two years to come up practically to the recommendations of the Central Association, and wishes it were possible to get at least a 3½ in. tread. It should be possible to operate electric cars upon steam road track, and that cannot be done until practically their dimensions of wheels are adopted. In the matter of wheels themselves a great many are using cast chilled wheels; others are using steel wheels. The steel wheel without doubt has come to stay. It is to-day used almost entirely upon his interurban road and it would be a short time before it will be used entirely on city roads. It is unfortunate that it is necessary to use so heavy wheels, whether steel or cast-iron. Apparatus should be made as light as possible as it costs as much to carry around 100 lbs. of dead weight as of passengers.

In regard to standardizing motor parts Mr. E. D. Priest (G. E. Co.) said he was satisfied something could be done in this direction, though it also might easily be overdone and become a disadvantage to manufacturers and users. He suggested various lines along which it would be possible to work to advantage.

Mr. G. I. Smith, of Kansas City, wanted to know why it was not possible to put a 3-in. tread into service at once. There are practically the same conditions: Trilby rail up to 137 lbs., girder rail up to 106 lbs., and the T rail from 70 to 100 lbs. He was running 600 cars with from 3-in. to 3¼-in. tread and found no difficulty. He put these all on within one year, and would have gone fully to 3¼ in. except that the trucks would not permit the greater weight. The saving on special work, frogs and switches made up for any extra cost in making the change.

Mr. Thos. K. Bell, of Philadelphia, said that to-day there is a necessity on the part of the street railways to get together on the question of the adoption of a suitable design of rail and insist on the rolling mills of this country getting them out. There are at the present time a number of propositions to be solved in connection with practical operation. For instance, the New York, New Haven & Hartford is figuring on trying to bring some of its M. C. B. flanges and treads right off the steam line into the city work. There is no city work to-day that will stand it, and it was only a question of a few years when the entire track structure would be destroyed by a flange going anything beyond the present depth of ⅞ in.; in other words, the best rail will only allow a vertical wear of 5/16 in.

Discussing Mr. Windsor's paper on "Gas Engines," Mr. Hewitt, Philadelphia, said regulation of the engine being a serious matter, it was his belief that the gas engine has been developed sufficiently well for use with direct-current generators, but he was not sure that the regulation has been obtained sufficiently close for alternating current generators, and he would like to ask if that was the case. If it was, it seemed to him that turbines are doomed.

Mr. Windsor said he was using direct current and had no trouble about the regulation. He understood that there are a good many gas engines running on alternating current and the reports to him were very favorable as to governing.

Other members testified regarding satisfactory results from gas engines with a.c. apparatus.

Following some discussion relative to first cost and operating costs compared to steam plants, Mr. Yawger (Westinghouse Co.) said it was his opinion that gas engines at the present time are to be looked on as desirable in special locations: where coal is high, costing $3 and upwards a ton; where water is scarce; and in other conditions, like saving in copper, etc. The cost per horsepower for gas engines is bound to be much more than for steam engines unless it is learned how to make gas engines much lighter per horse-power than now.

"Economy in Car Equipment Weights and Schedules." Mr. N. W. Storer (Westinghouse Co.) said he thought one of the greatest features in selecting motor equipments for successful operation is to get the right reduction for the motor. There have been thousands of dollars wasted and thousands of equipments given a very bad reputation simply because of the selection of a bad gear ratio. The motors may be geared for entirely too high a speed or they may be geared to too low a speed. A proper study of the conditions was not given before the gear ratio was selected. Suppose a gear ratio selected which is too high speed, 30 m.p.h. say, when service requirements are such that one only needs a maximum speed of 15 or 20 miles an hour. The motor will be run at a low voltage practically all the time. He had in mind a road where the motors were operated at an average voltage, when the power is on the motors, of about 275 volts, while the line voltage would average practically double. That means the motors have their capacity cut in two, and they are operating about half the horse-power capacity which they would have if they were worked more on the high voltage. To get the capacity out of the motor designed for 550 volts it is necessary to use that voltage as large a part of the time as possible. That is where the high-speed gear reduction will come in. If worked at too low a reduction, that is too low a speed, the motors must be forced, the power kept up to the limit and shut off, and it will be found that in braking at the maximum speed a large part of the power in the motor is lost in the brake-shoes. This not only wears out the shoes but the coal pile at the same time. That is where the slow speed gear gets in its bad work. The lower the speed gear the easier as a general thing it is for the motor to get over the ground, and the lower the heating will be.

There is a great tendency on the part of people going into interurban work to adopt gear ratios which are really beyond the requirements. They want to reach a maximum speed of 45 or 50 m.p.h. while the track conditions may not permit the use of that excessive speed for any considerable part of the time. They sacrifice a great deal in the capacity of the motors to gain a little in the speed on a small part of the line. That is a mistake. It would not be so bad if they could get sufficient motor capacity at the same time, but they select a quadruple equipment of 75 h.p. for a 35-ton car and gear them for a very high speed, and the result is that the motors are badly overloaded.

It was stated in the paper that a great deal of trouble is experienced from the wheels of the car slipping where the weight is not all on the driving wheels. There is one point which he thought would help very materially in many cases to obviate that trouble from slipping. A great deal of trouble is due to the fact that the hand controller which is used is operated very loosely as a general thing, and the motorman may, in throwing it on, give the motors very heavy rushes of current. That will momentarily give a very high torque and start the wheels to slipping. He believed the adoption of the multiple-unit control equipment for the street cars with purely automatic acceleration will go a long way toward avoiding that trouble. There the control is practically beyond the motorman; it depends entirely on the adjustment which the controller is given before it leaves the depot.

### AMERICAN ASSOCIATION.

The American Street and Interurban Railway Association, or the American Association, as it is called in contradistinction to the other organizations, convened on the 17th to 19th, President W. Caryl Ely, Buffalo, N. Y., in the chair. Welcoming addresses were made by Hon. Lewis C. Laylin, Secretary of State of Ohio; Hon. Dewitt C. Badger, Mayor of Columbus; Mr. Robert Sheldon, President of the Columbus Railway and Light Company, and Mr. John Y. Bassell, Secretary of the Columbus Board of Trade. President Ely followed with his annual address. He reviewed briefly the history of the association and the conditions leading up to the reorganization effected last year. Regarding the value to the member companies of the association, the cost of reorganization, and the work done and to be done, he outlined various features which he considered evidenced the value of what had already been accomplished. Of the work to be done, none was of greater importance or could be "carried on to great advantage by this great organization than in proper ways, well revised and well calculated, to educate the people of the country to a just and thoughtful conception of the rights of corporations, not only for themselves, but as they touch the people, and also of the business conditions under which they operate. I fancy that there is not a man to-day who is well read and well informed in this business who doubts for a moment the right of the people of any community to take over in a fair way and operate the public utilities, any of them, through their municipalities or other territorial domain. As a matter of right it is undoubted. Then it is up to you to say to the people that as a business proposition it is unwise for the municipalities to attempt to do business which you are able to establish to the satisfaction of everybody can be done more cheaply for the people by private business interests than by municipal corporations. For years we were afraid to discuss the question. For years we said, "Don't bring it out and talk about it in the convention," and during all those years all the other fellows were talking about it, all the newspapers were spreading what was largely misinformation before the people, and a sentiment was forming against us that, had the people who entertained it had the just and fair means of information, might have been very different from the manifestations that have become apparent within the last few years all over the country."

Members have reason to feel much gratified over the personnel of the committees of the reorganized associations. Much thought and care had been given to the formation of these committees and it was felt that they were made up of men of signal ability and peculiar fitness for the work assigned them.

President Ely was followed by the presidents of the other associations in short addresses.

The Secretary reported a total active membership of 228 companies, and 113 associate members. There was a balance in the treasury of $6,977.

The subjects of papers and reports were as follows: Car Wiring (committee report); Standardization of Equipment (committee

report); Promotion of Traffic (committee report); Insurance (committee report); Heavy Electric Traction (committee report); Elevated Railways and Their Bearing on Heavy Electric Traction, by H. M. Brinckerhoff, Consulting Engineer, New York; Electric Railways in Sparsely Settled Communities, by E. P. Roberts, of the Roberts & Abbott Company, Cleveland, Ohio; Interurban Freight and Express, by E. C. Spring, General Superintendent Dayton, Covington & Piqua Traction Co., West Milton, Ohio; Tickets and Rates, by F. W. Coen, Secretary Lake Shore Electric Co., Cleveland, Ohio; Some Notes on the Evolution of Electric Transportation, by Theodore Stebbins, Expert, National Civic Federation, Cohasset, Mass.; Electric Railway Employees and the Young Men's Christian Association, by E. M. Willis, Railroad Secretary International Committee Y. M. C. A., New York City; Selection of Trainmen, by Clarence E. Learned, Superintendent Inspection, Boston Elevated Ry.; Discipline of Trainmen, by F. W. Brooks, Assistant General Manager, Detroit United Railway; Uniforms and Badges, by John R. McGivney, Purchasing Agent, New Orleans Ry. and Light Co.; Municipal Ownership (committee report); Handling Public Complaints, by John A. Beeler, Vice-Pres. and Gen. Mgr. Denver City Tramway Co.; Leaks Between Passenger and Treasurer, by A. H. Stanley, Gen. Supt., Public Service Corporation of New Jersey.

Few of the foregoing subjects were discussed at all and of those that were the discussion was brief, with one or two exceptions. In the report on "Promotion of Traffic" the committee embodied its findings in a series of nine resolutions, the first of which was to the effect that the association believes that parks operated in connection with railways are profitable and desirable as a means of promoting traffic. Commenting on this, Vice-President Beggs said he did not believe, except in rare cases, in railway companies going into the matter of entertainment such as was contemplated in this resolution. He said a large amount of money had been lost by railroads going into a business they did not understand and should not be interested in at all. He believed in railroads giving assistance in some indirect manner to the promoters of these enterprises. Some of them were very profitable, but he should deplore it if the association passed the resolution in the manner in which it was set forth in the report. He thought a great many companies which years ago went into this thing lost large amounts of money. There were some railroad companies that would pay a bonus to some one who would take the parks off their hands.

The subject of "Interurban Freight and Express" brought out som points of interest. Mr. G. W. Parker, Detroit, referring to the difficulties with different municipalities relative to handling freight cars in the cities, said Detroit has an ordinance compelling payment of $1 a round trip for all freight cars operated into and out of the city and this now cost them $5,000 a year. Also they were not permitted to operate express cars oftener than every two hours.

Mr. Ernest Gonzenbach, Sheboygan, Wis., said he was connected with a small interurban line which up to two years ago had been doing a small amount of express and freight business using only one car, which was earning perhaps 20 cents per car per mile. Since that time they had been pushing the freight business and had succeeded to the extent that that car to-day is earning about 30 or 40 cents per mile, and in some months 45 cents, whereas their regular passenger interurban cars were earning about 25 cents per car per mile. Although they had only one car they handled very heavy shipments. They had gone into the handling of cheese. The country is a great cheese producing country and during the month of September last that one car took in $727 gross in freight, at an operating cost of $254, an item of operating cost which was decidedly better than could be obtained in the passenger service. On the road is a factory having an output of very heavy goods—plumbers' supplies. This factory had switching facilities from the Chicago & North-Western and was supposed to have an ironclad contract with the latter not to do business with any other road, but the facilities offered by the electric road were such that the parties undertook to get a release from the North-Western to allow them to do business with the interurban line, and while the latter was carrying the business for 33¼ cents per hundred, the goods were so heavy and the traffic so regular and so large that that business alone was netting about 45 cents per car per mile.

Mr. Spring, author of the paper, said Mr. Gonzenbach could not take a train of 14 cars off of a steam road and carry them to any point on his line with the present motors. Mr. Gonzenbach admitted this, but said that if he could get these results with one car, he would like very much to have 14 cars or 1,400 cars on the same basis. Mr. Spring said all would like to have them, but they would have to change their power stations to do it, and that it would be necessary to reconstruct not only the power station, but the track before freight, in its most liberal sense, could be handled.

Mr. G. B. Hippee, General Manager Interurban and Des Moines City Ry., Des Moines, Ia., said his company is handling carload freight and making an effort to get heavy carload freight in its business. He had a joint traffic arrangement with roads running to Chicago under which they would load a car of cattle and the steam road would furnish the cars, or load a car of corn, and his road got 33 1-3 per cent. of the long haul. From a 60,000 lb. load they would get $25 for hauling that car on an average of 15 miles. They were striving for heavy business, and had been for the last three years. Their freight earnings started at about 13 per cent., when the road first began business. The road was about completed now and freight earnings were about 40 per cent. of the gross receipts this year. They haul all the coal for the electric light station in Des Moines. This was the only road that went to the army post and they had hauled every pound of the material that had gone into the building of that post. In the last three years that represented about 8,000 cars. They have a regular freight department and had men soliciting business because there was money in long haul business—more, proportionately, than in the short haul.

Mr. Spring said there is not one road in ten equipped the same as Mr. Hippe's road to handle that kind of freight. Mr. Hippe admitted this, and added that this long haul freight did not go through the city. The company was equipped to take it around the city and make connections with the steam roads.

Mr. Brinckerhoff, New York, spoke of a discovery made on the Aurora, Elgin & Chicago, in using some Metropolitan Elevated motor cars for hauling coal, it being discovered that some of the old motor cars with very low gearing—very low speed cars—would haul five and six and even seven fully loaded coal cars. They went at a slow rate, but they would go up heavy grades successfully and very economically, so that they handle a great deal of their coal in that way and it was made profitable. If few cars could be fitted with a different gear ratio it would be found that the current consumption, that is the maximum current required in starting, would not be so large, and consequently there would not be tremendous jerks on the power stations.

He also spoke of the development of a stock-hauling traffic by some roads, hauling from the cross-roads, where the farmers brought the stock, to the steam roads, saving much driving. For a small cost a stock loading platform can be erected, the farmer is accommodated at his barnyard, and the electric road gets the haulage of the cattle to the connecting steam road. He inquired whether the steam roads objected to that; whether it was not possible to work in harmony with them to develop a business along that line; not to compete with them, but to feed the business to them which the electric roads gather at the cross-roads.

Mr. Spring said that is a matter which the interurban roads of Ohio and Indiana had been trying to arrange in some amicable way with the steam roads. At the present time the steam roads did not recognize any comity at all with the electric roads. An arrangement could be mde with the steam roads to interchange carload lots. The electric roads could work up a certain amount of business which could be turned over to the steam roads, which would be profitable to both, but it had been impossible up to the present time to get them to recognize or work together in any way or manner.

In the discussion of the paper on "Leaks Between Passenger and Treasurer," reference was made to the "pay-as-you-enter" cars of Montreal, one of which was exhibited at the convention. There are 50 of these cars in use in Montreal, and 100 more are to go into service shortly. It was explained by Mr. W. G. Ross, of Montreal, that the advantage to the public is, that once passengers are inside the car they are not troubled in any way. There are two separate exits, and they can leave the car without any interruption from the incoming passengers. Nor is the conductor going through the car every time a passenger boards it, which is considered a particularly good point, especially during the time when the cars are very crowded, for then the conductor, in moving through the car, pushes against the passengers, which is very objectionable. This car keeps the conductor where he ought to be to look after his business—on the rear platform.

Asked what method was pursued in issuing transfers to the passengers on such cars, Mr. Ross said that the conductor issued the transfers at the time the passenger entered the car.

Mr. Beggs thought that this might have a tendency to choke the entrance of the car and delay the car very greatly when the conductor is busy delivering to passengers a large number of transfers to different points. Nearly all roads in the different parts of the country have found it necessary in order to reduce the abuse of transfers, to require them to be demanded immediately upon the payment of fares, and in Milwaukee, unless they are so demanded, the transfer is not issued. It seemed to him that a mass of people crowding on the car might block up the passageway under such circumstances.

In answer to this it was explained that the platform was sufficiently large to accommodate about 40 passengers, although they might be a little crowded. In exceptional cases, the maximum cases, 35 or 40 will be the limit of any picking up at a transfer corner. The pay-as-you-enter car is not a pay-before-you-enter car. The rear platform is very large and has been made the pay office. When there are 35 or 40 passengers to deal with the pay office is sufficient to accommodate them, and while these 35 or 40 are getting on, 10 or 15 of them will already have paid and passed through, leaving 25 or 30 to be attended to. The conductors carry four different kinds of tickets and must furnish tickets of any of the series to passengers who request them, and issue transfers at the same time; but the

issuing of transfers and the giving of change and tickets is done while the car is under way, those not having paid remaining on the platform.

The election of officers of the American Association for the ensuing year resulted as follows: President, John I. Beggs, Milwaukee, Wis.; First Vice-President, Calvin G. Goodrich, Minneapolis, Minn.; Second Vice-President, James F. Shaw, Boston, Mass.; Third Vice-President, Arthur W. Brady, Anderson, Ind. Members Executive Committee in addition to the officers are: C. L. S. Tingley, Philadelphia (President Accountants' Association); H. H. Adams, Baltimore (President Engineering Association); S. L. Rhoades, Philadelphia (President Claim Agents' Association).

OTHER ASSOCIATIONS

The Claim Agents' Association held its meetings on the first two days of the week, President S. L. Rhoades, Philadelphia, in the chair. The subjects considered were: Which is the Better Policy, Quick or Delayed Settlements? by A. J. Farrell, Claim Agent International Ry. Co., Buffalo, N. Y.; The Policy of the Claim Department Toward the Public, by F. W. Web, Claim Agent Cleveland Electric Ry. Co., Cleveland, Ohio; The Claim Agent's Work of the Future, by C. W. Hare, United Gas Improvement Co., Philadelphia; The Relation of Statistical Bureaus to the Claim Agent's Work, by W. De M. Hooper; Methods of Management of Claim Departments, by H. C. Bradley, Adjuster Chicago Union Traction Co.; also a "Question Box" of 24 questions.

The Accountants' Association met on Tuesday and Wednesday forenoons—the latter being in joint session with the American Association—and on Thursday forenoon and afternoon. Papers were presented on: The Accounting of Capital Expenditures, by P. S. Yonng, Comptroller Public Service Corporation of New Jersey; The Use of Curves in Statistics, by A. Stuart Pratt, General Auditor and Treasurer Stone & Webster, Boston, Mass.; Depreciation as Applicable to Electric Railways, by R. N. Wallis, Treasurer Fitchburg & Leominster Street Ry., Fitchburg, Mass. Also there was a "Question Box" of 19 questions.

## Train Accidents in the United States in September.[1]

xc, 3d, Illinois Central, Clarksville, Tenn., a collision between a freight train and a work train; three employees injured.

unx, 3d, South & Western, Huntdale, N. C., a mixed train was derailed and two freight cars and one baggage car were wrecked. Five trainmen were injured.

bc, 4th, 10 p.m., Pere Marquette, Clary, Mich., northbound train No. 5, about to enter a side track, was run into by southbound passenger train No. 10, badly damaging both engines and one baggage car. Seven passengers, three trainmen and two tramps were injured. It is said that No. 10 was seven minutes ahead of time. There was a dense fog.

bc, 5th, Baltimore & Ohio, Sir John's Run, Md., butting collision of freight trains, making a bad wreck which blocked both main tracks, and which was run into a moment afterwards by a freight train on the adjacent track. One trainman was killed and two were injured.

bc, 5th, Louisville & Nashville, Middlesboro, Ky., butting collision between freight trains, due, it is said, to the failure of an operator to deliver an order to one of the trains. One engineman was injured.

unx, 5th, 9 p.m., Atchison, Topeka & Santa Fe, Houck, Ariz., passenger train No. 4 was derailed and several cars were overturned. Three passengers were injured.

dn, 6th, Western Maryland, Keyser, W. Va., a freight train was derailed at a misplaced switch; engineman and fireman injured, the former fatally.

dn, 7th, Northern Alabama, Calumet, Ala., freight train No. 1 was derailed at an unfastened switch; engineman and fireman injured.

dn, 7th, Southern Railway, Claremont, Va., a freight train descending a steep grade became uncontrollable and was derailed and wrecked at a switch. One man was injured.

unf, 7th, 8 p.m., Southern, Brompton, Ala., passenger train No. 36 was derailed by a push car loaded with sleepers, which had been accidentally or maliciously left standing on the main track. All of the cars except one were ditched. The engineman was killed and the fireman was injured.

unx, 7th, Erie road, Greenwood Lake, N. J., a car in a freight train was derailed and one employee was fatally injured.

bc, 8th, Baltimore & Ohio, Woodland, W. Va., butting collision of passenger trains, on a bridge over Fish creek, damaging both engines. Both firemen were killed and one engineman and one other man were fatally injured. There was a dense fog at the time.

eq, 8th, Chicago, Milwaukee & St. Paul, Chula, Mo., a freight train was derailed by a broken journal and ten cars were ditched. A brakeman was killed.

unx, 8th, Cleveland, Cincinnati, Chicago & St. Louis, Norris City, Ill., a freight train drawn by two engines was derailed at a switch; one engineman killed and one fireman injured.

re, 9th, Union Pacific, Manila, Colo., rear collision of freight trains; three passengers riding in the caboose of the leading train injured.

unf, 9th, 4 a.m., St. Louis, Iron Mountain & Southern, Gallion, La., southbound passenger train No. 103 was derailed at a switch which had been maliciously misplaced or loosened, and the engine was wrecked. The engineman was killed and the fireman, baggageman and mail clerk were injured.

†eq, 10th, Southern Pacific, Sea Cliff, Cal., a passenger train was derailed by a breakage in some part of the locomotive, and the first five cars fell down a bank. Twenty-seven persons were injured, two of them fatally.

unx, 10th, Wisconsin Central, Waupaca, Wis., a freight train was derailed, making a bad wreck; engineman and fireman killed and seven other men seriously scalded.

†10th, Atchison, Topeka & Santa Fe, Kingsley, Kan., a westbound passenger train was derailed; one passenger killed, seven injured.

bc, 12th, 2 a.m., Western & Atlantic, Ringgold, Ga., butting collision of freight trains, both running at full speed; both engines and many cars were wrecked. Seven trainmen were killed. It is said that the northbound train was running in violation of a meeting order which had been delivered to it.

bc, 12th, Louisville & Nashville, Ivalee, Ala., butting collision of freight trains, both running at full speed. Both engines and many cars were wrecked. One engineman and one fireman were killed and three other trainmen were injured.

xc, 13th, Oregon Railroad & Navigation, Durkee, Ore., a freight train which escaped control ran at high speed down grade eastward and collided with westbound passenger train No. 1, wrecking the engine of the freight and the engine of the passenger, and badly damaging 15 cars of the freight train. The fireman of the freight was injured by jumping and several passengers were slightly injured. The engineman of the passenger train had seen the approaching freight and had stopped and was moving backward slowly when the collision occurred.

eq, 13th, Midland Valley, Big Heart, Ind. T., a passenger train was derailed by the breaking of a spring of one of the trucks of the rear passenger car; five passengers injured.

†xc, 16th, Piqua, Ohio, a freight train of the Pittsburg, Cincinnati, Chicago & St. Louis ran into an excursion passenger train of the Cincinnati, Hamilton & Dayton, wrecking both engines and several cars. One passenger was killed and several others were injured.

unx, 17th, New Orleans & Northwestern, Cypress City, La., a gravel train was derailed and wrecked and one brakeman was killed.

o, 17th, Pennsylvania road, Monongahela City, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler; the engineman and fireman were killed and four other employees were injured.

unf, 18th, St. Louis & San Francisco, Carleton, Okla., a freight train broke through a bridge which had been weakened by a flood [illegible] and five cars fell into Canadian river. The engineman and fireman were killed.

[illegible] Baltimore & Ohio Southwestern, Huron, Ind., a local passenger train backing into a side track was run into by an express passenger train running in the same direction, and the engineman and fireman of the express were killed. One passenger and [illegible] were injured.

[illegible] 8.30 a.m., Chicago, Rock Island & Pacific, Dover, [illegible] bound passenger train No. 12 broke through the bridge over the Cimarron river. The engine was completely submerged and [illegible] two passenger cars were nearly so, the passengers in them having rescued. The river had been swollen by heavy rains, and [illegible] had weakened some of the supports of the bridge, so that the defect was not apparent to the engineman. The number of passengers was about 60. Seventeen passengers were slightly injured, two trainmen were slightly injured, a mail clerk was drowned and one child died from exposure. A representative of the road gave the following account of the accident: "The train reached the Cimarron at 8.30. Engineer Iles and Fireman Bryan, seeing the unsafe condition of the bridge, jumped, after the engineer had turned on the air-brakes. The engine and tender disap-

[1] Accidents in which injuries are few or slight and the money loss apparently small, will, as a rule, be omitted from this list. The complete record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The [illegible] in the present list is indicated by the use of the following

ABBREVIATIONS.

| | |
|---|---|
| rc | Rear collisions. |
| bc | Butting collisions. |
| xc | Miscellaneous collisions. |
| dr | Derailments; defects of roadway. |
| eq | Derailments; defects of equipment. |
| dn | Derailments; negligence in operating. |
| unf | Derailments; unforeseen obstruction. |
| unx | Derailments; unexplained. |
| o | Miscellaneous accidents. |

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers

peared and have not been seen since. The momentum of the train and the swiftness of the current was such that the cars did not pile up but shot off downstream when they hit the water, thus averting a terrible disaster. The mail and baggage cars soon lodged. The smoking car, from which ten persons escaped with slight injury, made for the middle of the stream more gradually and lodged about 600 ft. from the bridge, where it is still under water. The stream is about 800 ft. wide. In the day coach there were about 50 people, many being women and children. Had it followed the smoker half of the people in this car would have been drowned. Instead as the momentum was less it was carried more by the current and described a semi-circle, stopping near the south bank of the river. Many people in the car were nearly drowned when taken out, but soon revived. A number received injuries, being cut with glass and bruised. The two Pullmans and the chair car remained on the track. Many persons have been taken from driftwood in the stream below the wreck, and all who were not in the smoker have been accounted for." The bridge was 900 ft. long, and after the accident, by the further rise of the river, it was entirely swept away. There was no rain in the vicinity of the bridge and nothing to indicate to the engineman that a flood had come down from above. A southbound train passed over two hours earlier, at which time the river bed had its usual dry appearance, with sand bars the prominent feature. It is thought that a highway bridge which had broken loose above caused the sudden carrying away of the railroad bridge.

rc, 19th, Chicago, Indianapolis & Louisville, Bainbridge, Ind., a freight train ran into the rear of a preceding gravel train and 15 gravel cars and a caboose were wrecked. The fireman was killed. It is said that the gravel train had been delayed by breaking in two and that the flagman sent back to stop the freight train sat down and fell asleep.

*xc, 19th, Chicago & North-Western, Pulaski, Wis., a work train collided with a boarding car, wrecking the two cars. The wreck took fire and was partly burnt up. Two employees were killed and 11 were injured, some of them fatally.

*†rc, 20th, Great Northern, Cut Bank, Mont., rear collision of freight trains, wrecking two freight cars and the caboose. The wreck took fire and was partly burnt up. Two drovers and two employees were kiled.

bc, 20th, 11 p.m., Cincinnati, Hamilton & Dayton, Dayton, Ohio, collision between a southbound special passenger train and a northbound freight; one engineman killed, one fireman fatally injured. It is said that the passenger engineman was deceived by the absence of a headlight on the freight engine.

xc, 21st, Lake Erie & Western, Clemens, Ill., collision of freight trains; one engine overturned; one brakeman and the engineman injured, the former fatally.

21st, Chicago, Rock Island & Pacific, Forest City, Ark., passenger train No. 3 was derailed at a switch and one sleeping car was overturned. The conductor was fatally injured.

bc, 23d, Cincinnati & Muskingum Valley, Rock Cut, Ohio, collision between a freight train and a work train, due to a misunderstanding between the conductor of the work train and his engineman; three employees killed, nine injured.

unx, 23d, Texas & Pacific, Texarkana, Ark., freight train No. 19 was derailed and ten cars were wrecked. A trespasser riding in one of the cars was killed.

o, 23d, St. Louis, Iron Mountain & Southern, Ferriday, La., the locomotive of a freight train was wrecked by the explosion of its boiler and seven persons were injured, two of them fatally.

†24th, Minneapolis & St. Louis, New Prague, Minn., a southbound passenger train collided with a freight train switching on the main track. Four passengers and one trainman were killed and several passengers were injured.

†*xc, 26th, 5.10 a.m., Wabash road, Catlin, Ill., passenger train No. 8 ran over a misplaced switch and into a freight train standing on the side track, making a bad wreck. Four passengers, two trainmen and three other persons were killed, and 36 passengers, eight employees and two other persons were injured. The wreck took fire from the engine and five cars were burnt up.

unf, 27th, 3 a.m., Southern Railway, Allendale, S. C., passenger train No. 30 was derailed on a trestle bridge and the engineman and fireman were injured, the latter fatally. The fireman, before his death, asserted that a rail had been removed from the track. The cars were all overturned, but the passengers escaped without serious injury.

unf, 27th, Louisville & Nashville, Monroe, Ala., a passenger train was derailed at a washout and the engine was overturned. Three trainmen were injured.

unf, 28th, Mississippi Central, Brookhaven, Miss., the engine of a special train, consisting of an engine and caboose, was derailed at a washout and five trainmen on the tender were injured. The caboose was filled with passengers who had been taken from a disabled train, but all escaped without serious injury.

28th, St. Louis & San Francisco, Bushy Head, Ind. T., a freight train was derailed and eight cars were wrecked, in consequence of the overturning of a car on which was a steam shovel.

†rc, 29th, Pennsylvania road, Eddington, Pa., a westbound passenger train which had been unexpectedly stopped was run into at the rear by a following passenger train and the two rear cars of the standing train were wrecked. Three passengers were killed and 20 or more were injured. The moving train was running at uncontrollable speed in consequence of insufficient brake power. The angle cock on the front end of the fourth car had been accidentally closed, thus putting three of the six cars of the train out of the control of the engineman. Facts concerning this collision were given in the *Railroad Gazette* of October 19 and in the editorial column of this issue. The coroner's jury in its verdict said: "We believe that such collision occurred from causes unknown to and beyond the foresight or control of the employees or officers of said railroad company, and therefore release them from all responsibility for said accident."

dn, 29th, 7.40 p.m., Louisville & Nashville, Clarksville, Tenn., a northbound passenger train was derailed at an open draw and the engine and first two cars fell into the Cumberland river. Six trainmen went down in the wreck; four were rescued and two were killed.

*xc, 30th, St. Louis & San Francisco, Carthage, Mo., collision of freight trains, wrecking several cars. The wreck caught fire and was mostly burnt up. Three trainmen were killed.

## Steam Motor Car for the London & South Western.

The accompanying illustration shows a steam motor car in use on the London & South Western. It is driven by an engine mounted on the truck at one end and is divided into compartments for first and third class passengers, for which side entrances are provided. The engine is fitted with the Walschaert valve gear, and drives the end pair of wheels of the motor truck only, the trailing wheels not being coupled. The motor truck is built with inside frames and outside cylinders, and the rear truck has the same arrangement of frames.

The general dimensions of the engine are:

| | |
|---|---|
| Cylinders, diameter | 10 in. |
| Piston stroke | 14 in. |
| Diameter of wheels | 36 in. |
| Steam pressure | 175 lbs. |
| Total heating surface | 347 sq. ft |
| Grate area | 6.75 sq. ft |
| Total weight of car in working ord. | 72,352 lbs. |

Steam Rail Motor Car; London & South Western.

## Ship Building on the Great Lakes.

BY RALPH D. WILLIAMS,
Editor of the Marine Review.

At the beginning of 1906, the ship builders of the great lakes had under order 39 vessels for this year's delivery, of which 34 were bulk freighters, two package freighters, two car ferries and one a passenger steamer. Many of these boats had been ordered early in the preceding summer, a thing unprecedented in the history of the great lakes, as new vessels are usually not contracted for until late in the fall, when the volume of the next year's commerce can be more accurately gaged. With the exception of two 6,500-ton freighters, the 34 bulk (ore) freighters ordered had carrying capacities ranging from 8,000 to 12,000 tons, and a total carrying capacity of 338,000 tons. These 34 boats are capable of moving in a season approximately 6,760,000 tons of ore. The average carrying capacity of the modern lake freighter has grown so fast that it is now almost double what it was as late as three years ago. During the preceding year, 1905, there had been put into the water on the great lakes 28 steamers. All of the steamers ordered for 1906 delivery are now in commission.

The following table gives the names, dimensions, capacities and ownership of the new boats, and shows the company by which they were built. It will be observed from this table that the Pittsburg Steamship Co., which is the lake line of the United States Steel Corporation, the Cambria Steel Co., the Jones & Laughlin Steel Co. and the Cleveland Cliffs Iron Co., are among the heaviest builders of ships. These are all owners and consumers of iron ore and their orders represent the strong tendency of steel companies to control their own avenues of transportation.

Five of the new steamers are shown in the accompanying photographs. Of these the "Harry Coulby," a bulk freighter of 10,000 tons, was built at the Wyndotte yard, and the "Henry B. Smith," also of 10,000 tons, at the Lorain yard of the American Shipbuilding Company. The "William P. Snyder," of 10,000 tons, was built at the Ecorse yard, Detroit, of the Great Lakes Engineering Works. The other two vessels are each 12,000-ton boats, the largest on the lakes. The "Henry H. Rogers" is one of four sister ships built by the American Shipbuilding Co. during the year for the Pittsburg Steamship Co. (United States Steel Corporation), the other three being the "J. Pierpont Morgan," "Norman B. Ream" and "Peter A. B. Widener." They are 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep. With a load of 12,000 tons they draw 19 ft. When drawing 21 ft. they have actually carried 14,000 tons. This loading can be obtained on the exclusively Lake Michigan run from Escanaba to South Chicago, carrying ore for the Chicago plants of the Steel Corporation. The other 12,000-ton bulk freighter shown, the "Edward Y. Townsend," with the sister ship, "Daniel J. Morrell," was built by the American Shipbuilding Co. for the Cambria Steel Co., of Philadelphia, and is by a margin of two feet in length at present the largest freight boat on the lakes, being 602 ft. over all and 582 ft. keel. The extra two feet, however, is taken up in the forepeak and does not represent cargo space. In 1907 there are to be three 605-ft. steamers built.

The practice of ordering well in advance of delivery has been continued this year. In fact, in the spring of 1906 orders began to be placed for 1907 delivery. To-day there are under order for 1907 delivery 36 vessels, of which 34 are bulk freighters, one a passenger steamer and one a car ferry. These probably do not represent the extent of next year's building, for additional contracts are pending and expected in the near future. Of these 22 will be built by the American Ship Building Co., nine by the Great Lakes Engineering Works, three by the Toledo Ship Building Co., Toledo, and two by the Collingwood Ship Building Co., Collingwood, Ont. These 34 bulk freighters range from 5,500 to 12,000 gross tons capacity, one being 5,500 tons, three 6,500 tons, six 7,000 tons, one 7,500 tons, two 8,000 tons, three 9,000 tons, ten 10,000 tons, one 11,000 tons, and seven 12,000 tons. The tendency toward large ships is therefore very marked. The ships for 1907 delivery are as follows:

*American Ship Building Company.*

| Type. | Dimensions in ft.— Over all. | Keel. | B'm. | Dpth. | Carry'g capac'ty. | For whom building. |
|---|---|---|---|---|---|---|
| Car ferry | 270 | 259 | 52 | 19 | ..... | Ann Arbor Railway. |
| Freight'r | 440 | 420 | 52 | 18 | 6,500 | Dennis Sullivan, Chicago. |
| Freight'r | 440 | 420 | 52 | 18 | 6,500 | Dennis Sullivan, Chicago. |
| " | 605 | 585 | 60 | 32 | 12,000 | Weston Transit Co., N. Tonawanda. |
| " | 605 | 585 | 60 | 32 | 12,000 | Weston Transit Co., N. Tonawanda. |
| " | 605 | 585 | 60 | 32 | 12,000 | Weston Transit Co., N. Tonawanda. |
| " | 552 | 532 | 56 | 31 | 10,000 | C. L. Hutchinson, Cleveland. |
| " | 552 | 532 | 56 | 31 | 10,000 | John Mitchell, Cleveland. |
| " | 552 | 532 | 56 | 31 | 10,000 | H. Steinbrenner, Cleveland. |
| " | 440 | 420 | 52 | 28 | 6,500 | Joseph Sellwood, Duluth. |
| " | 540 | 520 | 54 | 31 | 10,000 | J. C. Gilchrist, Cleveland. |
| " | 540 | 520 | 54 | 31 | 10,000 | J. C. Gilchrist, Cleveland. |
| " | 552 | 532 | 56 | 31 | 10,000 | W. A. & A.H. Hawgood, Cleveland. |
| " | 440 | 420 | 52 | 28 | 7,000 | Lackawanna Steamship Co. |
| " | 440 | 420 | 52 | 28 | 7,000 | Lackawanna Steamship Co. |
| " | 440 | 420 | 52 | 28 | 7,000 | Lackawanna Steamship Co. |
| " | 440 | 420 | 52 | 28 | 7,000 | Lackawanna Steamship Co. |
| " | 440 | 420 | 52 | 28 | 7,000 | Lackawanna Steamship Co. |
| " | 500 | 480 | 52 | 30 | 8,000 | Lackawanna Steamship Co. |
| " | 500 | 480 | 52 | 30 | 8,000 | Lackawanna Steamship Co. |
| " | 500 | 480 | 52 | 30 | 8,000 | Lackawanna Steamship Co. |
| " | 440 | 420 | 54 | 28 | 7,500 | W. H. Becker, Cleveland. |
| " | 524 | 504 | 54 | 30 | 9,000 | S. P. Cranage, Bay City. |
| " | 524 | 504 | 54 | 30 | 9,000 | E. D. Carter, Erie, Pa. |
| Pass. str. | 402 | 390 | 54 | 22 | ..... | Detroit & Clev. Nav. Co., Detroit. |
| Freight'r | 600 | 580 | 58 | 32 | 12,000 | Pittsburg S.S. Co., Cleveland. |
| " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg S.S. Co., Cleveland. |
| " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg S.S. Co., Cleveland. |
| " | 524 | 504 | 54 | 30 | 9,000 | C. O. Jenkins, Cleveland. |
| " | 552 | 532 | 56 | 31 | 10,000 | Pickards,Mather & Co.,Cleve. |
| " | 552 | 532 | 56 | 30 | 10,000 | Acme S. S. Co., Duluth. |
| " | 552 | 532 | 56 | 31 | 10,000 | W.A. & A.H. Hawgood, Cleve. |

*Great Lakes Engineering Works.*

| | | | | | | |
|---|---|---|---|---|---|---|
| Freight'r | 440 | 420 | 52 | 28 | 7,000 | C. W. Elphicke, Chicago. |
| " | 440 | 420 | 52 | 28 | 7,000 | Pennsylvania Companies. |
| " | 440 | 420 | 52 | 28 | 7,000 | Dearborn (Mich.) Transit Co. |
| " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg S.S. Co., Cleveland. |
| " | 571 | 554 | 52 | 32 | 11,000 | Wm. P. Snyder, Pittsburg. |
| " | 552 | 532 | 58 | 31 | 10,000 | Pickards,Mather & Co.,Cleve. |
| " | 524 | 504 | 54 | 30 | 9,000 | Jas. E. Davidson and H. L. Shaw, Bay City. |
| " | 500 | 480 | 54 | 30 | 8,000 | ..... |
| " | 500 | 480 | 54 | 30 | 8,000 | ..... |

*Collingwood Ship Building Company.*

| | | | | | | |
|---|---|---|---|---|---|---|
| " | 400 | 380 | 50 | 28 | 5,500 | Farrar Transp. Co. Collingwd |
| " | 486 | 466 | 55 | 30 | 7,500 | Midland (Ont.) Nav. Co. |

*Toledo Ship Building Company.*

| | | | | | | |
|---|---|---|---|---|---|---|
| " | 458 | 438 | 52 | 28 | 7,000 | G. A. Tomlinson, Duluth. |
| " | 460 | 440 | 53 | 29 | 7,000 | Smith & Wilkinson, Syracuse. |
| " | 460 | 440 | 53 | 29 | 7,000 | Smith & Wilkinson, Syracuse. |

As in the 1906 list, the steel companies are prominent. Four of these steamers are for the Pittsburg Steamship Co., and three

*American Ship Building Company.*

| Name. | Type. | Dimensions in ft.— Over all. | Keel. | Beam. | Depth. | Carrying capacity. | For whom building. |
|---|---|---|---|---|---|---|---|
| Marquette & Bessemer No. 2 | Car ferry. | 350 | 338 | 54 | 19½ | ..... | Marquette & Bessemer Dock & Nav. Co., Conneaut. |
| Charles S. Hebard | Freighter. | 524 | 504 | 54 | 30 | 9,000 | Wilson Transit Co., Cleveland. |
| Joseph Sellwood | " | 545 | 525 | 55 | 31 | 10,000 | Captain John Mitchell, Cleveland. |
| Loftus Cuddy | " | 545 | 525 | 55 | 31 | 10,000 | Captain John Mitchell, Cleveland. |
| James B. Wood | " | 534 | 514 | 54 | 31 | 9,500 | Gilchrist Transportation Co., Cleveland. |
| John Sherwin | " | 534 | 514 | 54 | 31 | 9,500 | Gilchrist Transportation Co., Cleveland. |
| W. K. Bixby | " | 500 | 480 | 52 | 30 | 8,000 | Hugh McMillan, Detroit. |
| E. D. Carter | " | 524 | 504 | 54 | 30 | 9,000 | E. D. Carter, Erie, Pa. |
| D. Z. Norton | " | 500 | 480 | 52 | 30 | 8,000 | W. C. Richardson, Cleveland. |
| H. D. Goulder | " | 545 | 525 | 55 | 31 | 10,000 | H. A. Hawgood, Cleveland. |
| Abraham Stearn | " | 545 | 525 | 55 | 31 | 10,000 | W. A. Hawgood, Cleveland. |
| E. J. Earling | " | 545 | 525 | 55 | 31 | 10,000 | D. H. Oakes, Detroit. |
| Harry Coulby | " | 569 | 549 | 56 | 31 | 11,000 | H. S. Wilkinson, Syracuse. |
| Charles A. Weston | " | 569 | 549 | 56 | 31 | 11,000 | W. M. Mills, Tonawanda, N. Y. |
| J. Pierpont Morgan | " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg Steamship Co., Cleveland. |
| H. H. Rogers | " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg Steamship Co., Cleveland. |
| H. A. Hawgood | " | 545 | 525 | 55 | 31 | 10,000 | W. A. & A. H. Hawgood, Cleveland. |
| J. Q. Riddle | " | 545 | 525 | 55 | 31 | 10,000 | Henry Hawgood, Cleveland. |
| Ogdensburg | Package freighter. | 256 | 242 | 43 | 26.6 | 3,000 | Rutland Transit Co., Ogdensburg. |
| Rutland | Package freighter. | 256 | 242 | 43 | 26.6 | 3,000 | Rutland Transit Co., Ogdensburg. |
| W. G. Pollock | Freighter. | 440 | 420 | 52 | 28 | 6,500 | W. H. Becker, Cleveland. |
| Samuel Mather | " | 550 | 530 | 60 | 31 | 10,000 | Pickards, Mather & Co., Cleveland. |
| Norman B. Ream | " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg Steamship Co., Cleveland. |
| Peter A. B. Widener | " | 600 | 580 | 58 | 32 | 12,000 | Pittsburg Steamship Co., Cleveland. |
| Joshua Rhoades | " | 440 | 420 | 52 | 28 | 6,500 | W. H. Becker, Cleveland. |
| Daniel J. Morrell | " | 602 | 582 | 58 | 32 | 12,000 | Cambria Steel Co., Philadelphia. |
| Edward J. Townsend | " | 602 | 582 | 58 | 32 | 12,000 | Cambria Steel Co., Philadelphia. |
| H. B. Smith | " | 552 | 532 | 56 | 31 | 10,000 | W. A. & A. H. Hawgood, Cleveland. |
| Sir Thomas Shaughnessy | " | 500 | 480 | 52 | 30 | 8,000 | C. O. Jenkins, Cleveland. |

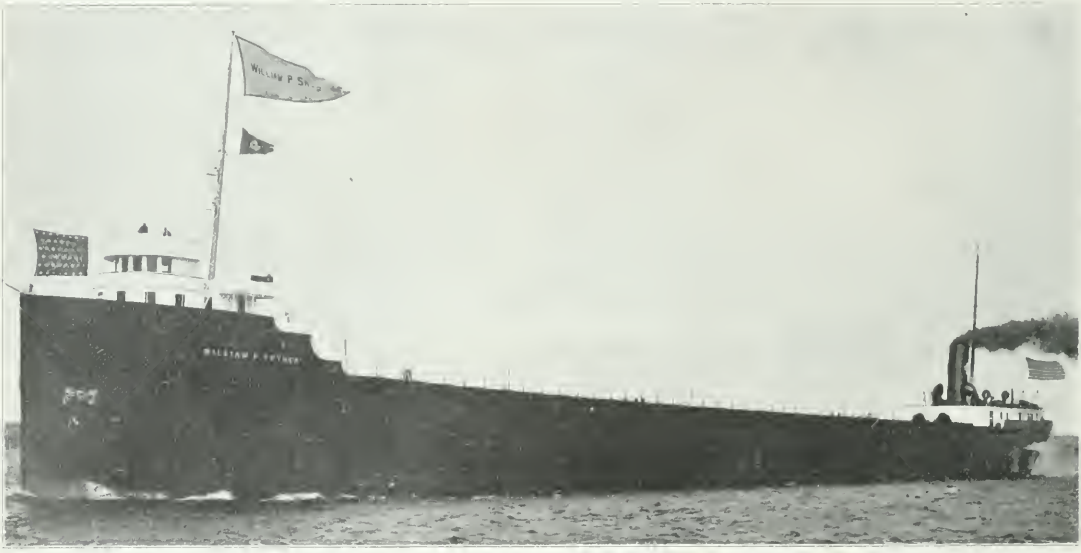
*Great Lakes Engineering Works.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frank C. Ball | Freighter. | 550 | 530 | 56 | 31 | 10,000 | Globe Steamship Co., Duluth. |
| James Laughlin | " | 550 | 530 | 56 | 31 | 10,000 | Jones & Laughlin Steel Co., Pittsburg. |
| B. F. Jones | " | 550 | 530 | 56 | 31 | 10,000 | Jones & Laughlin Steel Co., Pittsburg. |
| W. P. Snyder | " | 550 | 530 | 56 | 31 | 10,000 | Shenango Steamship Co., Cleveland. |
| Michigan | " | 550 | 530 | 56 | 31 | 10,000 | Cleveland Cliffs Iron Co., Cleveland. |
| Ishpeming | " | 550 | 530 | 56 | 31 | 10,000 | Cleveland Cliffs Iron Co., Cleveland. |
| J. H. Sheadle | " | 550 | 530 | 56 | 31 | 10,000 | Cleveland Cliffs Iron Co., Cleveland. |
| Ashtabula | Car ferry. | 350 | 330 | 56 | 20 | 30 cars. | James W. Ellsworth & Co., Cleveland. |

*Toledo Ship Building Company.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Eugene Zimmerman | Freighter. | 500 | 480 | 52 | 30 | 8,000 | L. S. Sullivan, Toledo. |
| Theodore Roosevelt | Passenger steamer. | 289 | 270 | 40 | 16 | ..... | Indiana Transportation Co., Michigan City, Ind. |

Ten Thousand Ton Freighter "Henry B. Smith."



Ten Thousand Ton Freighter "William P. Snyder"; Shenango Steamship Company.

Eleven Thousand Ton Freighter "Harry Coulby."

Twelve Thousand Ton Freighter "Edward Y. Townsend"; Cambria Steel Company.

Twelve Thousand Ton Freighter "Henry H. Rogers"; United States Steel Corporation.

for the Weston Transit Co., which is controlled by the Tonawanda Iron & Steel Co., further showing the determination of the steel companies to make a profit from the moment the ore leaves the ground. More than this, the Lackawanna Steel Co., which has built at Buffalo the largest individual steel plant in the world, intends to engage in the transportation business. It has already ordered eight steel steamers for 1907 delivery, and it is understood that eight more steamers will be ordered by this company for 1908 delivery. As part payment for the eight ships ordered, the American Ship Building Company is to take over the plant of the Ship Owners' Dry Dock Company, Chicago, which has been controlled by Moses Taylor, Vice-President of the Lackawanna Steel Company.

It may appear as though this was too great prodigality, but already the new boats put in commission the present year have proved inadequate to meet the rapid expansion of lake commerce. In no other way, perhaps, is the great prosperity of the country better reflected than by the recent growth of lake shipments. The cause of this increase in lake tonnage is the great demand for iron and steel. Nearly all of the workable deposits of iron ore are in the Lake Superior country. They are abundant and of excellent quality. They are mined so easily and transported so cheaply that none of the other known deposits of the country can compete with these ores in furnace cost. Of late years this ore commerce, for which most of these vessels are exclusively built, has grown by astounding leaps and bounds, the mere increase of the movement of 1905 over 1904 being greater than the total movement of any one year up to 1898. This ore commerce is the largest single item in the tonnage of the railroads leading from Lake Erie ports. The ships are unloaded directly into cars, and it is a wonderful sight at the harbors to see the trains slowly moving under the unloading machines, receiving their loads within a short space of time, and steaming away to the furnaces of the Ohio and Pennsylvania valleys.

The following figures show the growth of the ore trade of the great lakes since the canal at Sault Ste. Marie was first opened in 1855:

| Year. | Total Shipments. | Year. | Total Shipments. |
|---|---|---|---|
| 1855 | 1,449 | 1881 | 2,307,005 |
| 1856 | 36,343 | 1882 | 2,965,412 |
| 1857 | 25,646 | 1883 | 2,352,840 |
| 1858 | 15,876 | 1884 | 2,518,693 |
| 1859 | 68,832 | 1885 | 2,466,642 |
| 1860 | 114,401 | 1886 | 3,565,144 |
| 1861 | 49,909 | 1887 | 4,762,107 |
| 1862 | 124,169 | 1888 | 5,063,877 |
| 1863 | 203,055 | 1889 | 7,292,643 |
| 1864 | 243,127 | 1890 | 9,003,725 |
| 1865 | 236,208 | 1891 | 7,071,053 |
| 1866 | 278,796 | 1892 | 9,072,241 |
| 1867 | 473,567 | 1893 | 6,065,716 |
| 1868 | 491,449 | 1894 | 7,748,312 |
| 1869 | 617,444 | 1895 | 10,429,037 |
| 1870 | 830,940 | 1896 | 9,934,828 |
| 1871 | 779,607 | 1897 | 12,464,574 |
| 1872 | 960,901 | 1898 | 14,024,679 |
| 1873 | 1,162,458 | 1899 | 18,251,804 |
| 1874 | 919,557 | 1900 | 19,059,393 |
| 1875 | 891,257 | 1901 | 20,593,537 |
| 1876 | 992,764 | 1902 | 27,571,121 |
| 1877 | 1,015,087 | 1903 | 24,289,878 |
| 1878 | 1,111,100 | 1904 | 21,822,839 |
| 1879 | 1,375,691 | 1905 | 34,353,456 |
| 1880 | 1,908,745 | | |

## Large Passenger Tank Locomotive for the London & North Western.

The accompanying photograph shows one of the 4-4-2 tank locomotives recently built at the Crewe Works, England, for the London & North Western. These engines were designed by George Whale, Chief Mechanical Engineer of the road, for heavy local and suburban traffic, and they are now in operation between Manchester and Buxton and between Euston and Watford. They are the largest of their type in England. The cylinders are inside and are fitted with Joy's valve gear. The trailing truck has radial axle boxes. The boiler is of the same design as that of the "Precursor" class of express locomotive on the same road, but the total heating surface is slightly less. Some of the principal dimensions follow:

| | |
|---|---|
| Working steam pressure | 175 lbs. |
| Diameter of cylinders | 19 in. |
| Piston stroke | 26 " |
| Driving wheels, diameter | 75 " |
| Truck wheels, diameter | 45 " |
| Wheelbase, drivers | 10 ft. |
| Wheelbase, total | 32 ft. 7½ in. |
| Heating surface, firebox | 161.5 sq. ft. |
| " " tubes | 1,777.5 " |
| " " total | 1,939.0 " |
| Grate area | 22.4 " |
| Boiler, mean outside diameter | 5 ft. 3¼ in. |
| " length of tubes | 12 " 3 " |
| Firebox, length outside | 7 " 4 " |
| " width outside | 4 " 1 " |
| Tank capacity | 1,700 gals. |
| Coal capacity | 2½ tons |
| Weight, in working order, on drivers | 88,480 lbs. |
| Weight, in working order, total | 167,440 " |

## A Comprehensive Signaling Scheme.*

Your executive committee, on June 6, 1906, appointed a standing committee to consider and report on all subjects assigned to the Interlocking and Block Signal Committee of the American Railway Engineering and Maintenance of Way Association. This year the matters assigned were, first: the three position arm, giving indications in the upper right-hand quadrant, and, second, a complete system of signaling, giving, without confusion, clearly and distinctly, the different indications required for proper handling of traffic. [The upward arm has been approved by the R. S. A.]

Your committee recommends:

*First.*—That the following indications be adopted as those which are required in a complete system of signals:

*Indications—Restricting Rights.*

1. Stop at or before reaching, and stay.
2. Stop at or before reaching, and proceed cautiously.
3. Prepare to stop at next signal.
4. Proceed under control, block is occupied.
5. Take siding at next station.
6. Proceed on high speed route prepared to stop at next signal.
7. Proceed on limited speed route prepared to stop at next signal.
8. Proceed on slow speed route prepared to stop at next signal.

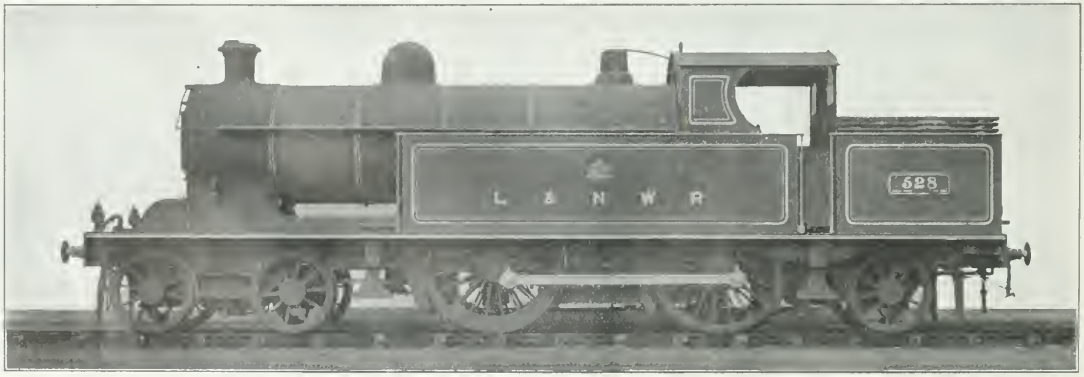
*Indications—Conferring Rights.*

9. Proceed. Block is clear.
10. Proceed, block clear and next signal at proceed.
11. Proceed on high speed route, next signal at proceed.
12. Proceed on limited speed route, next signal at proceed.
13. Proceed on slow speed route, next signal at proceed.

*Indications—Conveying Information.*

14. Switch open (Main siding).
15. Switch closed (Main siding).
16. Home switch indicator denotes open switch.
17. Home switch indicator denotes closed switch.
18. Stop for passengers.
19. Need not stop for passengers.
20. Track tank, entrance end.
21. Track tank, exit end.
22. Get orders.

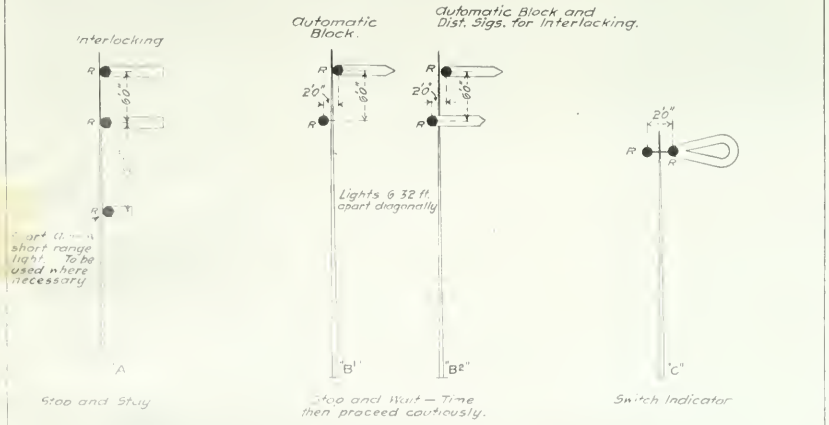
*Committee Report, Railway Signal Association, Washington meeting.




Ten-Wheel 4-4-2 Tank Locomotive for the London & North-Western.

Diagram No. 1.

## General Types of Signals
(2 Types and an Indicator)




Short distance short range light. To be used where necessary.

Stop and Stay

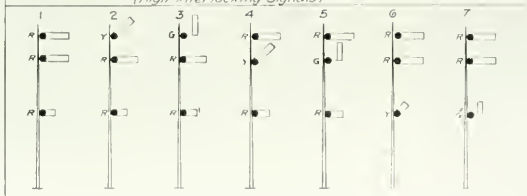
Stop and Wait — Time then proceed cautiously.

Switch Indicator

Note: In effect a two light system for high speed trains.

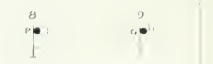
Diagram No. 2.

## Type "A" Developed
(High Interlocking Signals)



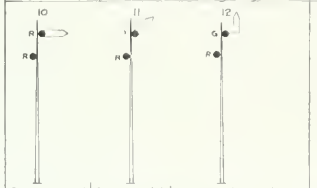

| Stop | Proceed cautiously to next signal on high speed track. | Proceed at speed on high speed track. | Proceed cautiously to next signal on medium speed track. | Proceed at medium speed on medium speed track. | Proceed cautiously on low speed tracks | Proceed at low speed next signal clear. |
|---|---|---|---|---|---|---|

## Dwarf Interlocking Signals



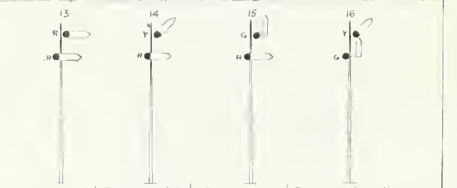

Stop — Proceed at low speed

## Type "B1" Developed
(Automatic Block Signals)




| Stop & proceed after waiting. | Proceed with caution to next home signal. | Proceed at speed next home signal clear. |
|---|---|---|

## Type "B2" Developed
(Automatic Block and Dist. Sigs. for Interlocking)




| Stop & proceed after waiting. | Proceed with caution to next home signal | Proceed at speed next high speed signal clear. | Proceed at medium speed next medium speed signal clear. Displayed only approaching Intg. |
|---|---|---|---|

Diagram No. 3.

## Suggestion No. 1.
(Telegraph and Controlled Manual Block)

Stop — Permissive — Proceed at Speed

## Suggestion No. 2.
(Telegraph and Controlled Manual Block)

Stop — Permissive — Proceed at Speed

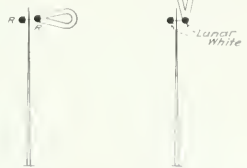
## Distant Signals for Interlocking Outside Automatic Block Limits

Proceed prepared to stop at next signal. — Proceed — high speed signal at proceed. — Proceed medium speed signal at proceed

Note: Take siding at next station to be given by 2nd arm inclined downward at 45°, lunar white light) on suggestion No. 1 displayed with top arm at proceed. Lower arm added and inclined downward on suggestion No. 2.
"Get Orders" to be indicated by illumated letter "O" displayed on block signal.

Diagram No. 4.

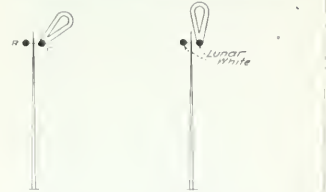
## Type "C" Developed
(Home Switch Indicator)




Sw. Open — Sw. Closed

To be used without Distant Sw. Ind.

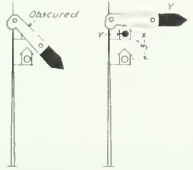
## Type "C" Developed
(Distant Switch Indicator)



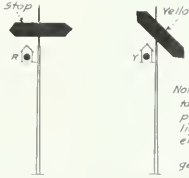

Sw. Open — Sw. Closed

To be used in connection with low stand at Sw.

## Flag Station Signal




## Stop and Slow Posts




Note: Siding Sns yellow and green targets and lights. Details purple and green targets and lights. Track Tank entrance end green targets and lights. Track Tank exit yellow targets and light.

Types of Signals Recommended or Suggested in Committee Report of the Railway Signal Association.

23. Reduce speed. (Track sign.)

24. Resume speed. (Track sign.)

*Second.*—That the following principles of giving indications govern in formulating a system:

(a) On all signals conferring or restricting rights a red light shall be the night indication for stop. A yellow light shall be the night indication for caution, and a green light the night indication for clear, when displayed in connection with a red light.

(b) That the day indications of semaphore signals be given in the upper righ-hand quadrant.

(c) That the semaphore arm horizontal shall indicate stop, inclined upward 45 deg. caution, and inclined upward 90 deg. proceed.

(Note.—The word caution to be used as indicating the function of a distant signal.)

(d) That two lights shall be displayed on every high speed signal.

(e) That the stop indication shall be given by red lights in a vertical line.

(f) That the stop and proceed indication shall be given by red lights in an oblique line.

(g) That lights in a horizontal line shall be used for information signals.

(h) That automatic home block signals shall have one arm with end pointed.

(i) That interlocking home signals shall always have two full sized arms representing unlimited, and limited or medium speeds, and shall have one low speed arm, distinguished by a greater interval between it and the second arm, than the interval between the top and second arm, and by a dim light at night, when such low speed arm is required. The arms to have square ends.

(j) That the stop indication of dwarf signals shall be given by a purple light.

(k) That the home signal shall be displayed in the 45 deg. position to indicate that the advance signal is at stop.

(l) That interlocking distant signals shall be provided with two arms.

*Third.*—Diagrams Nos. 1 and 2 illustrate the aspects recommended by your committee to give a part of these indications.

*Fourth.*—On account of the limited time at the disposal of the committee, it did not complete the work of providing all the aspects required. The types to be used for telegraphic, block and train order signals, for the indication "Take siding at next station," and for distant signals approaching an interlocking, not in automatic block limits; the colors of lights on high switch indicators, and the various forms of other information signals, were not decided on.

Your committee, therefore, recommends the adoption of the aforesaid articles numbered first, second and third, and suggests the types shown on diagrams Nos. 3 and 4, with accompanying notes, for discussion and action of the association.

Committee: W. A. D. Short, Chairman; C. A. Dunham, A. H. Rudd, G. E. Ellis, Azel Ames, Jr., J. C. Mock, C. C. Anthony, J. A. Peabody, H. S. Balliet, T. S. Stevens, L. R. Clausen, H. H. Temple.

## Interchange of Traffic Between Electric Lines and Steam Railroads.*

In the early days of electric traction, steam railroad men did not consider electricity as a rival. The electric lines were purely local, limited to the city in which they operated, the cars small in size and low in power; 500 volts was, as it is now, the standard voltage. But with 500 volt power transmission there was a decided limit to the distance that can be covered by a trolley system, and this kept the first trolley cars within close touch of their local power houses.

Not until the development of high tension power transmission with polyphase currents, did the electric roads have anything but a local significance. With the high tension system in use at present, power is generated at any desirable point and transmitted at high pressure to rotary converter sub-stations situated along the line, where the power is transformed to 500 volt direct current, and fed to the trolley. Any length of line can be served by this system if enough sub-stations are provided. This made suburban and interurban roads possible, and as the business on these roads increased, and as they gradually reached out for express, light freight and mail business, the steam roads were compelled to take notice of the changed conditions. An evidence of this is shown by the Sunday excursion rates being made on many roads, which a few years ago would have seemed preposterous. In many other ways have steam roads acknowledged the competition of the electric.

Up to this point in the development, electric traction has been in direct competition with its older and more firmly established rivals, and with but little interchange of traffic between them. Heavy freighting has not been attempted by the electric roads to any great extent, but in passenger and light freight departments of the interurban roads the rates have been decidedly in their favor. In any territory covered by both steam and electric roads, it would seem to be to the advantage of both, if some basis could be reached on which the roads could co-operate in moving the traffic of their community. As the situation stands at present the electric lines are in an admirable position to act as feeders for the steam lines. Suburban and interurban roads reach a territory that cannot well be reached by the steam roads, and they give a service through rural sections that is bound to bring considerable traffic to the long distance lines. The advantage of frequently running and convenient trolley cars has been recognized by the large railroad interests, and many roads are buying up competing trolley lines, while others are actively engaged in electrifying portions of their systems. Indications point to considerable interchange of traffic in the future between steam and electric lines, but all students of the subject are of the opinion that we are now on the eve of a new era in electric traction, and that electric roads will soon step into the field as full competitors of the steam roads, that traffic agreements will be as common between steam and electric lines as they are now between steam trunk lines.

Enthusiastic predictions are being freely made of the general adoption of electricity by trunk lines. These predictions are based on the success which has attended the development of alternating current tractions. The continued development in interurban railways going on at present, and the frequent and economical service which this development makes possible, it is believed will force the steam roads to adopt this system rather than see their lines paralleled by dangerous competitors. The recent 50,000 mile endurance run of one of the New York Central's electric locomotives with a maintenance charge of only 1.26c per mile is a substantial indication of what may be expected of the new conditions; while the invitation of the New York, New Haven & Hartford Railroad to its engineers and firemen to make application for positions as motormen and assistant motormen, is the first of a series of such actions which it is believed will be a common occurrence in the future.

A leading factor in this question is the possibility of placing much more power in front of a train, either passenger or freight, with electricity than with steam, two or three thousand or even more horse power being easily possible. The keynote of the new development in transportation, is high voltage on the trolley, from 6,000 to 12,000 volts being possible at this stage of development. This reduces the volume of current to be handled, thereby doing away with the enormous expenditures for copper feeders common on the 500 volt lines. With alternating currents carried on the trolley instead of a rotary controverter sub-station every ten miles or so apart, requiring constant attention, static transformers are placed more than twice that far apart, requiring no attendance, but periodical inspection.

That trolley cars and locomotives will be operated over the same tracks during the period of transition from the old to the new era seems to be settled. In this way locomotives can gradually be relegated to the switching engine class, without that loss of investment which stockholders are so quick to think of when any change is suggested. As a matter of fact, the steam roads with their heavy roadbeds would make excellent electric lines, and when the change is made will win back business on through lines which is now tending to go to the long distance electric lines wherever they exist. When the steam roads find it expedient to adopt the new motive power they will find it will result in a great increase of traffic, as business will naturally gravitate to the roads having increased facilities for handling it. The steam roads will be in a position to operate more frequent passenger and freight units, without a proportionate increase in operating expenses. These units can be of a size sufficient to take care of the traffic, varying large or small, according to the demand; operating passenger and express business on the multiple unit system by which each car furnishes its own power from the line with its own motors, and is controlled in common with the other cars, by the motorman. The heavy freight business would be handled by heavy electric locomotives.

When such a point of development is reached, the interurban roads and long distance lines will be practically one system as far as motive power is concerned, and working arrangements between local and trunk lines with these increased facilities would be a logical result of the change. Cars operated on the trunk lines could be shunted to the local tracks for distribution, and vice-versa. The two classes of roads will then settle naturally into their economic places and adjust themselves the one to the other, according to the class of traffic they are qualified to handle.

It is a peculiar fact that the latest developments in electric traction are such as would make possible such a condition of affairs; as the new single phase motors are in fact only direct current motors more highly developed, and while built to run on high tension, single phase current such as would be used on the main line, they can be adapted to operate on local 500 volt systems. This car could run over the local lines of a community on 500 volt cur-

*A paper read before the National Association of Railway Agents by C. A. Paul, Immigrant Agent, St. Louis & San Francisco.

Prairie Type (2-6-2) Locomotive for the Great Northern.

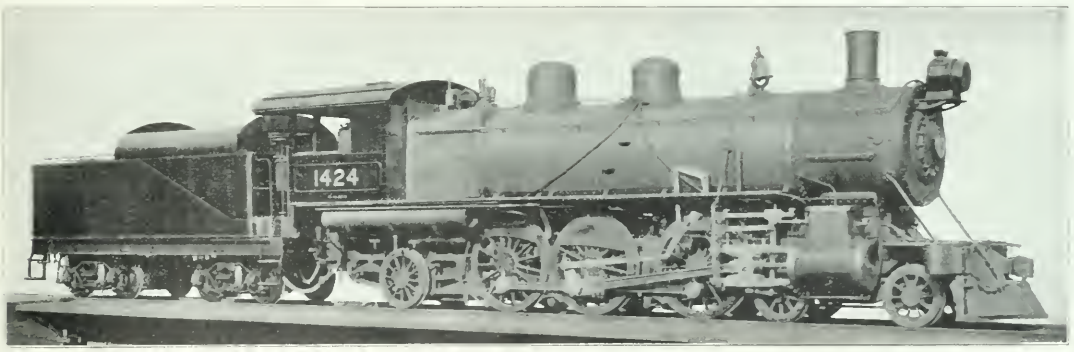
rent, be transferred to the trunk line, make one unit in a through train, controlled by the multiple unit system, furnish its own share of the power on the trunk line, and at the end of its run distribute its load over the local tracks of the city lines. Such an arrangement is one of the possibilities of the future, and would conform to the modern idea of centralization of power at a few economical points.

### New Locomotives for the Great Northern.

In addition to the Mallet articulated compounds described in our issue of October 12, the Great Northern has recently received from the Baldwin Locomotive Works 80 Atlantic (4-4-2), Pacific (4-6-2) and Prairie (2-6-2) type locomotives. They are all built on the same general lines, the aim having been to make as many parts as possible interchangeable with present Great Northern equipment. The boilers and heating surface are identical, with the exception of the Pacific type, which requires an extra long boiler with 21-ft. tubes, and consequently has a little larger heating surface. The trailing arrangement is practically the same in all three classes, consisting of the Rushton truck with inside boxes.

The Atlantic type engines, ten in number, are Vauclain balanced compounds with 15 in. and 25 in. by 26 in. cylinders. The high-pressure cylinders are between the frames and connect with the forward crank axle. This axle is built up, having a cast-steel web and forged steel bearings. The low-pressure cylinders are outside the frames on a line with the high-pressure cylinders and are connected to the rear drivers. The Stephenson valve motion is used with the eccentrics on the rear driving axle. One striking feature of this design is the enormous weight, 50,000 lbs., carried by the trailing truck. These locomotives are now being used on the Great Northern's Oriental Limited service from the Mississippi river to the coast.

The Pacific type, 20 in number, and the Prairie type, 50 in number, are identical in many respects. Several of the Prairie type




Pacific Type (4-6-2) Locomotive for the Great Northern.

locomotives have been in service for a number of months hauling heavy ore trains on the iron range in northern Minnesota. One of the first of this class was exhibited by the Baldwin Locomotive Works during the recent Master Mechanics' Convention at Atlantic City. All of these engines are equipped with Walschaert valve motion. One engine in each class has been designed to take the new Baldwin smoke-box superheater. This requires little change in the front end arrangement and can be easily replaced by regular

Four-Cylinder Balanced Compound Atlantic Type (4-4-2) Locomotive for the Great Northern.

steam pipes if necessary. The following table gives the principal dimensions of the three types:

| Type engine & Gt. North. Class | Atlantic ($K_4$) | Pacific ($H_2$) | Prairie ($J_1$) |
|---|---|---|---|
| Weight on drivers | 112,000 lbs. | 151,000 lbs. | 151,000 lbs. |
| " total of engine | 211,000 " | 227,000 " | 209,000 " |
| Wheel base, driving | 7 ft. 1½ in. | 13 ft. 0 in. | 13 ft. 0 in. |
| " total | 30 " 4½ " | 33 " 5½ in | 30 " 9 in. |
| " engine and tender | 62 " 10 in. | 66 " 4 in. | 63 " 7½ in. |
| Cylinders, diameter | 11.75 in. | 22 in. | 22 in. |
| Piston stroke | 26 in. | 30 in. | 30 in. |
| Valves | Piston. | Slide. | Slide. |
| Diameter of wheels, driving | 73 in. | 69 in. | 69 in. |
| " " " eng. truck | 36 in. | 36 in. | 36 in. |
| " " " trailing | 49 in. | 45 in. | 45 in. |
| Boiler, diameter, front end | 72 in. | 72 in. | 72 in. |
| Length of firebox | 126¼ in. | 126¼ in. | 126¼ in. |
| Width of firebox | 66¼ in. | 66¼ in. | 66¼ in. |
| Number of tubes | 301 | 301 | 301 |
| Diameter of tubes | 2¼ in. | 2¼ in. | 2¼ in. |
| Length of tubes | 18 ft. 6 in. | 21 ft. 0 in. | 18 ft. 6 in. |
| Working steam pressure | 210 lbs. | 210 lbs. | 210 lbs. |
| Heating surface, tubes | 3,277.89 sq. ft. | 3,720.36 sq. ft. | 3,277.89 sq. ft. |
| " " fire box | 210.77 " | 210.77 " | 210.77 " |
| " " total | 3,488.66 " | 3,931.13 " | 3,488.66 " |
| Journals, driving | 10x10½ in., | 9½x12 in. | 9½x12 in. |
| " eng. truck | 6x12 in. | 6x12 in. | 6x12 in. |
| " trailers | 8x12 in. | 8x12 in. | 8x12 in. |
| " tender | 5½x10 in. | 5½x10 in. | 5½x12 in. |
| Tender capacity, water | 8,000 gal. | 8,000 gal. | 8,000 gal. |
| Tender capacity, coal | 13 tons. | 13 tons. | 13 tons. |

## Walschaert Valve Gear.*

The cost of maintenance of the Walschaert valve gear I believe to be fully 25 per cent. less than that of the Stephenson link motion. This estimate is based on figures obtained from the Rock Island roundhouse at Burr Oak, Ill., where there are a number of engines equipped with the Walschaert valve gear, while others are equipped with the Stephenson link motion, both classes being in freight service out of that point. Engine failures due to the breaking of valve motion connections during 12 months' service have been very slight. With 15 engines equipped with the Walschaert valve gear we have had only three failures that were chargeable to valve motion failing, while with engines equipped with the Stephenson link motion we have had at least three times as many failures due to the link motion getting out of order.

In view of the fact that the Walschaert link, not being influenced by a backing up eccentric, does not rock through as large an angle as the ordinary Stephenson link, this means that the link has a more favorable action on the link block with the Walschaert gear and does not have a tendency to spring the motion as much as the Stephenson link when at and near the extremity of its stroke. It should also be noticed that with the Walschaert gear all parts in connection with the valve move in almost a straight line, which does away with the up-and-down motion that is very noticeable with the Stephenson link. There is no question in my mind that this up-and-down motion has a tendency to cause a rocking action of the valve on its seat, whereas with the Walschaert link the valve has an easy gliding motion and is not so apt to hollow the valve seat.

My experience has been that where tonnage is considered the main factor and speed a secondary consideration, the Walschaert motion is superior to the Stephenson in tonnage capacity of engines, as it will handle a train better at a slow rate of speed with very little slipping, while with the Stephenson motion at a slow rate of speed the engine requires greater care in handling in order to prevent this trouble, making it necessary to use a greater amount of sand.

In regard to speed, I am not in a position to say which motion has the advantage, as none of our engines in passenger service are equipped with the Walschaert valve gear. In freight service we have about the same number of each, and they take their turn in all classes of freight, both fast and slow. It seems to be the general opinion of the men running these engines that engines equipped with the Stephenson motion can take a train of the same tonnage and make better time on the level or where the grade is in their favor than they can with those equipped with the Walschaert motion, but when they get on the hills or where the grade is against them they can make better time with the Walschaert than they can with the Stephenson motion. The only reason I can advance for this difference is the manner in which the valves are set, as both engines are of the same size and weight and carry the same steam pressure—185 lbs.

The valves on our engines equipped with the Stephenson link motion are set with 1-32 in. lead at full stroke, making about ¼ in. lead in the 6-in. cut-off; valve lap, 1 in. Valves on engines equipped with the Walschaert valve gear are set as follows: Five have ⅛ in. lead, which is constant, and 7⅛ in. lap; the remainder have 3-16 in. lead and 15-16 in. lap. These latter give the best results. It must be understood that the engines referred to were built for freight service and were not intended for high speed.

*Extracts from a paper presented to the convention of the Traveling Engineers' Association, by O. H. Rehmeyer, C., R. I. & P. Ry.

## Unit Costs of Railroad Building.*

II.

The costs given below are for a first-class branch line 12 miles long, giving the St. Louis Southwestern an entrance into Dallas, Texas. The road is well ballasted and laid with 75-lb. rail.

(1) Length of new railroad, 12.13 miles main single track, 1.52 miles sidings.

(2) Year built, winter 1903-4.

(3) Cost for distance of 12.13 miles, including preliminary survey, clearing right of way, etc., but not including real estate, stations, equipment or signals, $19,649.24 per mile.

(4) Brief description: Line follows dividing ridge between two North Texas streams. No side hill cuts. Considerable fill but ground mostly level. Line being on ridge, but few openings required, all of which were made of a permanent character, including

Crossing of Dallas Branch of the St. Louis Southwestern over Missouri, Kansas & Texas Tracks.

concrete arch culverts, cast-iron pipe, vitrified tile drain, etc. Excavated material mostly earth; some loose rock.

The line is practically one tangent with the exception of 2,200 ft. of 1 deg. curve which occurs about midway and a few other light curves entering the suburbs of Dallas. The line crosses the M., K. & T. overhead on the edge of the Trinity river bottoms entering Dallas; the crossing consists of three 50-ft. deck plate girder spans carried on steel columns and concrete masonry abutments. Immediately after crossing the M., K. & T., the line enters the Trinity river bottoms and continues along the edge of the bottoms on a high embankment until the crossing of the Texas & Pacific on Pacific avenue, Dallas, is reached. The overhead crossing with the M., K. & T. required a heavy embankment through Trinity river bottoms, amounting to a quarter million cubic yards in a distance of about one mile. The material for this embankment was obtained by grading down ground to be used for an outer yard of the Dallas Terminal Railway and Union Depot Company. Steam shovels were used in excavating and the dirt hauled by train to make this fill. This method enabled the grading to be done for the outer yard, and at the same time gave waste material to fill the bottoms. The balance of the grading on the extension was done by teams.

The following table shows in detail the cost of the road:

| | |
|---|---|
| Engineering | $6,322.57 |
| Grading (of this amount $48,924.46 is chargeable to the Dallas extension proper, the balance to outer yard, Lamar street wye, etc.) | 77,276.94 |
| Bridges, trestles and culverts | 41,661.75 |
| Ties | 26,838.38 |
| Rails | 37,607.06 |
| Track fastenings | 5,596.28 |
| Frogs and switches | 1,176.74 |
| Ballast | 30,526.14 |
| Tracklaying and surfacing | 9,510.71 |
| Crossings, cattle guards and signs | 1,928.81 |
| Interlocking or signal apparatus | |
| Total | $238,345.18 |

*The first article of this series giving cost of railroad building in the Eastern States was printed in the *Railroad Gazette*, Sept. 7, 1906.

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay.* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 18. FRIDAY, NOVEMBER 2, 1906.


The disaster at Atlantic City, N. J., last Sunday may have to be classed with the small number of unexplainable railroad accidents, for the officers of the Pennsylvania Railroad declare that they have been unable to discover its cause, and the coroner and others who have tried to believe that they knew it have produced no coherent evidence to substantiate their opinions. The first right-hand rail on the draw span was found displaced after the accident, but the evidence seems more in favor of the theory that this was caused by the derailment than that the derailment was caused by it. The fact that the bridge was nearly new and yet had been in service several weeks, is in favor of the assumption that it was sound; and the assertion of the officers of the road that the structure was first class in design, material and workmanship is buttressed by the known excellence of all new work of that kind done by the Pennsylvania Railroad. This disaster may arouse the prejudiced feeling that the electrical operation of steam railroads is a risky experiment, based on the idea that all untried things are necessarily dangerous. For this superficial view there is no ground whatever, though it is, unhappily, true that had a hundred tons of engine and tender been in front of the train it would have formed a barrier which might have broken the fall of the passenger cars and thereby protected the passengers. The line was straight, and there is no suggestion that the motorman was at fault. There was no fog or darkness to impair his view or his efficiency. It is just ten years and three months since the crossing collision at Atlantic City, which killed 47 persons and injured 50; but it is only two years and one month since we had in this country a railroad disaster equally appalling—the butting collision at Newmarket, Tenn., in September, 1904, when 63 were killed. In August, 1904, the flood disaster at Eden, Colo., killed 88.

The appointment by the Rock Island and Frisco systems of a new officer bearing the title of "Commerce Counsel," whose duty is to co-work and harmonize things with the Interstate Commerce and the State Railroad Commissions, has several suggestive features. It bears evidence (1) of the logical tendency toward specialization which affects railroads and all other great institutions as they become functionally more complex; (2) of the increased activity and force of federal and state regulation, and (3) of a new office the incumbent of which must have peculiar and somewhat versatile traits, mental and otherwise. He must be a lawyer and know statutes and legal precedents; he must be familiar with railroad operation, especially in that branch that includes rates; he must be tactful and, in a technical sense, what we call in social life a "good mixer." But, assuming that the office, or a similar one, is to be created by other railroad corporations, the horizon widens to larger questions of railroad policy. About four-fifths of the states now have railroad commissions, some active, some passive; some with high powers, some with low powers. As regards the states where commissions are assertive we are likely to see, for obvious reasons, a tendency toward the creating of the new "harmonizing" office, while in states with inactive commissions—though a good many of them have high statutory powers—the railroad policy will be to let sleeping dogs continue to slumber. West and south we shall see the new mechanisms of harmony, in eastern states few or none. Such at least is the case so far as the state railroad commissions affect it. A more optimistic view of the matter is that a "Commerce Counsel," or cognate officer of a railroad system, forms in a sense a new connecting link between the federal and state commissions to the advantage of both as well as of the railroads and their patrons. The state commissions have already learned much from the interstate body, and from it has come a very appreciable influence toward unifying the organization, the duties and the rulings of state bodies still very heterogeneous. Any new force tending to make the commissions homogeneous is to be welcomed, especially by the railroads that traverse several states. Protectively and as against the state's supervisors of railroads the place of Commerce Counsel or its equivalent ought to be an indirect restraint on these public officers.

The pressing need of an increase in the rate per day for interchanged freight cars is at last thoroughly appreciated by a large number of important railroads. Whether it will be practicable to make any widespread change before next June is another and a difficult question. Notwithstanding the abuses of low rates for interchange and for demurrage and the improper use of cars by railroads and by consignees or shippers, it must still be admitted that in providing inflexible regulations for a business which imperatively demands flexibility trouble must be expected. No general uniform car service rate can avoid resulting in certain cases unjustly. At the meeting of the American Railway Association last week the committee on car service recommended an increase of the rate from 25 cents a day to

35 cents, an increase so large that a year ago it would have aroused vigorous opposition from a large majority of the members of the association; yet to-day it is loudly opposed as too small. A dozen roads met in Chicago, October 16, and voted in favor of 50 cents "at the earliest possible date," and again just before the convention a larger and more influential "caucus" brought out even stronger views. Among the roads in favor of an increased rate at once are the North-Western, the St. Paul, the Rock Island, the Atchison, the Illinois Central, the Union and the Southern Pacific, the Erie and the Pennsylvania; and a conference is to be held in Chicago, November 9, to see what can be done. Short terminal roads, some of them influential, will, of course, object to an increase, and the question is whether a workable plan, not liable to destroy itself by its own friction, can be agreed upon. With numbers of roads helpless, while their millions of dollars' worth of new freight cars are being wrongfully used by conscienceless borrowers for their own profit, there must be a strong sentiment for a change. The adoption of a higher rate by a few, or many, roads independent of the Association would at least call for a stirring up of the car accounting offices, and that in itself would be a good thing, for the feeling that freight car records cannot be kept as carefully and fully as records of passenger cars is one of the obstacles in the way of car-service progress. The most encouraging thing that we have seen recently in the freight car world is the statement that one big road has taken a large number of agents out of the soliciting field and set them to hunting freight cars and prodding consignees. This is reported to have been highly effective in releasing cars. One local agent who really stirred up his consignees reduced the cars on his team track about 75 per cent. in a short time. This is not car interchange, but it is a kind of work that greatly ameliorates the troubles of car interchange.

President Delano, of the Wabash, believes that there is about to be another general advance in the wages of railroad employees. The present great prosperity of the country tends in several different ways to make the lower ranks of railroad men dissatisfied. In the first place they naturally want a larger share of it. Railroad earnings have been increasing at a wonderful rate, dividend payments have been begun or enlarged, and the man who moves the traffic feels that to him should come part of the increase. More than this, the cost of living has greatly increased, and he feels sharply the added cost of the things for which most of his pay must be spent. These two reasons apply in general to all classes of workmen. There is a third reason applicable, more especially to the railroad man—namely, that as a result of the great volume of business he is worked harder. The rush of traffic which came to the railroads in 1905 was exceptional, and was generally handled in emergency fashion, meaning long hours and great strain on the operating force. But the expected return to normal has not come. Instead an even greater traffic is to-day being handled. The movement for a readjustment of railroad wage schedules is already under way. In Chicago the Switchmen's Union is demanding better terms from all the railroads entering that city. The Pennsylvania Lines west and their trainmen are discussing wages and hours. In the east the New York Central, Lackawanna, Central of New Jersey, Reading and Erie are treating with conference committees of their train and yard employees. There is no serious talk of strikes yet and small occasion for anxiety. Every year at about this time many railroads talk over and adjust wage schedules with their employees in a friendly spirit, and some of the negotiations now on were arranged long ago. But the fact remains that the feeling on the part of the men is general and widespread throughout the country. The railroads, however, as evidenced by President Delano, are disposed to treat the demands fairly and as far as possible adjust all differences.

## MECHANICAL TRACK INSPECTION.

Periodical track inspection is desirable, for without it intelligent distribution of maintenance work where it is most needed cannot be made. Many roads now have an annual inspection in the Fall when the track has been put up in good shape for the Winter. A committee of officers goes over the line on a special car or train; one is usually assigned to note surface, another alinement, another curves, another neatness, etc. They mark each section, sub-division and division according to their own standards of perfection and at the end of the day or the trip a general average is made up of all the markings. Where premiums are awarded this method is used for selecting the prize winners. These inspections stimulate healthy competition among the men in charge of maintenance, but the personal co-efficient introduced by relying on the individual judgment of a number of different men makes really accurate comparisons of the actual condition of the track from year to year out of the question. The track inspection car of the Baltimore & Ohio, which is described in another column, gives a permanent record, without appreciable error, showing the result of maintenance work during any period. While it does not replace the general officer's inspection which should, and usually does, include all the machinery of transportation, it is an almost invaluable aid.

When the car was first run over the road the trackmen were inclined to doubt its accuracy in spotting low joints and variations in gage. By stopping the car and making a few check measurements on the track whenever the record was questioned the men were convinced that in the essential matters of surface and gage the mechanism was as accurate as their track levels and gages. Having accepted the records as correct they put to good use the information thus obtained and put extra work on the track where it most needed attention. The marked improvement in track on the Baltimore & Ohio during the last three years is in great part due to this intelligent direction of effort. Of course, this car is not directly responsible for the improvement; it takes money to make good track and in this case money has been spent liberally and in increasing amounts. In 1903 the expenditures for maintenance, excluding the cost of rail and tie renewals, was $934 per mile, $982 in 1904, $1,044 in 1905 and $1,260 in 1906.

It may be urged as an objection to the use of a car of this kind in making periodical inspections that in the effort to make a good record the supervisors spend their time two or three weeks in advance of the car's arrival in their district in "varnishing" the track. This is undoubtedly done and is bad practice, but no amount of varnishing can make really good track out of normally bad track. In any event the record is of value chiefly for comparison, and if the amount of varnishing is nearly constant before each inspection the true condition of the track can be compared from year to year, making due allowances for the extra work done to cover up bad places. Further, varnishing does no harm even if it does small good.

## THE DEVELOPMENT OF THE LONG ISLAND RAILROAD.

The art of railroading is not at all confined to economical management and wise construction. There is another department of which Mr. Peters, President of the Long Island Railroad, is now furnishing an excellent example, in many respects like that of Mr. Hawks, President of the Detroit & Mackinac road, described several years ago in these columns. The Long Island has always been unprofitable, primarily for the reason that it was a summer road only. Employing great additions to the force in the spring and discharging them in the fall, offers little inducement to the young railroad man who wants to get on, and this, to a large extent, shuts off the Long Island from building up a staff of trained young men ready for vacancies in important places. During the short period of Mr. Peters' administration he has shown that he has a grasp of the situation and is trying to overcome it by methods that are interesting and worth noting. He has already electrified 122 route miles reaching to the outlying districts beyond the borough lines. This does not produce an adequate return on the costs but there are already indications that it may produce large return. The building of moderate priced houses is going on at a wonderful rate and in one case a whole community, bound together by ties of religion, are moving their living places from near the East river to the outlying district. In many other cases more important homes are in course of construction for well-to-do people. Old towns are growing and new ones are being made; all this within a time distance of less than an hour from City Hall.

Side by side with this expenditure of large sums of money for getting new business and handling it, there is going on a thorough study of the capabilities of Long Island both for pleasure and for profit. There are now more than 200,000 acres of land with rich soil, capable of being made into market gardens sufficient to supply Greater New York, and with a decided advantage of quick and inexpensive transportation directly to the consumers. The sandy portions of the island were originally covered by pine which has been cut away and replaced largely by a stunted growth of pine. The arable acres were covered with broad-leaved trees, largely white oak, black oak and chestnut. This has been lumbered for profit three times since the island has been inhabited,

but of late years the trees have not been allowed to grow to commercial sizes of lumber before they are cut for firewood, so that this land is covered by scrub trees, producing little or nothing. This waste is painful to the railroad officer who wants to see every acre along his line make for transportation, and, therefore, for experimental purposes the company bought two tracts, one of 18 acres, the other of 80 acres of rather undesirable looking land, paying for it only $15 an acre, and put it in the hands of an expert who cleared it and planted it and kept an exact account of the whole cost. The result was proof that a market gardener can make money there and include the value of his own time in the costs of operation. Having learned this much the Long Island company has not been slow to make it known not only to the people throughout the island, but to those who are capable of conducting a market gardening business. The results are promising. This is simply one of the many schemes being tried to induce settled residence on Long Island, to the end of adding largely to the permanent population and making an all-through-the-year business for the road. In addition to this there are many other schemes for the same purpose. The island is so located that it would seem at first sight idle to undertake to make it a manufacturing region, for the reason that all raw material as well as finished material has a long haul. Nevertheless the company's staff are studying this out and find branches of manufacture where cheap land, a healthy region, and any degree of isolation that is desirable, would be strong attractions to the manufacturer.

Among the several devices for attracting people to come along the line of the road for pleasure purposes the most novel one is a present undertaking to build a 60-mile speedway for automobilists. The location and construction of this speedway will be such that there will be no grade crossing either of a road or railroad throughout its length. It will be fenced and probably have entrance gates five or ten miles apart. Its cost is guessed at a million and a half dollars. Of course it is not proposed that the company shall pay this cost, although it may be a modest subscriber to the capital stock. It is initiated, carefully studied out as to location and methods of using it as a toll road for automobilists by the company officers, and the results of this study have been submitted by Mr. Peters to a meeting of enthusiastic motorists who can well afford to furnish the money and have been found quite willing to do so. Alertness and skill and initiative in developing a country to the end of conferring a blessing on the public, and dividends to the stockholders of an unprofitable road, is quite as worthy of the efforts of men of high talent as is any department of the planning and operation of a railroad.

## LOCOMOTIVE PERFORMANCE.

The satisfactory performance of the single expansion steam locomotive becomes more apparent as facts derived from accurate tests accumulate. From being regarded as a wasteful machine, the American locomotive is now coming to be looked upon as a machine of high efficiency. It was shown by the Purdue laboratory tests a dozen years ago that when all conditions were exceptionally favorable, the steam consumption per indicated horse-power hour could be brought as low as 25 pounds. Statements to this effect have since been confirmed by results of tests obtained by the Pennsylvania Railroad at St. Louis involving a number of different locomotives. The report of these tests shows that a simple locomotive will operate on no more than 23.7 pounds of saturated steam per horse-power per hour. Values approaching this limit have been regarded as exceptional, and it has been assumed that under ordinary conditions of service the consumption is far in excess of the value quoted. In other words, while it is admitted that high performance may be obtained under test conditions, it has been generally believed that the locomotive sustains its reputation for wastefulness under service conditions. It is upon this point that new evidence is soon to appear. Work but recently completed at the Purdue laboratory justifies the statement that whenever the conditions of running are such that the throttle may be wide open, steam consumption is not far above the minimum. For example, there has been run a series of fifteen efficiency tests, all under a wide open throttle, the boiler pressure being 180 pounds. The series represented speeds ranging from 20 to 60 miles an hour and all positions of the reverse lever which were possible with a wide open throttle at the speeds selected. The results are, therefore, comparable with those which may be, and doubtless are obtained in daily service on the road. They show a minimum consumption of 23.7 pounds of steam per horse-power hour, and a maximum of but 28.8 pounds. In passing from the most economical to the most wasteful condition of running under a wide open throttle, the steam consumption was increased by but 5 pounds, or 22 per cent. It appears from these and similar series of tests that so long as a locomotive is fairly well maintained and so long as it is operated under a wide open throttle, it cannot be really wasteful in its use of steam. Single expansion stationary engines, even of large size, when subjected to variations in load, cannot show a better performance than this.

Another phase of the performance of locomotives, concerning which there have been many conflicting opinions, is the advantage derived from high steam pressures. The question has been under investigation by Purdue University under the patronage of the Carnegie Institution of Washington. An account of these researches has been reported to the Carnegie Institution, and is soon to be issued in book form. While a full understanding of the results must necessarily await the issue of the forthcoming volume, the tests have served to define the steam consumption per horse-power hour, for different pressures as follow:

| Boiler pressure. | Steam per H. P. hour. | Differences Pounds. | Differences Percentages. |
|---|---|---|---|
| 120 | 29.1 | ... | ... |
| 140 | 27.7 | 1.4 | 4.8 |
| 160 | 26.6 | 1.1 | 3.4 |
| 180 | 26.0 | 0.6 | 2.2 |
| 200 | 25.5 | 0.5 | 2.0 |
| 220 | 25.1 | 0.4 | 1.6 |
| 240 | 24.7 | 0.4 | 1.6 |

The columns of differences show the amount by which the steam consumption is reduced for each 20-pound increment in pressure. For example, an increase from 180 pounds to 200 pounds pressure reduces the steam consumption one-half pound, which is but 2 per cent. of the steam consumed at 180 pounds. Small as are the values in these columns of differences, they are in excess of the true measure since a true measure should be based upon heat consumption rather than upon the weight of steam used. As the pressure is increased, more heat is required for the generation of each pound of steam, so that the gain which appears in the record of steam consumed is in part apparent. But under the range of pressures dealt with, the difference between the true measure and pounds of steam per horse-power hour is small. It is significant, of course, that its effect, if applied as a correction, would be to reduce the value of the differences given above, as the pressure is increased. These values considered in connection with losses occurring through increase in leakage as the pressure is raised, constitute poor arguments in favor of the further increase of boiler pressue, if, indeed, they do not suggest the advantage of pressures which are lower than those now common.

Choice of steam pressure is a question of design. When the pressure is assumed, the cylinders may be proportioned to transmit to the wheels such force as may be desired. This fact will generally make it inexpedient to change the pressure in existing locomotives, except in cases where locomotives under the present pressure are over cylindered.

The Pennsylvania testing plant which was used at the St. Louis Exposition has now been put in commission at Altoona. A large building has been erected for its reception, the plant has been installed and locomotives are now operating on it. It would be an admirable thing for the railroads of the country, and, incidentally, for the Pennsylvania Railroad System, if some scheme of co-operation could be secured between the railroad company and the Master Mechanics' Association whereby such portions of the work accomplished upon the plant as may be of general interest and free from all spirit of competition, could be reported to the Association. The advantages of such a plan to the Association would easily justify the expense of maintaining an expert as its reporter at the plant. The Pennsylvania Railroad would lose nothing, but would gain through the work of the Association's expert aid, and as the result of public discussion of its methods and results.

### Northern Pacific.

It was no longer ago than 1898 that the Northern Pacific directors were making a special appropriation out of income "as a reserve for the continuity of dividends upon the preferred stock" which now, converted into common shares, sells at over 200. It was less than two years earlier that the road, then earning something like $20,000,000 gross and $7,000,000 net a year, and having rolled up a total deficit of over $14,000,000 in three years, was, after reorganization, taken over by the present company. Among all the marvelous instances of growth within a decade from railroad bankruptcy to railroad prosperity, none has been more remarkable

than that of the Northern Pacific. With an increase since 1896 of less than 1,000 miles in operated mileage, gross earnings have risen to over $61,000,000 and net to over $30,000,000. To put it briefly, net earnings are a third larger than gross were in 1896.

The fiscal year 1906 proves to be the banner year in this remarkable upward progress. A year ago gross earnings for the first time passed the $50,000,000 mark. Last year they increased $10,500,000 to over $61,000,000, a gain of more than 20 per cent. Instead of using all the added earnings in increased operating expenses like the Burlington, whose annual report was reviewed in these columns last week, less than half of the gain was used in larger outlays, so that there was an increase of over $6,200,000, or more than 25 per cent. in net earnings. These evidences of prosperity are the more remarkable in view of the then wonderful gains of 1905, when gross earnings increased over $4,000,000 and net earnings over $1,600,000.

Nearly three-quarters of the $4,200,000 increase in operating expenses was in conducting transportation. Maintenance of way stands at almost the same figure as in 1905. There was a gain of $890,000, or 17 per cent., in maintenance of equipment. No detailed statement of expense is given, so that figures of maintenance per equipment unit cannot be worked out, but maintenance of way cost $1,387 per mile against $1,382 in 1905. Again, without detailed figures of expenses it is impossible to accurately locate the reasons for the increase of 25 per cent. in cost of conducting transportation. Train load certainly played no part in bringing it about, for the average revenue load increased from 366 tons in 1905 to 400 tons last year. Including company freight, the train load was 468 tons, a high figure for a 5,000-mile road. There is, however, another factor which accounts for part of the increased cost of carrying the traffic; namely, an increase in the percentage of "helping" to revenue train mileage in both the passenger and freight department. The fact that freight helping mileage made up last year 16 per cent. of the revenue train mileage shows that there is much work still to be done before the road has satisfactory grades and curvature.

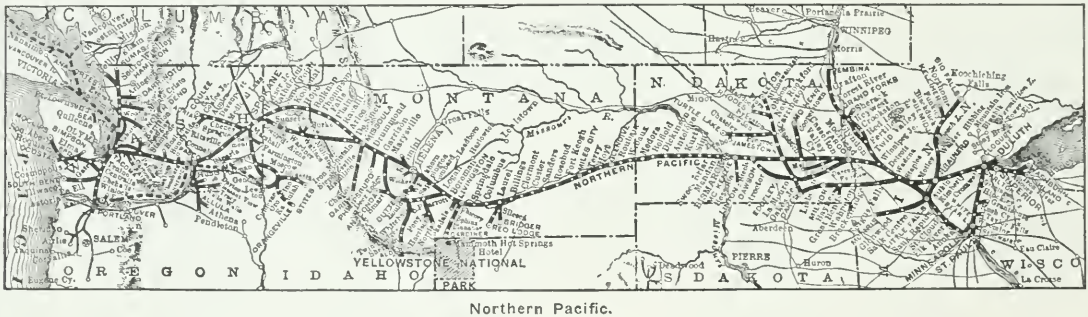
Passenger results were most favorable, due in part to the effect of the Portland Exposition, the latter half of which was included in the fiscal year. The long distance Exposition travel is shown by comparison of the gain in number of passengers carried with the number of passengers carried one mile. With 15 per cent. more passengers carried, there was an increase of 35 per cent. in the number of passenger miles, and the average distance traveled by each passenger rose from 95 to 111 miles. Including mail and express, passenger department earnings were $16,244,695 against $13,076,377 in 1905, a gain of 24 per cent. Increases in the freight department were not quite as large proportionately. There were 18 per cent. more tons of revenue freight carried and 20 per cent. more revenue ton miles. The average haul increased from 334 miles to 341 miles. Freight department earnings increased $7,180,335, or 19 per cent. There was an increase per mile of road of $547 in passenger and $1,219 in freight earnings.

The income account shows the strong financial position of this not long ago bankrupt property and the large extent to which reconstruction is being paid for out of surplus earnings. After all payments for taxes, bond interest and rentals, there was a net income before dividends of $22,500,000, which is over $5,000,000 larger than in the previous year. The same amount was paid out in dividends as in 1905, so that if appropriations for betterment out of income had been no larger than in that year, there would have been a profit and loss surplus for the year larger by $5,000,000 than in the fat year 1905.

It was in the first full fiscal year in which the road was operated by the present management, covering the 12 months ended June 30, 1898, that the first modest charge of a little more than $800,000 was made against earnings for additions and improvements. In every year since that, more than $2,000,000, and in most years as much as $3,000,000, has been thus appropriated. Last year in addition to what has come to be the regular annual charge of $3,000,000 against income for betterments, $2,000,000 was appropriated for depreciation of equipment and over $1,000,000 for the insurance fund, making a total spending of over $6,000,000 out of earnings for betterments, depreciation and insurance, as against $3,000,000 in 1905.

The average operated mileage on June 30, 1906, was 104 miles more than on the same date a year earlier. Most of the new line was in four branches: The Fargo & Southwestern branch from Edgeley to Streeter, N. Dak., 40 miles; the Sykeston branch from Denhoff to Turtle Lake, N. Dak., 31 miles; the Peninsular branch from Hoquiam to Moclips, Wash., 28 miles, and the Sunnyside branch from Toppenish to Sunnyside, Wash., 12 miles. The report deals with important new construction under way. The Portland & Seattle, as has often been described in the *Railroad Gazette*, is building a low grade line from Portland, Ore., up the north bank of the Columbia river to Pasco, Wash., and thence to Spokane. Another arm of this road is also being built from a point 24 miles east of Pasco, where the Spokane line is to diverge, east along the Snake river to Texas Ferry, Wash., where it connects with a joint line now being built under the direction of the Union Pacific and owned by the Northern Pacific and Union Pacific jointly. This joint line runs from Texas Ferry to Lewiston, Idaho, just across the state line, 72 miles. It is to be finished in 1907 and have a grade of 11 ft. to the mile against eastbound traffic. From Lewiston a Northern Pacific line runs to Culdesac, and from Culdesac the Northern Pacific is building a line to Grangeville, Idaho, 55 miles. This is well under way and is to be finished in 1907. Heavy grades are necessary to bring it from the Snake river valley to the top of the plateau, the maximum ascending grade being 3 per cent. to the top of the plateau and then 1 per cent. This line also will be owned by the Northern Pacific and Union Pacific jointly.

More important than these joint lines in a local territory so long in dispute between the Hill and Harriman systems, is the projected through line of the Portland & Seattle from Spokane to Portland. The Portland & Seattle was incorporated August 22, 1905, and is owned jointly by the Northern Pacific and the Great Northern. The Northern Pacific already runs from Spokane to Pasco, so that the Spokane end of the line will not be built until the Portland connection is open. From Pasco to Portland the route parallels the line of the Oregon Railroad & Navigation Company along the Oregon bank of the river. On its completion, the Hill roads instead of having a roundabout route with heavy grades to Portland via Puget Sound will have a direct and efficient water grade line. It is being built to a very high standard and involves a great deal of expensive work. From Portland to a point 17 miles east of Vancouver, Wash., and from Kennewick, opposite Pasco, to a point 23 miles west, the road will be double-track, making 47 miles of double-track, in which are included double-track steel bridges over the Columbia and Willamette rivers. It will have a maximum grade eastbound of 11 ft. to the mile from Vancouver, on the north bank of the Columbia river opposite Portland, east to Texas Ferry, on the Snake river, and will be 10 ft. above the high water level reached in 1894. From a point 24 miles east of Pasco, where the road to Spokane diverges, the maximum grade northbound will be 22 ft. to the mile. The curvature on the whole line will be low, with few grades higher than 3 degrees. The total number of miles which is being built by the Portland & Seattle is 423. This line of low grades and light curvature will permit the handling of a large amount of business, both freight and passenger, between Spokane and points west and north of Vancouver, and will relieve the present congestion through the Yakima valley and over the Cascade mountains. Valuable terminal property has been bought in Portland and Vancouver, and it is expected that the line from Portland to Pasco and Texas Ferry will be finished by the autumn of 1907, and the line from Pasco to Spokane in operation early in 1908. Great efforts have been made, supposedly by




Northern Pacific.

the Harriman forces, to block its construction, and at the present moment a rival company—the Wallula Pacific—claims to hold a franchise covering the route of the Portland & Seattle along the Columbia river to Portland. In spite, however, of the numerous conflicts which have taken place between the two parties, both in the courts and on the ground, construction of this new Hill outlet to Pacific tidewater seems assured. As suggesting the importance of this project there is already a new charge on the Northern Pacific balance sheet this year of $5,600,000 against the Portland & Seattle.

In other ways, it is evident that the management is actively attacking the problem of bettering the lines. There are 10 separate stretches of grade revisions or double-track described in the report. There are also other improvements under way. Forty steel bridges are under construction. Large bridges over the Missouri river at Bismarck and over the Columbia river at Pasco are now completed. The joint Northern Pacific-Great Northern passenger station at Seattle was put into service May 10, 1906. A large brick freight house at Seattle which was put in service in June, 1905, having already proved inadequate, a new freight house two-thirds as large is now under construction, to be finished this year. Two tie treating plants are being built, each to have a capacity of treating 900,000 ties a year, one at Brainerd, Minn., and one at Sand Point, Idaho. A new road is building, by the Great Northern, to make a connection between the Chicago, Burlington & Quincy and with its own lines at Great Falls, Montana. This will connect with the Northern Pacific at Laurel, 15 miles west of Billings. Billings is growing rapidly and the crowded terminal facilities divide the city into two parts. On account of the large and growing interchange of business between the Northern Pacific and the Burlington and the prospective business between the Burlington and the Great Northern, the Northern Pacific's division terminal is to be moved to Laurel, where land has been bought and construction is to be shortly begun. A large tract of land has been bought at Pasco, Wash., where a yard and freight terminal will be built for the joint use of the Northern Pacific and the Portland & Seattle.

The principal results of operation for the last two years are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 5,401 | 5,315 |
| Freight earnings | $44,041,467 | $36,861,132 |
| Passenger earnings | 14,368,221 | 11,334,852 |
| Gross earnings | 61,223,476 | 50,722,886 |
| Maint. way and structures | 7,493,730 | 7,345,821 |
| Maint. of equipment | 5,944,119 | 5,053,586 |
| Conducting transportation | 15,673,348 | 12,565,740 |
| Operating expenses | 31,095,432 | 26,808,759 |
| Net earnings | 30,128,043 | 23,914,127 |
| Net income | 22,487,741 | 17,126,241 |
| Appropriated: betterments, &c. | 6,081,980 | 3,000,000 |
| Year's surplus | 5,555,760 | 3,276,242 |

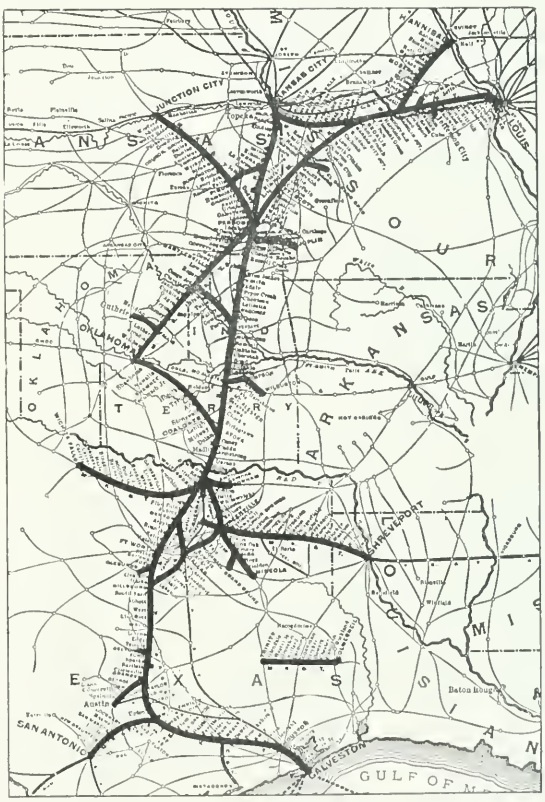
## Missouri, Kansas & Texas.

A year ago the statement was made in the annual report that, owing to the defective plan of reorganization which made it necessary to apply to improvement of the property all surplus revenue and to use the company's credit in paying for necessary equipment, dividends could not be thought of until the equipment notes were met and cancelled. Owing, however, to the rapidly increasing credit of the company and the prosperity which it has continued to enjoy during the past year, a first semi-annual payment of 2 per cent. was made on May 10 on the preferred stock. The conditions referred to in the last report as precluding an immediate consideration of such a dividend were previously removed by the sale of $10,000,000 general mortgage 4½ per cent. bonds. These bonds provided funds for retirement of the equipment obligations amounting to a little more than $4,000,000 outstanding on January 1, 1906, the date of the mortgage, and serve to reimburse the treasury for expenditures made and to be made in reduction of grades, betterment of alinements, rail renewals and other improvements to the line north of the Texas boundary. The proceeds of these bonds have substantially relieved the existing and prospective drain on current revenues caused by the necessity of providing out of earnings for the large equipment payments and betterments. As the case now stands betterments north of the Red river—that is, on the lines which do not fall under the jurisdiction of the Texas Railway Commission—may be capitalized. The beginning of dividends marks the full return to prosperity of the Missouri, Kansas & Texas. Previous earnings were satisfactory, but there was the constant handicap that the expense of improvements could not be met except out of a small surplus.

The gross earnings of the year were over $21,000,000, an increase of $1,118,050 over 1905. Of this increase $834,499 came from freight and $222,289 from passenger traffic. Operating expenses were larger by $422,000, and net earnings increased by $696,188. The operating ratio was 73 per cent., against 75 per cent. in 1905. Even after the new charge of $260,000 against income for the semi-annual dividend of 2 per cent. on the preferred stock, there was a profit and loss balance for the year of $798,424 against $29,000 in 1905.

The increase in passenger earnings is notable, in view of the fact that the previous year included the large traffic of the closing months of the St. Louis Exposition. The increase of only $110,000 in conducting transportation expenses is also noticeable as indicating efficiency in handling the larger traffic, especially as $101,000 of it is, according to the company's statement, due to the coal strike. A supply of 151,000 tons of coal was laid in, and the extra fuel cost was due to double handling and the higher price paid. Reduction of operating cost was also helped by improvement in car and train loading, the revenue tons per car mile being 14.2, against 13.4 in 1905, and the revenue train load 218 tons, as against 205 tons in 1905. There were also small increases in the average car mileage per car per day and in the per cent. of loaded to empty car mileage. Maintenance of way cost $1,231 per mile, as compared with $1,197 in 1905 and $933 in 1904.

Coal furnished a considerably smaller percentage of the total traffic than in 1905, both on account of the strike and because the territory for the sale of coal mined along the road was somewhat restricted by withdrawal of coal rates by the Missouri Pacific and Rock Island. The tonnage of grain was nearly doubled, as well as its percentage of the total traffic. There were 1,057,465 tons of




Missouri, Kansas & Texas.

manufactures and merchandise carried, against 971,684 tons in 1905. The report mentions that there has been a marked increase in the traffic of new lines in Oklahoma, in spite of the coal strike, the shortage in the cotton crop and almost complete suspension of activity in the oil field. Freight rates were better maintained throughout the year by all competing lines than at any previous time. Mail earnings were increased by $125,000 by putting on a fast mail train from Parsons, Kan., to Denison, Tex., running in connection with the Frisco system.

Reduction of grades north of the Red river, which is necessary before any large increase in train load can be made, is now actively under way. Between Atoka, Ind. T., and the Red river, 50 miles, a north and southbound maximum grade of four-tenths of 1 per cent. compensated is to be obtained. Original estimates were to reduce grades to 0.5 of 1 per cent. southbound, and allow northbound grades to remain at 1 per cent. compensated. North from the Red river there will be a new line with 0.4 per cent. grade compensated for eight miles, which will be used by northbound trains, making a double track on that part of the road. It is expected that the whole work between the Red river and Atoka will be finished in 1907.

Surveys are now being made between Atoka and McAlester, Ind. T., and improvement of this part of the line is soon to be begun.

Work on the new shops at Parsons, Kan., has been under way during the year, the necessary grounds secured, the site graded, sewer work completed, foundation for the main erecting shop, blacksmith shop and paint shop laid and erection of steel structures under way. These shops are to be in operation by the end of the calendar year. A large freight house has been built in Kansas City, ground for which was acquired at the time of last year's report. Part of the filling for the Kansas City freight terminal has been done in the outer yards, where a roundhouse and other locomotive facilities have been built. No new mileage was built or acquired during the fiscal year, but on the first day of the present fiscal year (July 1, 1906) joint operation of 30 miles of track of the International & Great Northern between Austin, Tex., and San Marcos was begun under a fifty-year contract. This gives an outlet southwest from Austin and makes a saving in distance and time between San Antonio and northern points.

The Missouri, Kansas City & Texas has the advantage, as well as the disadvantage, of being an independent line. It is handicapped because its competitors are most of them parts of one of the larger and stronger systems. On the other hand, it is especially popular in its territory, probably because it is not controlled by one of the larger corporations. Every increase in the proportion of grain sent for export via the Gulf will be to its advantage, for it connects Kansas City with Galveston over a line which is now reasonably efficient, and which is to be made more so. Its financial requirements are for the time being met by the new bond issue and dividends have been begun on its stock. Provided the Southwest continues to increase in wealth and prosperity at its present rate, the road appears to have a bright future before it.

The principal results of operation for the last two years are as follows:

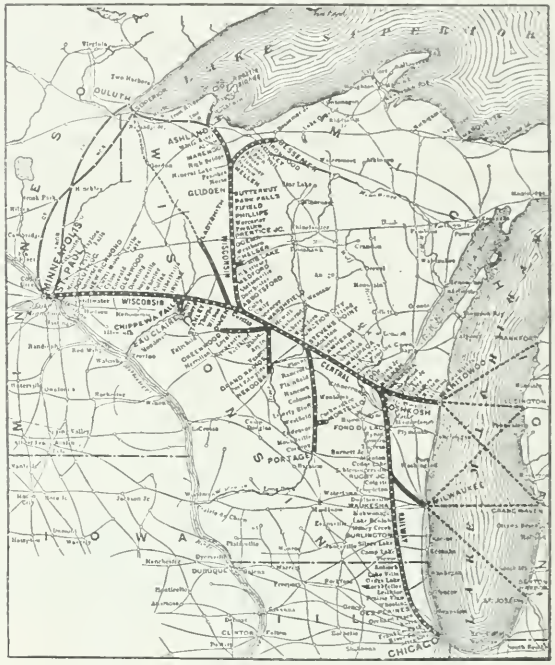
| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 3,043 | 3,043 |
| Freight earnings | $14,968,834 | $14,134,335 |
| Passenger earnings | 5,157,881 | 4,935,992 |
| Gross earnings | 21,159,145 | 20,011,095 |
| Maint. way and structures | 3,746,241 | 3,643,201 |
| Maint. of equipment | 2,044,313 | 1,925,195 |
| Conducting transportation | 8,224,348 | 8,114,061 |
| Operating expenses | 14,990,298 | 14,568,436 |
| Net earnings | 6,168,847 | 5,472,659 |
| Net income | 1,653,088 | 1,267,191 |
| Year's surplus | 798,424 | 29,049 |

## Wisconsin Central.

The Wisconsin Central runs from Chicago north and northwest to St. Paul and Minneapolis, with branches from Abbottsford, Wis., north to Ashland on Lake Superior, and from Menasha east to Manitowoc on Lake Michigan. It owns and operates 917 miles of road, including the branches mentioned and shorter branches, and has 60 miles of trackage rights. A line is being built from Owen, Wis., northwest to Duluth, 100 miles. On this line the 42-mile section from Owen to Ladysmith, built by a subsidiary company, the Owen & Northern, was opened to traffic on August 6th of this year. The rest of the extension is being built by the Lake Superior & Southeastern. The Wisconsin Central some months ago amended its articles of incorporation to allow it to take over both of these subsidiary companies. A mortgage was made on these lines built, and to be built, securing an issue of $7,000,000 first mortgage, 30-year, 4 per cent. bonds, whose sale furnished funds for retiring the issue of $5,000,000 five-year 4½ per cent. notes dated July 1, 1905, and for paying other debts incurred in the building of the Duluth extension. The parent company is also to pay, from its surplus, $1,000,000 of the cost of the new lines. The $8,000,000 thus accounted for covers the estimated cost of the line and terminals.

A month ago it was announced that the Wisconsin Central stock held by Edward Sweet & Co.; Maitland, Coppell & Co.; Brown Brothers, and James B. Colgate & Co. had been sold to interests represented by W. A. Bradford, President of the Chicago, Cincinnati & Louisville, and associates. W. L. Bull, chairman of the board, resigned and was succeeded by George M. Cummings, chairman of a protective committee of preferred stockholders. The preferred stock is entitled to 4 per cent. dividends with the provision that if such dividend is not paid for two successive years after July 1, 1904, the preferred stockholders have the right to elect a majority of the directors. It is supposed that the change in control was an outcome of this condition, since no dividend has been yet paid on this stock. Following the change in control, Mr. Bradford was made President, succeeding H. F. Whitcomb, and a new board of directors was elected. It is interesting to notice that the Chicago, Cincinnati & Louisville, of which Mr. Bradford remains President, recently made arrangements with the Illinois Central for an entrance into Chicago, giving it connection with the Wisconsin Central.

The gross earnings of the company for the year ended June 30, 1906, were $7,120,000, which compares with $6,650,000 in 1905. A great part of the tonnage of the road is in iron ore, and the tremendous demand for iron and steel during the last year has been the prime factor in this increase in earnings. Operating expenses were $4,540,000, a small increase in proportion to the increase in gross earnings, the expenses in 1905 having been $4,370,000. The largest increase under this head was in conducting transportation, which rose 6 per cent. Maintenance of way and general expenses cost slightly less than last year, while maintenance of equipment increased 4 per cent. While the maintenance charges are low, it is




Wisconsin Central.

to be remembered that the freight density on this road is less than on other competing lines in its territory.

The principal statistics of operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 977 | 977 |
| Freight earnings | $5,317,237 | $4,930,220 |
| Passenger earnings | 1,481,175 | 1,105,126 |
| Gross earnings | 7,118,516 | 6,650,884 |
| Maint. way and structures | 959,723 | 866,203 |
| Maint. of equipment | 805,666 | 776,650 |
| Conducting transportation | 2,618,434 | 2,466,141 |
| Operating expenses | 4,542,477 | 4,374,336 |
| Net earnings | 2,576,100 | 2,276,547 |
| Net income | 802,188 | 555,844 |
| Year's surplus | 363,517 | 66,397 |

## NEW PUBLICATIONS.

*Report of the Electric Railway Test Commission to the President of the Louisiana Purchase Exposition.* J. G. White, Geo. F. McCulloch, James H. McGraw, H. H. Vreeland, W. J. Wilgus, Commissioners. New York: McGraw Publishing Co. 621 pages; 212 illustrations; 6 in. x 9½ in. Price, $6.00.

This is a report of the work done under the Electric Railway Test Commission at the St. Louis Exposition, and forms about the most comprehensive collection of data that has thus far been brought together. The tests were of five kinds: Service, acceleration, brake, alternating current losses and train resistance. The results should be of great value to street railway managers, both in their choice of equipment and for operation. The report, unfortunately, is not as well fitted to practical use as it should be. A concluding chapter giving a general summary and comparison of the results should have been added. There is a discussion of the results at the end of each chapter, but this is not always clear. With these exceptions the report is admirably complete.

The tests of single-truck and double-truck cars showed that the average watt-hours per ton mile are 162 for a single-truck car and 122 for the double-truck car. While the average per car-mile was not much less for the single-truck car, the weight of this car was little more than two-thirds that of the double-truck car. It would appear that, of the two, the operation of the double-truck car is far more economical.

The brake tests confirmed the already known fact that a higher

average schedule speed can be maintained by using the air-brake than where the hand brake is used. The difference is about 7 per cent. The additional expenditure of power is saved by the greater time during which a car can be allowed to drift after shutting off the current before applying the brakes, because the application of the air-brake takes less time. It is to be regretted that the tests did not include a measurement of this interval, which would have made a valuable addition to the data already existing on this subject.

Another point of great importance that has been settled is the effect of the form of the front end or vestibule on train resistance. End resistances at different speeds were taken with floating vestibules that were flat, in the form of a paraboia, of a parabolic wedge and of the standard curved form. As would be expected, the flat vestibule made the greatest resistance at speeds of from 40 to 60 miles an hour. At 60 miles an hour, this resistance was from 20 to 40 per cent. greater than when the other forms were used. Below 40 miles an hour there is not much difference. It appears also that the form of the rear of the car has an important influence, and what is best for the front is not necessarily the best for the rear. These instances are cited to show how thoroughly the work was done and of what practical benefit in a saving of dollars and cents in railroad operation the data may be to officials who will but take the time to study and make the most of the information set forth in this report.

# CONTRIBUTIONS

## The Marshall Valve Gear.

Louisville, Ky., Oct. 29, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

At the last convention of the American Railway Master Mechanics' Association a paper was presented by Mr. C. J. Mellin on Special Valve Gears for Locomotives in which reference was made to the Hackworth valve gear, and to the fact that in the case of the Hackworth gear the vertical displacement of the axle in the pedestal jaw affects the steam distribution. Two motion diagrams of the Marshall valve gear (a modification of the Hackworth gear) worked out by the writer and reproduced in the *Railroad Gazette* May 29, 1903, give a clear idea of the kinematic features of that year. The accompanying drawings show an adaptation of the Marshall valve gear to locomotives wherein the disturbing effect on the

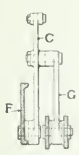


Fig. 2.

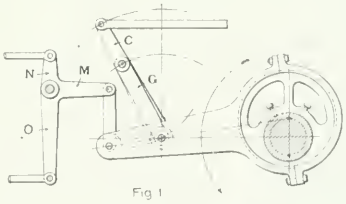


Fig. 1

Fig. 3.

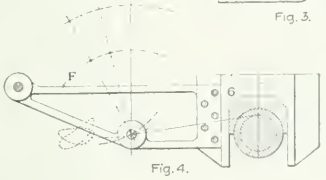


Fig. 4.

lead and cut-off, due to the vertical displacement of the axle, is obviated. It will be seen that the principal parts of the motion gear are carried by the beam F, which is bolted to the driving box 6. This arrangement causes the whole gear to rise or fall in unison. Flat valves may be driven through the arm N of the valve-operating bell-crank M N O, or a piston valve of the inside admission type can be driven through the arm O of the bell crank. Figure 2 is a transverse view of the supporting beam, the arm C for sustaining the guiding link G. Fig. 3 is a plan of the eccentric rod or combination lever.

It is the belief of the writer that proportions can be assigned to the Marshall valve gear, for application to different types of locomotives, that will give as satisfactory steam distribution as the Stephenson link motion or the Walschaert valve gear under all conditions.

HARRY CORNELL.

## Specifications for Direct Current Relays.*

*1. Type.*—All relays must be of the enclosed type with all working parts enclosed in a transparent case.

All relays should be sufficiently water-tight to stand a water immersion test of at least 10 minutes.

*2. Material and Workmanship.*—Magnet cores and armatures shall be made of the best quality of soft annealed iron, and all other materials used in the construction of relays shall be of good quality, free from defects; workmanship and finish shall be satisfactory to purchaser.

*3. Armature Supports.*—Armature supports must be securely mounted on the magnet cores, or the armature supports and cores may be mounted on the same piece of metal, in such manner that the same relative position of armature and cores faces will always be maintained.

Trunnions of armature bearings shall be hard drawn German silver, shall be cylindrical and at least $^1/_{16}$ in. in diameter.

Trunnion screws must fit tightly in their supports and be provided with jamb nuts.

*4. Armature.*—Armatures shall be parallel with face of cores when relay is energized. Springs, adjustable stops or other means of adjusting armature vertically will not be permitted.

A minimum air gap of $^1/_{64}$ in. between armature and magnet cores shall be insured by bone or brass pins driven in end of cores or in armature.

Stop pins must be driven firmly to the bottom of the holes drilled for their reception and secured by cupping.

*5. Contact Springs.*—Contact springs or fingers shall be mounted rigidly on the armature not less than $^3/_8$ in. from nearest face of same and shall be sufficiently heavy to retain any adjustment they are given.

*6. Contact Points.*—All contact points shall make sliding contact.

Stationary front contact points of track relays shall be of non-fusible materials and back contact points shall be of platinum.

A closed contact shall not have more than 0.13 ohms resistance.

All contacts shall have a minimum opening of $^1/_{16}$ in.

*7. Magnet Coils.*—All magnet coils must be form wound and convenient of application to core; all insulation shall be applied before coils are assembled on cores and when assembled they must be securely held to prevent vibration.

The wire for magnet coils shall be soft drawn copper covered with a good quality of silk or cotton braid or equally good insulation and of proper size to give resistance specified.

The ends of wires connecting magnets shall be soldered, non-corrosive flux being used.

Terminal wires of magnet coils shall not be less than No. 20 B. & S. gage.

Magnet coils shall be encased to prevent mechanical injury to wire.

*8. Binding Posts.*—Binding posts shall be of brass of such cross section that they will not turn in the base or frame on which they are carried. The stud carrying thumb screws for fastening wires shall not be smaller than 10-32.

*9. Insulation.*—An air gap of not less than $^3/_8$ of an in., or approved insulation equivalent thereto shall be provided between any part of the relay carrying current and any other part thereof. Parts so insulated shall withstand a test with an alternating current of 3,000 volts for one minute.

*10. Resistance.*—All track relays shall be of 4 ohms resistance, unless otherwise specified.

*11. Adjustment of Relays. Track 4 ohm.*—Four ohm track relays shall be adjusted to release at not less than 30 mil-amperes after an initial charge of 110 mil-amperes has been given for one minute.

After relay has been adjusted to release as specified, the current through coils shall be reversed when armature shall pick up at not more than 65 mil-amperes.

*Sixteen ohm.*—Sixteen ohm track relays shall be adjusted to release at not less than 14 mil-amperes after an initial charge of 55 mil-amperes has been given for one minute.

After relay has been adjusted to release as specified, the current through coils shall be reversed, when armature shall pick up at not more than 36 mil-amperes.

*All Track Relays.*—If after a relay has been adjusted as specified, the front contact points are adjusted so they do not make contact when relay is energized, the initial charge is applied and gradually reduced to 40 per cent. of normal release current, the armature shall release.

*12. Adjustment of Relays—Line Relays.*—Relays shall be adjusted so armatures will pick up and give good sliding contact as follows: One hundred ohms at not more than 1.7 volts; 250 ohms at not more than 2.6 volts; 500 ohms at not more than 3.6 volts; 750 ohms at not more than 4.4 volts; 1,000 ohms at not more than 5.0 volts.

*Committee Report, Railway Signal Association, Washington meeting.

After being adjusted as specified the voltage required to pick up the armature shall be increased 100 per cent. and then gradually decreased by means of a variable resistance, and armature shall release when voltage is reduced to 40 per cent. of the voltage required to pick up same.

*All Line Relays.*—If after relay has been adjusted as specified the front contact points are adjusted so they do not make contact when relay is energized, and the voltage required to pick up armature increased 100 per cent. is applied and gradually reduced, relay shall release at not less than 10 per cent. of the pick up voltage.

*13. Residual Magnetism.*—Before adjusting all relays of less than 100 ohms resistance must be subjected to a momentary e.m.f. of not less than 40 volts, and all relays of more than 100 ohms resistance must be subjected to a momentary e.m.f. of not less than 100 volts nor over 500 volts.

*14. Sealing and Marking.*—All relays must be sealed with the manufacturer's seal, and all adjustments marked plainly in the sealed portion of the relay.

*15. Test After Assembling.*—All tests are to be repeated after relay has been assembled and sealed.

*Addendum.*

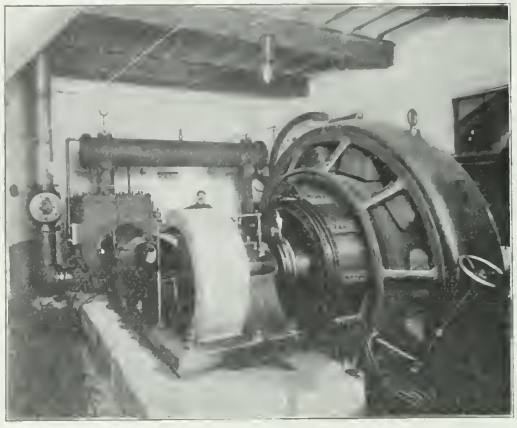
The Union Switch & Signal Company, the General Railway Signal Company, the Hall Signal Company, and the Federal Signal Company have recently agreed upon a standard set of symbols to be used in making drawings of signal circuits, etc., which agree with but contain a larger number of symbols than the Association has adopted to date. It is recommended by the committee in the interest of promoting standards and in view of the beneficial results which may be expected if all railroad and signal companies used the same symbols, that the additional symbols appearing in the signal companies' standard list be adopted by the Association and added to those in present use.

L. R. Clausen, Chairman, C., M. & St. P.; W. A. D. Short, Ill. Central; V. I. Smart, C. & E.; C. E. Denney, L. S. & M. S.; E. A. Everett, M. C., Committee.

## The Pennsylvania Tunnels Across Manhattan Island.

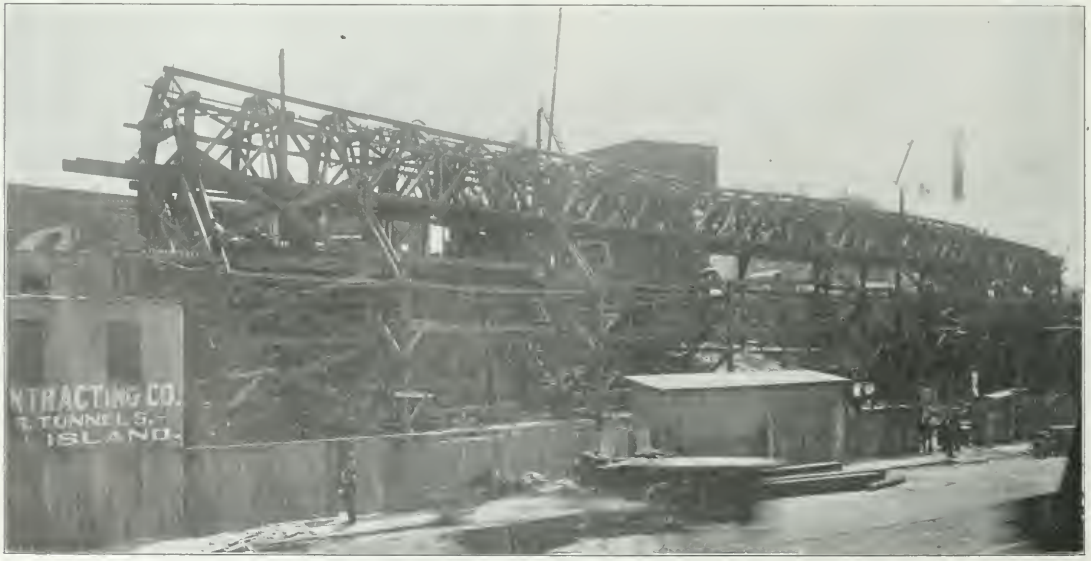
The principal features of the Pennsylvania tunnels under the North and East rivers and Manhattan Island were illustrated and described in the *Railroad Gazette*, Oct. 9 and 16, 1903. In the issues of July 6 and 27, 1906, the method of driving the sub-aqueous tunnels under the East river and the contractor's plant were the subjects of two articles. Through the courtesy of the Pennsylvania, New York & Long Island and the United Engineering & Contracting Co., contractors for the work, we are now permitted to describe the methods and plant used in driving the tunnels under 32d and 33d streets from the shaft at First avenue to the terminal station at Seventh avenue about one mile. A double track tunnel is being driven through rock under both streets without disturbing the surface.

The river tunnels emerge into the two shafts just east of First avenue. These shafts are 63 ft. 3 in. x 32 ft. and are divided by a temporary longitudinal wall of reinforced concrete extending up about half-way to the surface. The west half of each shaft is used by the United Engineering & Contracting Co. and the east half by S. Pierson & Sons, the contractors for the river tunnels. The two lines running under 33d street are designated as A and B and the two under 32d street as C and D. The two lines in each tunnel leave the shafts in separate tunnels, 34 ft. 3 in. center to center and separated by a rock wall 12 ft. thick. They continue west on a 1 deg. 30 min. curve until they strike the tangents under the two cross streets at Second avenue. They converge west of First avenue into parallel twin tunnels separated by a concrete dividing wall. One of the drawings shows the standard twin tunnel section. From the shafts to a point under Fifth avenue the four lines rise on a uniform 1.5 per cent. grade. At this point the twin tunnels widen out into a single arch three-track tunnel, which continues on to the station on a 0.5 per cent. rising grade. The second drawing shows this section. The crown of the twin tunnels is at average depth of about 60 ft. below the street surface, but for the three-track tunnels this diminishes to from 25 ft. to 35 ft. The rock is mica schist and hard gneiss and is of good quality for most of the distance.

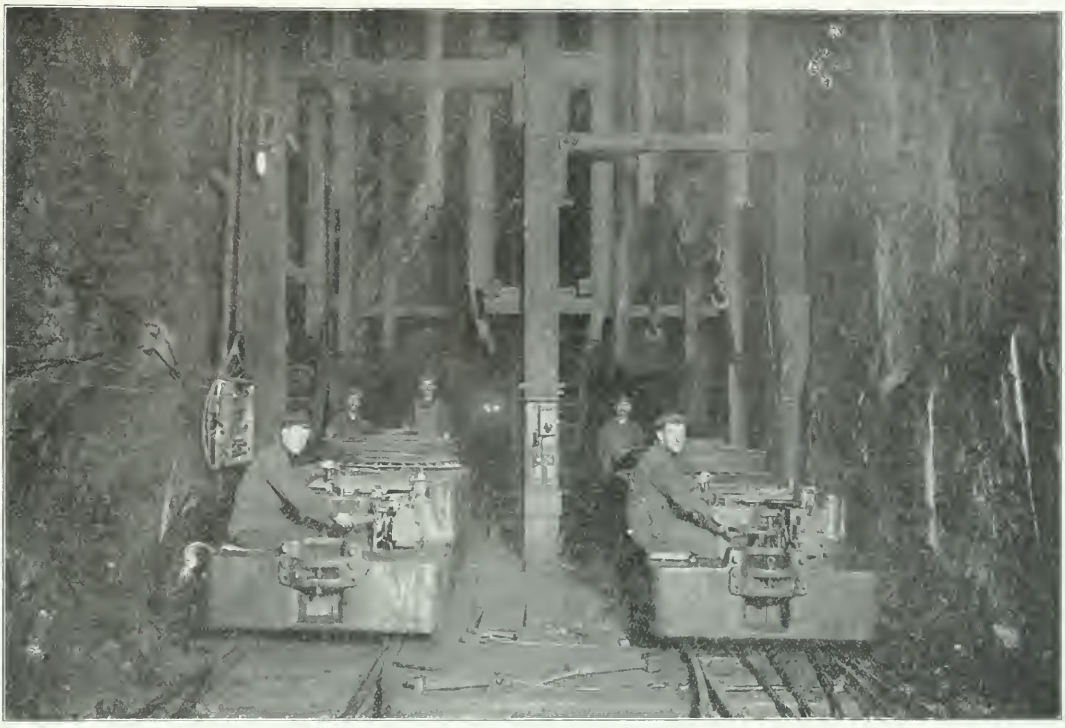


Motor-Driven Air Compressor at River Shaft.

Work was begun by the contractors in July, 1905. The railroad company bought a lot on the north side of 33d street, near Fourth avenue, and another lot on the north side of 32d street between Fourth and Madison avenues for the use of the contractor in sinking shafts and erecting a working plant. Space was also provided at the river shafts. A shaft about 20 ft. x 30 ft. was sunk on each




Telpher Runway at River Shafts; Pennsylvania Railroad Tunnels Under Manhattan Island.



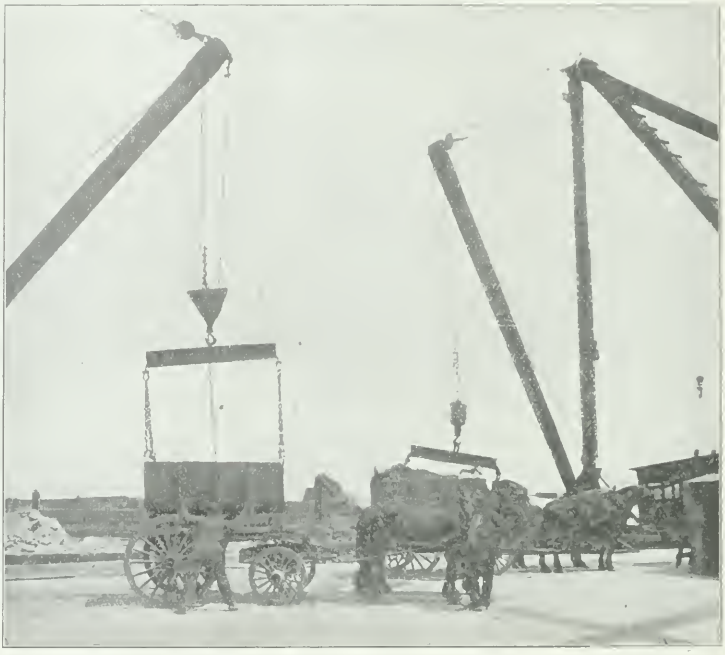
Electric Locomotives at Foot of Fourth Avenue Shaft; Pennsylvania Railroad Tunnels Under Manhattan Island.

After a Blast, Showing Two Headings; Pennsylvania Railroad Tunnels Under Manhattan Island.

of these two sites to the level of the tunnels and cross drifts excavated into the south wall of the tunnels. A sump 10 ft. below the tunnel floor was provided at the bottom of the shafts for draining the workings of surface water. At the river shafts the tunnels were begun in the solid rock, the caissons not having been sunk to the level of the tunnels. Excavation has since been going on continuously, the headings being driven in both directions from the Fourth avenue shafts.

The working plant installed by the United Engineering & Contracting Co. was designed to meet the peculiar conditions existing. West of Fourth avenue the tunnels will pass under a section of the city occupied by heavy and expensive buildings and carrying an enormous traffic on the streets. Real estate values are high and only a limited space was available for the shafts and working plant. It was essential to avoid as much as possible noise, dirt and concussion from blasting. How well this has been done is shown by the few complaints made, although the 33d street shaft is immediately adjoining a large private hospital and across the street from one of the well-known hotels. The 33d street tunnel was driven under the subway station at 33d street and Fourth avenue without loosening a tile in the station walls, although the roof of the tunnel is only 35 ft. below the subway floor. Electricity has been employed throughout in the above ground plant and compressed air from electrically driven compressors for all operations below ground except haulage. Except for the smith's forges in the repair shop not a pound of coal has been burned on the job. Direct current at 230 volts is supplied by the New York Edison Co.

Two compressor plants have been installed, one at 34th street and First avenue for supplying the headings opening from the river shafts and one in the rear of the 33d street shaft near Fourth avenue. The plant at the river shaft contains one Laidlaw-Dunn-Gordon, two-stage compressor with cylinders 32 in. and 20 in. x 30 in. stroke, direct connected to a 480 h.p. Ft. Wayne motor. This compressor will deliver 2,870 cu. ft. of free air per minute at 100 lbs. pressure when running at 100 r.p.m. It was found that this machine could not supply enough air for both headings and two smaller belt-driven compressors were installed. One has a capacity of 650 cut. ft. of free air per minute, and is driven by a 200-h.p. General Electric motor. The other has a capacity of 1,250 cu. ft. per minute, and is driven by two 200-h.p. G. E. motors placed in direct line with both belts running over the one fly-wheel of the compressor. This arrangement was adopted because of the difficulty in getting delivery of a single motor of the power required. These small compressors are also two-stage, Laidlaw-Dunn-Gordon machines. All three compressors discharge through an aftercooler into a large storage tank from which an 8-in. main leads to the shafts, where it divides into two 6-in. mains leading into the two tunnel headings. The water for the aftercooler is cooled in a Barnard cooling tower, through which circulation is maintained by a small direct driven Worthington centrifugal pump. A motor-driven blower also provides for additional circulation of pure air in the tunnels through a 14-in. riveted steel pipe which extends up to the headings. At the river shafts are also a forge shop, machine shop, oil house, sand house for filling tamping bags, powder magazines and carpenter shop.



Loading and Unloading Skips at the Dock.

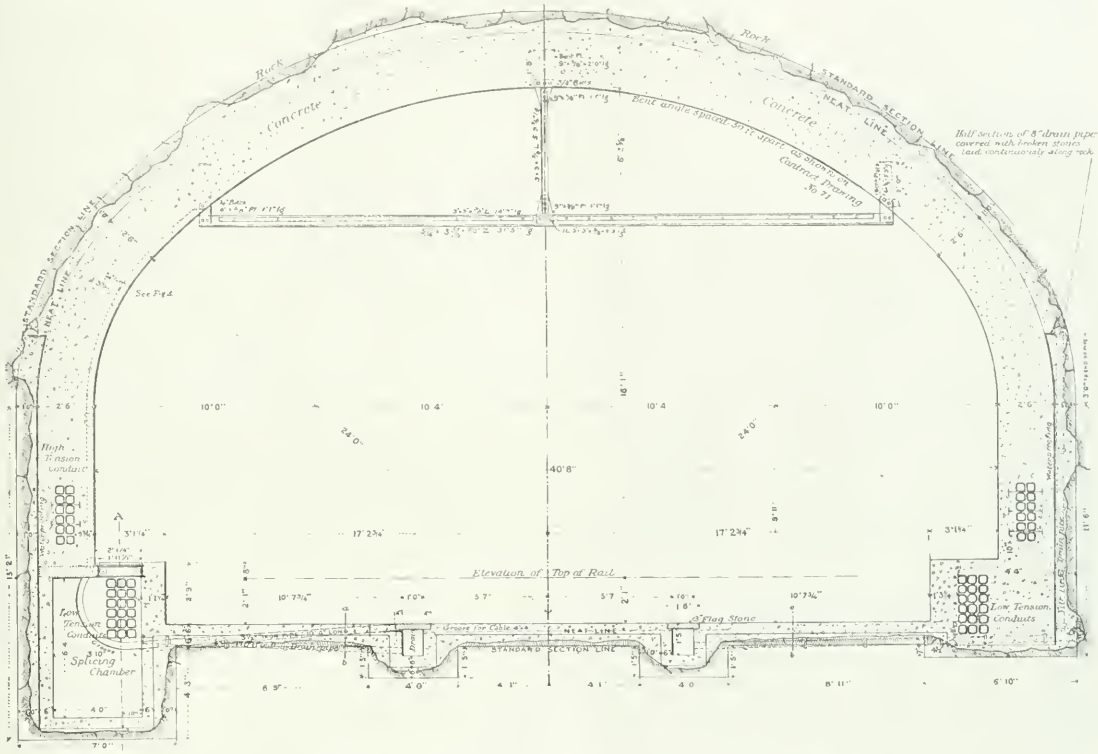
The 33d street compressor plant contains two compressors similar in every respect to the large unit at the river plant. These machines are governed by throttling the intake. They are on concrete foundations resting on solid rock and run with little noise or vibration. They supply air to both the 33d street and 32d street tunnels, a 6-in. main being carried over to the other shaft. A blower is also installed for ventilation.

Lowering a Skip to Wagon at 32d Street Shaft.

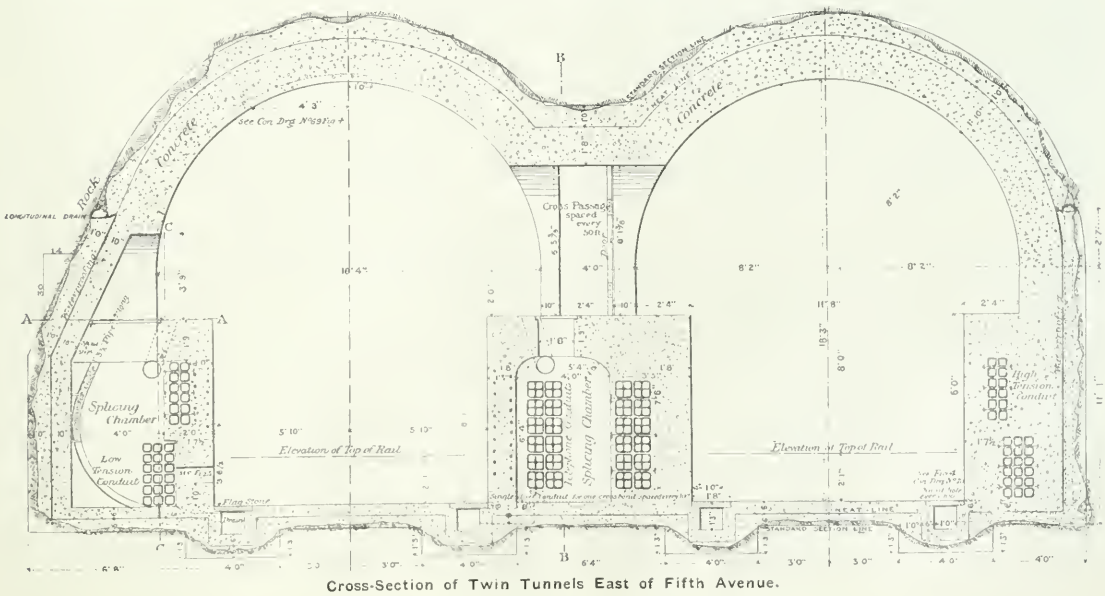
Dumping a Skip over the Scow.

The plant below ground is equally novel. Up to the present time the tunnels each way from the Fourth avenue shafts have been driven with two headings near the crown. These headings are kept a short distance in advance of the bench excavation, and the wall between them is shot out as the work progresses. Owing to the good quality of rock encountered no timbering has been required so far in the 33d street tunnel, but in the west end of the 32d street

tunnel supports are being put in at frequent intervals to prevent falls. The process of drilling, blasting and mucking is carried on alternately at the two headings of each tunnel. After the day's blasting has been finished in the afternoon the drills are put to work immediately and mucking begun at the same time. For this a Marion No. 20, 35-ton, 1½-yd. steam shovel is employed. This shovel is a standard machine with special rock dipper, but the boiler is used as an air receiver and is connected by a flexible hose with the compressor line supplying the drills. It runs on a 3-ft. gage track in the center of the tunnels and has sufficient swing to reach both side walls. A gang of 15 or 20 laborers clears out the headings and the shovel loads from the pile of loose rock into 90 cu. ft. skips on trucks standing on a track between the shovel and the wall. This track has a descending grade away from the heading, and after a skip is loaded the truck is given a push by the shovel bucket and runs back to a siding where trains of four cars are made up. An empty skip is hauled up to the shovel by a cable running up to the shovel around a sheave and then back to a small hoisting engine mounted on a flat car and operated by compressed air. When four cars are loaded they are hauled back by electric mine locomotives to




Cross-Section of Three Track Tunnels West of Fifth Avenue.




Cross-Section of Twin Tunnels East of Fifth Avenue.

the cross drift and in under the shaft to be raised to the surface. These locomotives, which were made by the General Electric Co., weigh 10 tons and have a drawbar pull of 3,500 lbs. They have two 40-h.p. motors and have a speed of six miles an hour. Current is transmitted from two trolley wires suspended from the top of the tunnel by a traveling trolley carriage, which is connected to the locomotive by a cable carried on a reel. This reel may be made to automatically wind or unwind when desired, so that the locomotives can be run beyond the trolley wires which are not carried up close to the headings on account of the danger when blasting.

After mucking is finished at one end of the tunnel the shovel is turned and run to the other end, where the blasting has just been finished. It requires about 24 hours to drill, blast and muck each end.

The loaded skips are pushed under the bottom of the shaft two at a time on parallel tracks and are hoisted by electric telpher hoists to the level of a platform about 12 ft. above the street. The telphers, which were designed and built by the Dodge Coal Storage Co., Philadelphia, are suspended from an overhead single track which is carried on a substantial wooden trestle. They have two carriages, one supporting the hoisting heave and the other carrying most of the weight of the hanging cab and also the traversing motor. These telphers run on parallel tracks from over the shaft to the curb line of the street. The loaded buckets are lifted, carried out and lowered on to trucks in the street below. They are carted through the streets to the company's dock at the foot of East 35th street, where they are dumped into scows. There is no noise and no dirt at the shafts and the operation is carried on day and night without disturbing the neighborhood. There is a down grade all the way to the river, so that a two-horse team has no difficulty in hauling a loaded skip except in winter when heavy snow is on the ground. It is a haul of about half a mile to the dock from the Fourth avenue shafts and about two blocks from the river shafts.

At the dock the buckets are lifted from the trucks, swung out over the scows moored alongside and dumped automatically. This is done with two 40-h.p. electrically driven Lambert hoists. A third hoist of 60 h.p. is used for unloading materials from scows. The skips are made of steel in two halves with hoisting eyes for attaching a spreader beam at the center of the ends. No latches are required to hold the skip shut when hoisting. To dump the skip a tripping rope is used, passing down from the boom point sheave and made with a sling attached to the bottom of the sides. This tripping rope passes around a loose drum on the hoisting engine and is provided with a counter-weight to take up all slack. By checking the tripping rope drum and lowering the fall block about 2 ft. the entire contents of the bucket can be dumped at any desired height over the scow. When the tripping rope is slacked off the bucket closes by gravity and is swung back on the waiting truck to be returned to the shaft. About 50 teams are employed day and night between the shafts and the dock. The railroad company furnishes the empty scows and removes the loaded ones to Greenville, N. J., in New York Bay, where the rock is being used for filling in the new terminal freight yards.

At the present time the tunnel under 33d street has been excavated west from the river shaft to a point between Second and Third avenues, east from the Fourth avenue shaft to a point between Lexington and Third avenues and west to a point west of Fifth avenue. The 32d street tunnel has been driven west from the river shaft to a point between Second and Third avenues, east from the Fourth avenue shaft to a point near Lexington avenue and west to a point between Madison and Fourth avenues.

We are indebted to Mr. D. L. Hough, President of the United Engineering & Contracting Co., for information and to Mr. George Perrine and the New York Edison Co. for the photographs.

## American Railway Association.

The fall session of this Association was held at Chicago, October 24, 220 delegates being present, representing 94 railroads. The membership of the Association now comprises 317 companies, operating 227,462 miles; associate membership, 32 members, 997 miles.

The Association authorized the president to appoint a special committee of nine members to consider the question of the Standard Location for Third-Rail Working Electric Conductors.

The Committee on Train Rules, with the Committee on Safety Appliances, proposes to revise the Standard Code of Block Signal and Interlocking Rules. The Committee on Safety Appliances has made considerable progress in the formulation of a Standard Code of Air Brake and Train Air Signal Rules. Of the 1,861,129 freight cars reported to this committee 92 per cent. are fitted with air brakes.

The Committee on Statistical Inquiry has again revised the form of report for "Railway Transportation Statistics" previously approved, and also some of the directions for compiling the different items, but the report was presented only for discussion, and at the request of the committee it was referred back. Under the provisions of the revised Interstate Commerce Law the committee is confronted with the fact that Congress has authorized the Interstate Commerce Commission to prescribe the forms of any and all accounts, records and memoranda of the movement of traffic; but an informal conference has been had with Professor Adams, the statistician of the Commission, and he says that no drastic regulation is likely to be prescribed. Nevertheless, the committee has laid aside considerable work that it has had in hand until such time as the policy of the Interstate Commerce Commission on this subject has been officially announced. The committee is convinced that while forms of statistics may be recommended for adoption, they should be made sufficiently elastic to be adapted to the requirements of roads operated under widely different conditions and open to the freest amendment. An absolute prescription of the forms would be positively injurious. Improvements in statistical forms must be made as the result of actual experiment, in order to be practically valuable.

The Association formally adopted the Standard Cipher Code which has been compiled, and a resolution was adopted recommending that it be used exclusively by all members of the Association for non-secret cipher messages after January 1, 1907.

The Committee on Transportation of Explosives presented a report in which were embodied the various interpretations which have been rendered in connection with the Regulation for the Transportation of Explosives. A list of roads which have adopted the Regulations also accompanied the report. The committee announced that a meeting of the railroads which have subscribed to the Articles of Association of the Bureau of Explosives would be held in New York City November 21.

The Committee on Standard Rail and Wheel Sections recommended, and the Association approved, an increase of $\frac{1}{8}$ in. in the thickness of the flange in cast-iron wheels in accordance with the action of the Master Car Builders' Association. The committee was instructed to consider standard specifications for the manufacture of rails, in addition to the other questions which it has in hand.

The Committee on Car Service reported its doings in regard to the formulation of a diversion rule, to be effective "only in cases where cars are delivered to specified foreign roads contrary to the expressed wish of the car owners." The committee has given much time and thought to the consideration of the question of an accurate definition of "diversion" and to the penalty that should be imposed, but finds that wide differences of opinion exist among the members of the Association. It also reports having found a strong sentiment in favor of a further increase in the per diem rate, especially on cars of high capacity. The committee deprecated too frequent alterations of the per diem rate. The present rate of 25 cents a day did not take effect until July 1 of the present year, and has been in operation but a few months, not long enough to judge of its effect. The committee recommended that no further change in the rate should be made until after July 1, 1907, when the present rate shall have been one year in effect. The committee proposed alternative rules for a diversion penalty not being able to agree unanimously on any form; but neither was approved, and the report was referred back. Neither was there agreement concerning an increase in the per diem rate, and the letter ballot which is to be taken will offer two propositions, one for 50 cents a day and one for 75 cents. In short, the convention appears to have been too excited to effectively discuss the subject of per diem calmly. A committee of five is to be appointed by the president to consider the subject of a freight car pool, and this committee will very likely endeavor to crystallize the views of the members on the whole subject of car hire and the treatment of foreign cars. The appointment of this committee was the result of a proposition by President Fish, of the Illinois Central, to consider the question of a clearing house. The resolution reads:

*Resolved*, That a special committee of five be appointed by the president to inquire into and report upon the causes of car shortage and the lessening efficiency of equipment, and to recommend remedies, the committee to be authorized to employ such assistance as may be necessary, and that a special assessment of 10 cents per mile operated be levied to meet its expenses, payable December 1, 1906.

*Resolved*, That the communication from Mr. Fish be referred to this special committee, with instructions to consider the formation of a plan under which railroads desiring to pool their freight cars can form a clearing house which will assure to each road at all times the use of a number of cars equivalent to those contributed by it.

Mr. Daniel Willard, Second Vice-President of the Chicago, Burlington & Quincy, was elected First Vice-President. The following railroads were elected members of the Committee on Car Service: Boston & Maine, Chicago, Milwaukee & St. Paul and Delaware, Lackawanna & Western.

The following railroads were elected members of the Committee on Safety Appliances: Chicago & North-Western, Cleveland, Cincinnati, Chicago & St. Louis and Philadelphia & Reading.

The next meeting of the Association will be held at Chicago, April 24, 1907.

## Annual Meeting of Railway Signal Association.

Three of the committee reports presented at the annual meeting of the Railway Signal Association in Washington, October 16, 17 and 18 were published in the *Railroad Gazette* of October 19* and a fourth report, together with portraits of the new President and Secretary and the retiring President, were published last week. Following is an account of the discussions at the meeting, with abstracts of the remaining reports.

### MECHANICAL INTERLOCKING.

At the opening session, Tuesday morning, about 100 members were present. President C. H. Morrison (Erie) presided and the secretary of the association, H. S. Balliet, was secretary of the meeting. Mr. Morrison, in his opening address, spoke of the important work which has been done by the association and the need of enterprise and energy in taking up a wider range of work for the future. The first business done was to amend the constitution so as to permit active members who leave the railroad service to retain their membership if they do not engage in the manufacture or sale of railway appliances or materials. The first report was that of the committee on standard specifications for mechanical interlocking, which presented a revised code embracing numerous paragraphs different from those in the specifications heretofore approved. The meeting took up the report one paragraph at a time and a large number of points were discussed, some of the criticisms resulting in votes approving corrections, but after an hour or two spent in this way some one recalled the stipulation of the constitution that propositions to adopt standard practice or recommendations must be voted on without amendment, and only by senior members, the votes of two-thirds of the seniors present being required to carry any point. But on the declaration of a prominent member that as "between frinds" a constitution should not count, the meeting enthusiastically approved the whole code, as amended. Following are the more important amendments approved:

Article 3, last line, add "and provide space for all connections."

Article 27, last line, each *spare* lever space.

Article 39, second paragraph, 8 feet, change to 6 feet.

Article 48, *high* home signals.

Article 49, rivets for pipe plugs to be $1^{31}/_{32}$ inches long.

Article 50, 5 feet from gage line of nearest rail. Cut out reference to long ties.

Article 52, expunged.

Article 128, $6^1/_2$ inches or $8^3/_8$ inches diameter.

Article 144, 6 feet from gage line of nearest rail.

Article 158, 2 inches diameter over all.

Article 172, concrete *not less than* 3 x 3 x 3.

Article 173, same change.

Article 174, cut out first eight words, and read: "Iron piers shall be set," etc.

Article 210, two coats of black paint.

Article 219, all wooden boxing shall be painted two coats., etc.

### SPECIFICATIONS FOR ELECTRIC INTERLOCKING.

The meeting next took up seriatim the standard specifications for all-electric interlocking. These were discussed in the same way as the others until it became evident that the subject would take up an inordinate amount of time, when, at Article 27, the report was referred back to the committee. In this report Article 3 was changed to have a blank in place of "signal engineer" and Articles 6 and 25 were changed in the same way. In Article 11 the requirement to furnish stroke completers was cut out. In Article 13 the last sentence was cut out. Article 17 was cut out entirely.

### STORAGE BATTERIES.

The report on installation and maintenance of storage batteries (which was printed in the *Railroad Gazette* October 19) was accepted as a progress report after but little discussion. This report proved in the main acceptable, but the recommendations were held applicable only to batteries of low voltages.

### A NEW SYSTEM OF SIGNALING.

Following this the committee took up committee report H. This report, made by a committee of members who are members of the Signal Committee of the American Railway Engineering & Maintenance of Way Association† sets forth "a complete system of signaling for proper handling of traffic." The report was printed last week. It was not formally accepted, and is likely to be amended both in form and substance, the meeting having referred it back to the committee. It is of interest, however, as a radical departure from present practice in a number of features. In most of its recommendations the committee report agrees with a report made some months ago to the general managers of the Pennsylvania Railroad Lines both east and west of Pittsburg, by Messrs. A. H. Rudd and Frank Rhea, and Mr. Rudd was the chief spokesman for the committee. The illustrations given in the *Railroad Gazette* have been corrected, those shown with the report as issued by the association having been in some respects inaccurate. Those on the two pages of the pamphlet following diagram No. 2 were printed by mistake and have no connection with the report. The diagrams headed "suggestions" are not touched upon in the report itself and the discussion ended before they had been reached.

The principle that a semaphore should give its indication in the upper right-hand quadrant was approved by the association a year ago, though the three-position principle was not then voted on. This being so, the first important point taken up was the matter of two lights (second recommendation, paragraph d). This principle was perhaps more seriously criticised than any other. The use of a second light where there is no diverging track, and where the light has to be constantly red, is regarded by many as an unnecessary expense, besides making one more red light to disturb runners of fast trains. It was stated, on behalf of the committee, that the views expressed in this report had received the decided approval of a good number of officers, some of them high officers, of the Pennsylvania Lines. In reply to the question how it would be possible to secure the approval of men who deem it highly important to relieve runners of fast trains of every possible red light, it was said that that idea was impracticable. Those who try to get rid of all red lights always fail in practice, though they stick to their theory. Runners of fast trains are encountering red lights constantly at interlockings and it is futile to try to do away with the alleged disadvantage. The main object in making the two-light arrangement uniform is to make it easier for enginemen to quickly identify signals. On the Delaware, Lackawanna & Western, when its signaling plans were revised about six years ago, the lower light on the high posts at diverging junctions was arranged to be obscured when the arm was horizontal, and that plan was followed for some time, but it proved unsatisfactory, as, in some cases under peculiar circumstances, enginemen not sufficiently vigilant would go through the junction at too high speed. If lights were always perfect the committee would not have felt warranted in recommending the two-light arrangement. The most common cause of light failures is inadequate or unskilful attendance and this is a difficulty sometimes hard to remedy. The committee believes that the cost of the additional light and its maintenance (with long-time burners) is very small compared with the added safety.

Mr. Rhea, in giving his experience with enginemen who run under the three-position automatic block signals on the Pennsylvania Lines west of Pittsburg, said that the runners liked the three-position idea in the daytime but not in the night; and, on analyzing their objections, he found that at night they wanted two lights, not because they made a better signal to read, but because the signal was easier to locate.

Mr. J. B. Stewart, General Superintendent of the Boston & Albany, being present, was invited to take part in the discussion. Mr. Stewart said that he approved the upward inclination of the semaphore arm and hoped it would prevail. A committee of the New York Central Lines had voted in favor of it sometime ago. Voicing the views of those who believe that the committee is unnecessarily multiplying signal indications, Mr. Stewart argued in favor of simplifying and reducing them. The engineman of a fast train must have the least possible variety. The Boston & Albany, on its semaphores, had formerly used lights in a vertical line, and in a horizontal line, but the arrangement was abandoned and single lights substituted, because it was believed that the position or shape-lights could not be distinguished far enough away for enginemen running at the very highest speeds. He thought that the additional light was not needed to make a signal more easily identified, especially in a country of diversified topography such as the Eastern states; on the prairies it might be all right. Mr. Stewart also asked why the committee had ignored disk signals. These are in extensive use in New England and if, by a committee report, they are outlawed, a railroad using them will suffer in its reputation, for the public will think it is not up with the best practice.

Mr. Rudd, replying to Mr. Stewart, declared that the committee had not multiplied indications at the expense of simplicity. He called attention to the fact that, contrary to the impression gained by some, the committee had provided no more indications for night signaling than for day signaling. Criticisms of the arrangement of lights in a diagonal line are based on a misapprehension. The runner never has to distinguish between lights arranged diagonally and lights arranged vertically until he gets very near to them. Many criticisms of signal lights are based on the assumption that no distant signal is provided—or, rather, the critics forget that, with the distant signal, the two lights on a signal—any kind of signal—do not need to be distinguished one from the other at a great distance. The distance between the two lights in the committee's report (6 feet) is the same as that now existing between home and distant arms. As to conditions in the East as compared with those in the West, the two lights are more necessary in the

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*"Storage Batteries," Oct. 19, page 333. "Disturbances by Foreign Currents," Oct. 19, page 335. "Specifications for Rubber Insulated Wire," Oct. 19, page 334. "New Scheme of Signaling," Oct. 26, page 368. Editorial on "New Signaling Scheme," Oct. 26, page 350. Portraits of Officers, Oct. 26, page 358.

†Committee:

| | | | |
|---|---|---|---|
| W. A. D. Short, | C. C. Anthony, | C. A. Dunham. | J. A. Peabody, |
| A. H. Rudd. | H. S. Balliet. | G. E. Ellis. | T. S. Stevens, |
| Azel Ames, Jr. | L.R. Clausen. | J. C. Mock. | H. H. Temple. |

East as confusing outside lights are more common. To expect the engineman to depend on a big rock behind a barn, or Jenks's sprout lot, to keep his bearings is pretty poor signaling. Mr. Rudd described the installation of upwardly inclined semaphores recently put in service on the Pennsylvania Railroad and described in the *Railroad Gazette* of October 19.

The committee provides for the use of five colors: green, red, yellow, purple and lunar white. White is not used as a marker. As to disk signals, the scheme proposed by the committee is for new work. It does not conflict with present signals or practice and does not forbid the use of disks. No one denies that the disk has done magnificent service. A prominent superintendent has expressed his willingness to put in the upwardly inclined signals at one or many points on his road one at a time, mixing them in with signals of the present pattern.

Mr. Clausen: No railroad should suffer for continuing to use disk signals. They are too numerous and have too settled a reputation to be disturbed by any action of any association. If we can adopt nothing new without fully retaining everything that is old, how can we ever make progress? A second light does make a slight increase in cost, but the increease will be very gradual and the advantage of the new system is so greeat that the increased expense is justified.

Mr. Rhea, replying to a criticism of his advocacy of a rule forbidding permissive block signaling, explained that he referred only to practice under the telegraph block system. Discussing the indications recommended in the report he called attention to the fact that in the scheme there is no such thing as a distant signal.

Mr. Yocum (P. & R.): We use a few disk signals [several hundred miles] and we have no fault to find with the report on this score.

Mr. Peabody (C. & N. W.): We believe the disk is a first-class signal, and we have put enclosed disks in service this year on 300 miles of double track line.

Mr. Rudd, answering further questions, alluded to the advantage of being able to give a distant indication at every signal. Under present practice, where a station has a home and a starting signal and perhaps another stop signal between these two, enginemen will pass a distant signal which stands against them and then, finding the first home signal clear, will proceed, assuming that the starting signal will be clear also; and thus they have got into trouble. The proposed scheme provides against this by furnishing a distant indication for every signal of any grade. A clear distant indication never gives authority to proceed more than to the second signal beyond.

The first vote taken was on paragraph *e* of the second recommendation, but it failed to receive the ayes of two-thirds of the senior members present. A motion to accept the report only as a progress report was lost, indicating that the meeting was determined, if possible, to approve everything in the report which could be agreed to as genuine progress. To clear the air it was then moved that the association (having already approved the upward inclination) recommend the use for night signaling of green for clear and yellow for caution. This received the unanimous approval of the senior members voting (41). It was then voted, 37 to 2, that the association recommend that where the semaphore is used the indications be given in the right hand upper quadrant; horizontal for stop, 45 degrees for caution and 90 degrees (vertical) for clear.

The discussion of the details of the report proceeded only as far as paragraph *e* under the second recommendation. Paragraph *a* was amended to read on all *high* signals and the last eight words were disapproved. The word "clear" was changed to "proceed" so as to make the term conform to the usage of the American Railway Association, but the weight of opinion among the signal men appeared to be that "clear" is the better word. Paragraph *d* was amended to read two *standard* lights. This much done, the subject was laid on the table, and when it was again taken up the association unanimously adopted the following resolution, presented by Mr. Mock:

"Whereas, Certain fundamental principles contained in this report have received the approval of the Association, it is

"*Voted* that it is the sense of the Association that the submitted methods of displaying the signal indications have advantages over other methods now in general use. We therefore accept the balance as a progress report and refer it back to the committee with instructions to further develop the scheme, with the object of securing their unanimous report."

It may be said that the tone of the discussion was less conservative than would be indicated by this resolution, Mr. Mock's aim being evidently to fully satisfy the conservative view. He assumed, no doubt correctly, that the members present who were not fully convinced of the wisdom of the bold innovations presented by the committee had not sufficiently formulated their objections to give them adequate expression. The most pronounced objections which did find expression were those relating to disk signals, before referred to, and those based on the excessive cost and complication of the additional lights at night.

### RUBBER INSULATED WIRE.

The next report taken up was that on specifications for rubber insulated wire, which was printed in the *Railroad Gazette* October 19. This report was adopted substantially as presented, but not until after a long discussion concerning the alleged severity of the requirements of the specifications. One of the changes made in the report since last year is the omission of the word "dry" before "mineral" in paragraph 2, thus admitting of the use of "dope." The views of the wire manufacturers were presented by four or five members connected with the makers, one of them saying that his claims were backed up by 12 out of the 14 firms making insulated wire. The two others appear to be the firms which are satisfied with the severest possible requirements. The principal points made by the 12 were, that if wire larger than No. 6 is to be furnished in lengths over 1,500 ft., the specifications ought to have a rule such that a market could be found for short lengths; that the insulation resistance test might just as well be far less severe; that multiple conductors ought to be excluded from the requirements of the specifications; that if the buyer comes to the factory and sees 30 per cent. Para rubber put in there is no need of a subsequent test to prove the fact.

The chairman of the committee replied to the last point that the specifications had to be prepared with a view to the needs of the small buyers who could not afford to send an inspector to the mill. The committee will probably prepare specifications for cables and stranded conductors, and negotiate with inspection bureaus with a view to arranging with one such bureau to inspect wire ordered under these specifications. It is hoped that a number of the more important railroads will agree on uniform specifications and arrange to jointly employ a bureau for the inspection of all wire ordered by such roads. One of the questions to be settled in this connection is that of making wire in dull seasons. If the wire is to be inspected when made, some authority must have control of it from that time until a buyer appears for it.

### SIGNAL LAMPS AND OIL.

The next report taken up was that on signal lamps and oil for use in them. The chairman of this committee is Mr. C. C. Rosenberg. The committee says that the only satisfactory design of lamp is that with top draft ventilation. The interior construction should be such that the inflowing air shall not come directly over the chimney, as with the small size long-time burners it may extinguish the flame. The air should descend into the body of the lamp by means of a vertical perforated cylinder forming the side walls and an imperforate upper wall, the two being connected by an inclined cone. The air chamber thus formed should be divided into parts by the use of vertical wings. Another method is to have a solid cone, bell shaped, at the bottom with two perforated plates, the upper or smaller of the two to have circular perforations, the lower plate to have elongated perforations. By the use of either of the systems described, the air entering the top of lamp follows the outside of cone, passes through the perforations and diffuses, thus breaking a straight draft, strikes the inside of body of lamp which it follows, thereby preventing any condensation or sweating on the sides of lamp or lenses.

On one road having 4,030 lamps in use, 3,700 of these having long-time burners and 80 per cent. having bottom draft, the record for the year ending June 30, 1906, shows 492 failures, classed as follows:

| Cause of failures. | No. reported. | Draft— Top. | Draft— Bottom. |
|---|---|---|---|
| Broken chimneys | 56 | 9 | 47 |
| Defective fittings | 81 | .. | 81 |
| High wind | 74 | .. | 74 |
| Light wind or smothered | 260 | .. | 260 |
| Smoked chimneys | 21 | .. | 21 |
| Total | 492 | 9 | 483 |

Of the 81 failures due to defective fittings, 35 were due to leaky founts; these were made of tin and had been in service several years. The other items were defective burners, broken reflectors and poor wicks. In no case has a top draft lamp of either of the two designs mentioned been found to have flame blown out by high winds or has it failed to give a full flame if properly looked after.

The committee made tests of six samples of illuminating oil and recommended the following specifications:

#### SPECIFICATIONS FOR ILLUMINATING OIL.

Samples must not flash below a temperature of 110 degrees Fahr. in the "Elliot" closed cup, nor burn below 160 degrees Fahr., in the Tagliabue open cup when heated at the rate of 2 degrees per minute and flame applied every 2 degrees beginning at 100 degrees temperature.

Must be not less than 47.3 Baume, or .7896 specific gravity.

Must be strictly water white in color and remain perfectly clear and transparent when cooled to a temperature of zero and held there for 10 minutes. Oil must be perfectly neutral showing neither acid nor alkaline reaction.

A sample will be taken from each carload or part carload lot (either in bulk or in packages) and such sample shall be considered representative of the entire shipment.

All samples will be taken with a thief.

The oil must burn steadily and clearly in a suitable lamp, without smoking and with a minimum incrustation of the wick for a period of at least 100 hours.

Any sample failing to meet all the requirements of this specification will be condemned and the shipment represented by it will be returned to the manufacturer at his expense, be paying for freight both ways.

Sample No. 1 shows the flashing point at 109 degrees Fahr., and sample No. 6 shows a burning point at 150 degrees Fahr. While this is below the flashing and burning points recommended in the specifications, there were certain properties in these oils that make them acceptable and the committee in drawing up specifications had to be governed so as to prevent the acceptance of an oil at a lower test which would not meet the requirements. Members will, of course, use their own judgment in accepting oils at a lower rating than that recommended. Oils from some localities will give better results at a lower rating than oils from other localities at a higher rating.

As the question of successfully using the long-time burner is still a matter of doubt in the minds of some, the committee has followed this up for another year and states that there is no question but that these burners are a success both from an economical as well as from a practical standpoint. The lamps must be properly looked after and those responsible should see that they get the attention they require. The old method of putting "drill outs" to look after lamps never was a success and never will be.

The cost of running the 4,030 lamps referred to for one year was as follows:

| | |
|---|---|
| Number of lamps | 4,030 |
| Number of gallons oil used | 46,688 |
| Number gallons oil used per lamp per annum | 11.59 |
| Cost per lamp per annum for maintenance | $7.64 |

This cost includes all labor, all repairs to lamps, and oil, wicks, etc.

There was little discussion on this report but a letter was read from Mr. C. K. Freeman protesting against the action of the committee in recommending only two forms of lamp, both of which, said Mr. Freeman, were controlled by patents owned by a single company. The specifications for oil were adopted unanimously, but the rest of the report was recommitted with the request that the committee investigate farther.

### TROUBLES FROM FOREIGN CURRENTS.

The report of the committee on how to remedy the effects of foreign current on automatic block signals, the conclusions of which were printed in the *Railroad Gazette* October 19, was accepted as a report of progress and referred back to the committee. The conclusions, as published, were based on information received in replies to a circular sent out by the committee, and some of these replies were printed in the report. From these we quote:

Foreign current in track circuit usually follows both rails and not any one particular rail, and it is not possible to connect battery to work in same direction as foreign current, except in rare cases where the conditions are such that foreign current traverses rail in opposite directions. The direction of flow changes during certain hours of the day, principally on account of location of cars on adjacent electric lines. Foreign currents are most likely to enter track circuits at iron bridges, planked highway crossings, at switches, and at electric road crossings. To guard against the current affecting the working of track relays, one member uses alternating current; one recommended removal of ballast from rail; one to equalize resistance of rails of circuit; two, installation of cut-section and arranging polarity of battery current; one, multiple relays and arranging polarity of battery current; and one uses single rail track circuit and insulates this rail as well as possible. One says: "Since a 1,600-ft. track section will 'pick up' from .5 to 2 amperes from a running stream, it would seem that steam roads which run along a river, as so many do, may expect considerable trouble from stray currents as the lines of the electric roads are extended."

Summing up on the question of overcoming the effects of foreign currents, one member says: "Hardly know as yet what to suggest. Have lately heard of several cases, found by trial, where 5-ohm relays have picked up after rear of train had passed a joint (in each circuit tested) from which the bond wires had been removed; the splice bars were on and bolts as tight as usual on good main-line track. Have no doubt foreign current from electric roads caused this; apparently the undue resistance through the splice bars of joint from which wires had been removed set up a sufficient difference of potential between rails to pick up the relay. It was found that a 9-ohm relay, substituted for the 5-ohm relays in each test, would not pick up; but, of course, the margin must have been very small and, under other conditions, a 9-ohm relay might not have been unaffected. This is one of the most serious situations that has come to my knowledge as, if the mere breaking of the bond wires on one joint, may cause a white failure [false clear indication], the risks seem very great. But it is not clear to me what remedy is to be applied."

Another says: "After 13 years fighting with foreign currents on automatic signal work. I have been convinced that their harmful effects can be over come in only two ways. One way is to insulate the rails of electric roads and steam roads in such manner as will prevent any current leakage to the earth. The other is to use a current for track circuits which will operate a track relay on which direct current will have no effect. The first scheme is not practicable on account of its excessive cost. The second can be applied at a moredate cost, and is entirely reliable."

### SPECIFICATIONS FOR RELAYS.

The report of the committee on circuits for automatic block signals was made up principally of a code of specifications for direct current relays, and these were discussed very thoroughly through 11 of the 15 specifications when, on motion of Mr. Rudd, the association voted to accept the specifications as a whole, with a few changes which the committee agreed to. This motion was carried, in spite of numerous differences of opinion on certain points, because it was deemed important that a code of some kind, even if not satisfactory in every respect, should be adopted as a guide for the use of members generally during the ensuing year. These specifications are printed in another column. We note the principal amendments approved: The end of the last paragraph of article 3 was made to read "with jamb nuts or otherwise securely locked." In article 4 the first sentence was eliminated by a unanimous vote. In article 7 the words "form wound" were cut out, making the article read, all magnet coils must be convenient of application to cores, etc. The word "braid" was changed to "winding," and the third paragraph was made to read, "the ends of wires connecting magnets shall be soldered, non-corrosive flux being used; or they may be joined by means of substantially mounted metal binding posts provided with lock nuts." Article 8 was made to read, "binding posts shall be of such construction that they will not turn," etc. Article 9 was made to read, any other *metal* part.

Mr. Waldron, of the Interborough Rapid Transit, had found that in relays required to open every 1½ minutes throughout the day the trunnions wore out and particles of brass collected so as to hold the armature closed, giving a false clear signal. Mr. Clausen (C., M. & St. P.) had found that glass trunnions proved too brittle. The committee defended the requirement of jamb nuts (article 3) on the ground that this means of adjustment was necessary when, on account of damages by lightning, a large number of relays had to be renewed at one time. In such cases it is desirable to change relays from one signal to another.

On the construction of relays there was a long discussion about getting iron absolutely free from residual magnetism. The manufacturers claimed that this was a very severe requirement and one which had never been maintained in practice; while, on the other hand, the committee, supported by the signal engineers, declared that whatever the practice may have been, past or present, the only safe standard was the highest possible. Two members had had a half dozen or more false clear indications within one year from residual magnetism.

After the close of the discussion and the unanimous adoption of the report, as before stated, the association approved the suggestion of the committee that the code of standard symbols used in making drawings be enlarged in accordance with the practice of the four principal signal manufacturers.

### MODIFICATION OF FLAGGING RULE.

At this point the meeting listened, by unanimous consent, to a short paper by Mr. W. W. Slater, Signal Engineer of the Southern Pacific, who took for his text the following proposed supplement to Rule 99 of the Standard Code of Train Rules:

"When a train is within block-signal limits, the flagman must go back to a point not less than one fourth mile where a block signal not less than one-half mile can be seen clearly and distinctly; when positively known to be in position indicating "stop," he must place two torpedoes on the rail, and then return to his train. Under other conditions than covered specifically by this rule, flagman must be governed by Rule 99."

Mr. Slater said that this rule had been favorably considered by a number of the officers of the Southern Pacific, and not long ago it was laid before a meeting of superintendents who received it with marked enthusiasm, but the next morning their courage failed and they rescinded their brave resolution to recommend the adoption of the rule. Mr. Slater succinctly summarized his argument for the rule in the statement that if the large amount of money that has been spent in the installation of automatic block signals is to be put to profitable use it will be necessary to make of signals something more than ornaments. To see a flagman go back past one and even two block signals, standing in the stop position, as may frequently be seen, should convince any one of the absurdity of the present rules. Mr. Slater held that automatic block signals, as now made, are as reliable, as a measure of protection, as would be a flagman, if not more so. The semaphore being always in the same situation, where the engineman knows he can find it, it is not so liable to be disregarded as is the flagman, who is unexpected. Speaking informally, after the reading of his paper, Mr. Slater said that he had more confidence in the signals than in flagmen. He had found any number of superintendents and general managers who agree with him, but they have not the courage to take the initiative.

In the discussion on the paper it was brought out that Mr. Joseph Crawford, formerly Superintendent of the New York division of the Pennsylvania Railroad, had framed a rule something like this, as much as ten years ago, but had found that he was ahead of the times, the same as Mr. Slater finds himself now. Everybody admits that an automatic signal may possibly give a false clear indication but, even so, are we not ready to guarantee that after the signal has once gone to the stop position it will stay there until the train goes out of the section? Mr. Slater, for his part, was disposed to give such a guarantee.

The discussion was necessarily cut off for lack of time, no place having been assigned to it in the programme, but the meeting unanimously adopted a resolution, presented by Mr. Rudd, that inasmuch as the question of Rule 99 has been brought up, it is the sense of the Railway Signal Association that where a railroad is completely equipped with controlled manual signals, with full

equipment of track circuits to throw the signals automatically to the stop position on the passage of trains, flagging may be omitted; and that where automatic block signals are in use, the definition of the term "sufficient distance" as used in Rule 99, might well be framed with regard to the fixed signal [as proposed by Mr. Slater].

MISCELLANEOUS.

The next matter brought up was a paper by Professor Churchill, of the Corning Glass Works, on the "Optics of the Signal Lens." This paper is long and detailed and its reading was omitted for two reasons; first, because of lack of time, and second, because in its nature the subject is one that cannot be profitably taken up in report and referred back. The committee has postponed action because of the possibility that the Interstate Commerce Commission may make rulings which will affect this matter. The report of the committee on circuits for interlocking signals was dealt with in the same way, and a paper by Mr. F. G. Shaw on oil and gas a large meeting. Professor Churchill was thanked unanimously.

The report of the committee on costs was accepted as a progress heaters to keep switches from freezing was accepted with thanks but not read. Mr. Shaw described the apparatus of the International Switch & Signal Company which was used on the Boston of these steamers are for the Pittsburg Steamship Co., and three tend to except the reading of the reports of the Secretary and Treasurer, the election of officers and the selection of a place for the next annual meeting.

The report of the Secretary showed the number of members one year ago as 450 and the number at the present time 631, in addition to which a considerable number have been admitted but have not as yet qualified by paying the annual dues.

The place selected for the next annual meeting is Milwaukee. The officers elected for the ensuing year are: President, J. A. Peabody (C. & N.-W.), Chicago; Senior Vice-President, A. H. Rudd (P. R. R.), Philadelphia; Junior Vice-President, L. R. Clausen (C., M. & St. P.), Milwaukee; Secretary-Treasurer, C. C. Rosenberg, 12 North Linden street, Bethlehem, Pa.; members of Executive Committee, A. R. Raymer (P. & L. E.), H. S. Balliet (Grand Central Station, New York), and the three latest past Presidents, Messrs. H. C. Hope, J. C. Mock and C. H. Morrison.

EXHIBITS.

Adams & Westlake, Chicago.—Signal and switch lamps; C. & N. W. double lamp; long-time founts and burners.

American Railway Signal Co., Cleveland, O.—Electric motor semaphore signal.

American Signal Co., Boston. Model of a railroad and a car illustrating operation of an audible and visual locomotive cab signal, worked by a pulsating current.

American Vulcanized Fibre Company, Wilmington, Del.—Fibre insulations.

Battery Supplies Co., Newark, N. J.—Gladstone Lalande batteries.

Bryant Zinc Co., Chicago, New York and San Francisco.—Battery supplies.

Dressel Railway Lamp Works, New York City.—Switch, semaphore and other signal lamps; marker lamps for passenger cars; long burning lamps and founts.

Edison Mfg. Co., 31 Union Square, New York.—Edison primary batteries.

Electric Cable Co., Bridgeport, Conn.—"Voltax" insulated wires and cables.

Electric Storage Battery Co., Philadelphia. Chloride accumulators and the Exide battery.

Ely Signal Co., New York.—An eight-lever electric interlocking machine of a new design and a very English appearance.

Galena Signal Oil Co., Franklin, Pa.—Perfection signal oil and railway safety oil.

General Electric Co., Schenectady, N. Y. Electric motor semaphore signal, with motor at top of post; mercury arc rectifier battery-charging panel.

General Railway Signal Co.—Eight lever Taylor interlocking machine on iron pedestal; vertical electric motor for semaphore signal; two-arm electric-motor dwarf signal; switch movement of a new design; lock and block apparatus, with foot power, electric generator; switch indicator on iron post.

Gordon Battery Co., New York City.—The Gordon battery.

Gould Storage Battery Co., 1 West 34th street, New York. Storage batteries in glass and rubber jars; batteries for train lighting and for electric vehicles.

Hall Signal Co., New York and Chicago. Loree-Patenall semaphore, giving indications by upward inclinations; new standard relay with binding posts fastened in grooved insulating strips preventing turning; choke-coil lightning arresters made in units easily put together; motor for electro-gas signal; Style F electric motor signal with glass covered contact points; Style G three-position signal, with motor arranged to pull the arm to the clear position.

Hayes Track Appliance Co., Geneva, N. Y.—A Hayes lifting derail of new design made to use with N. Y. C. 100-lb. rails; Hayes pivot derails.

International Switch & Signal Co., 111 Purchase street, Boston, Mass.—Illustrated matter concerning gas and oil heaters to prevent freezing of switches.

Joseph Dixon Crucible Co., Jersey City, N. Y.—Graphite paint and pipe joint compound.

Leeds & Northrup Co., Philadelphia. Portable electric testing apparatus and a special apparatus for testing submarine cables.

Rail Joint Co., New York City.—The "Continuous" rail joint; the Weber and the Wolhaupter insulated rail joints; new designs of insulated rail joint for N. Y. C. 100-lb. rail.

Railroad Signal Co., Chicago.—Full size crossing signals, two patterns; electric indicators.

Railroad Supply Company, Chicago. Tie plates, bills, lightning arresters, channel pins and relays.

Schwarze Electric Co., Adrian, Mich.; J. Allen Haines, Manager, 324 Dearborn street, Chicago. Crossing alarms, electric bells and buzzers.

Simplex Electrical Co., Boston.—Insulated wires.

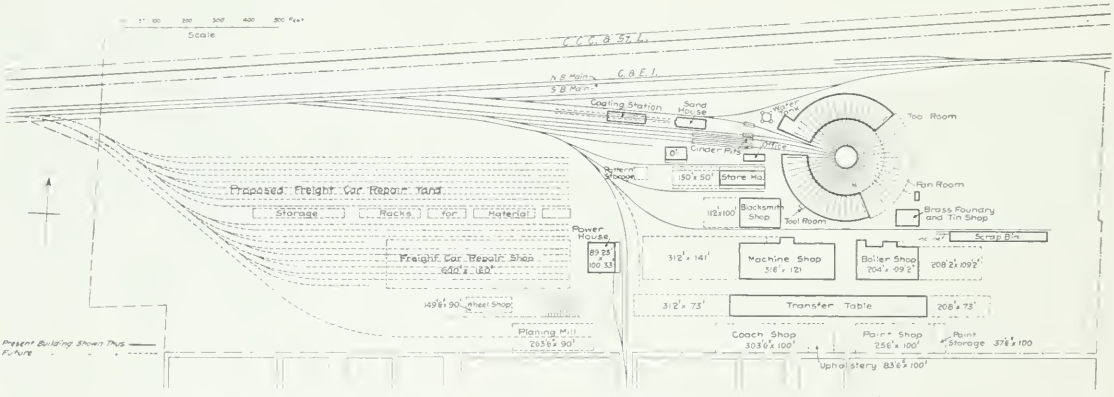
Union Switch & Signal Co., Swissvale, Pa.—Semaphore to give indications by upward inclination of arm; relays of different patterns; electric motor dwarf signal; Kopp glasses for signals. This exhibit included the electro pneumatic interlocking machine which was put in service at East Liberty, Pa., in August, 1884, and which was taken out in September of this year on account of changes in the tracks. This was one of the earliest electro-pneumatic machines.

Westinghouse Machine Company, East Pittsburg, Pa. Storage batteries.

Whall & Co., C. H., 170 Summer street, Boston.—Fiber for insulated joints.

## Large Extensions to Oaklawn Shops of Chicago & Eastern Illinois.

The Oaklawn shops of the Chicago & Eastern Illinois at Danville, Ill., were finished at the end of 1903. At that time the road had 159 locomotives which ran 5,053,869 miles during the year. Including locomotives now on order and shortly to be received, there will be 341 locomotives in operation at the end of the present year, and the estimated locomotive mileage for 1906, based on ten months' actual mileage, is 7,320,000. While the increase in number of locomotives is over 100 per cent., the increase in power has been much greater than this, so that the burden on the repair shops will have been much more than doubled by the end of the year. Enlargement of the shops to double their present capacity is therefore to be undertaken at once.




Oaklawn Shops of the Chicago & Eastern Illinois, Showing Proposed Additions.

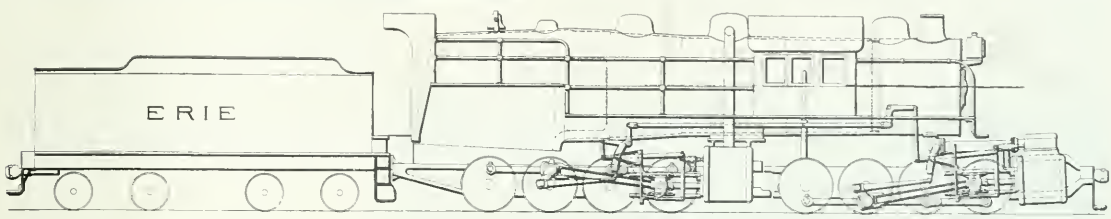
A ground plan of the present plant and the proposed extensions is shown herewith. All proposed work is indicated by broken lines. The work to be done immediately will double the size of the boiler shop, the machine and blacksmith shops and the storehouse. The roundhouse will be completed to the full circle by adding 17 stalls, and the transfer table will be extended to correspond to the increased length of the boiler and machine shops. A pattern storage house will be built west of the storehouse. No car work is done at these shops at present, the old shops on the west side of town being used for that purpose. But, as the plan indicates, the concentration of all this work at the Oaklawn plant is contemplated, and provision has been made accordingly in the layout. The future coach and paint shops are shown on the south side of the transfer table and the future freight car repair yard, with its necessary buildings, west of the locomotive plant.

As will be noted from the plan, the increase in area of the machine shop will more than double it. The new portion is to be 141 ft. wide, 20 ft. more than the present building, which will be widened this distance for the western half of its length. This will allow of a better arrangement of the tools than is possible in the present shop. The enlarged shop will have 28 pits. The extreme width of the new part of the roundhouse will be 90 ft. 4 in. and the total number of stalls in the completed house will be 56. The design of each addition will be uniform with that of the building to which it is made. The total estimated cost of the new work, for buildings, equipment, etc., is over $500,000.

## Mallet Compounds for the Erie.

The Erie has ordered for freight service on its Susquehanna division three Mallet articulated compounds from the American Locomotive Company. The Mallet engine built by this company for the Baltimore & Ohio has proved the advantages of this type for service on heavy grades and sharp curves, and it is to meet such conditions that the Erie has ordered these three locomotives. These Erie engines, however, will be much heavier and more powerful than the one on the B. & O., or the latest example in this country of this type of locomotive, the Great Northern engines built by the Baldwin Locomotive Works, which were recently illustrated and described.

The proposed design here illustrated is for an engine weighing 410,000 lbs., with a tractive effort of 98,000 lbs. The engines will have conical boilers with 468 tubes 2¼ in. in diameter and 21 ft. long. They will have wide fireboxes, 114 in. wide and 126 in. long, with a heating surface of 348 sq. ft. The tank capacity will be 8,500 gals, and coal capacity, 16 tons. As the design of these engines is in the preliminary stage, little more can be given in regard to the details at this time, but the following comparison of their principal dimensions with those of the Baltimore & Ohio and Great Northern engines will be of interest:




Mallet Articulated (0-8-8-0) Compound Locomotive for the Erie Railroad.

| Road | Balt. & Ohio. | Great Northern. | Erie. |
|---|---|---|---|
| Builder | Am. Loco. Co. | Baldwin. | Am. Loco. Co. |
| Type | 0-6-6-0 | 2-6-6-2 | 0-8-8-0 |
| Total weight | 334,500 lbs. | 355,000 lbs. | 410,000 lbs. |
| Weight on drivers | 334,500 lbs. | 316,000 lbs. | 410,000 lbs. |
| Cylinders | 20 and 32x32 in. | 21½ & 33x32 in. | 25 and 29x28 in. |
| Diameter of drivers | 56 in. | 55 in. | 51 in. |
| Tractive effort | 71,500 lbs. | 71,600 lbs. | 98,000 lbs. |
| Working steam pressure | 235 lbs. | 200 lbs. | 215 lbs. |
| Total wheel base | 30 ft. 8 in. | 44 ft. 10 in. | 39 ft. 2 in. |
| Driving wheel base, rigid. | 10 ft. | 10 ft. | 14 ft. 3 in. |
| Total heating surface | 5,585 sq. ft. | 5,658 sq. ft. | 6,108 sq. ft. |
| Grate area | 72.2 " | 78 " | 100 " |

## Colombian Railroads.

A recently published book on the Republic of Colombia (no longer the United States of Colombia, but perhaps the most centralized government in America), by F. Loraine Petre, an Englishman interested in its prosperity, gives a description of all the railroads in the country. As their aggregate length is only 385 miles one might suppose they were few in number; but, in fact, there are twelve separate lines, the longest being 65 miles.

Colombia presents extraordinary difficulties in the way of transportation. The larger part of its area is a plain, part bordering the Caribbean Sea and part east of the mountains in the Orinoco and the Amazon valleys; but this part of the country is mostly a tropical wilderness, thinly peopled. The inhabited parts of Colombia are the valleys and lower slopes of the Cordilleras, which traverse the country from south to north in two parallel ranges. These can be crossed only in a few places by beasts of burden, and in still fewer by wheeled vehicles. The inhabited country is thus separated into three long strips which can communicate with each other only by circuitous routes and with great difficulty. Of these the one bordering the Pacific coast is narrow, but has two parts accessible to its most settled parts. It has an unhealthy climate, but has in former years produced a great deal of gold; since 1850 comparatively little. The populated part of Colombia east of the eastern range is small and reaches the sea most conveniently through Venezuela.

The valley between the western and the central range is drained by the Cauca river, which flows into the Magdalena after reaching the Caribbean plain. The Magdalena drains the valley between the central and the eastern ranges and empties into the Caribbean near the two principal ports, Puerto de Colombia and Cartagena. The Cauca is nearly as long as the Magdalena, and flows through a more productive country, but at no great distance from its mouth it is broken by falls and rapids, and throughout its upper course is much higher than the Magdalena. For about 200 miles of its upper course it is navigable at an average elevation of 3,500 ft. above the sea, in a beautiful and fertile valley. Then for a long distance rapids and falls prevent navigation, which is possible again for about 60 miles; but below, nearly to the point where the mountains sink into the plain, the stream is full of obstructions and again unnavigable.

The Magdalena, at the head of navigation, is about 1,100 ft. above the sea, where in the same latitude the elevation of the Cauca is 3,500 ft. This point is a little south of the latitude of Bogota, the capital, in about 4 deg. north latitude; but here the valley is quite narrow, and Bogota, in a straight line only 50 miles from the river, is 7,500 ft. higher up, while it is itself, like the city of Mexico, in the bed of a prehistoric lake, so that the summit between the river and Bogota is still higher.

While a very long stretch of the Magdalena is navigable (through about 8 deg. of latitude), and it forms the great artery of communication for Colombia, it is by no means easy of navigation. In the first place its mouth cannot be entered from the sea. Barranquilla, near its mouth, is reached by a railroad 18 miles long from Sabanilla (Puerto de Colombia), where there is an artificial harbor. From Cartagena, the old chief port, another railroad reaches the river at Calamar, 60 miles above Barranquilla, and from Barranquilla and Calamar, river steamboats drawing 3½ ft., go up the stream 480 miles from Calamar in about seven days to La Dorada, whence a railroad, 22 miles long, extends past the rapids to the navigable water above, where steamboats drawing 2½ ft. go 71 miles further to Girardot, the head of navigation, whence a railroad not quite completed, but already about 60 miles long, ascends the mountain toward the Bogota basin.

Thus communication sufficient perhaps for immediate needs is provided for the actual valley of the Magdalena. Unfortunately, the great need for transportation is chiefly in much more elevated regions. Colombia has important gold mines in the central range and on the western slope of the eastern range. To get heavy machinery up the Cauca is difficult; up the Magdalena, not easy; but to get it up from either valley to the mines is almost impossible. The railroads planned and partly built are designed largely for this purpose.

Strange to say, among the earliest railroads, are short lines extending from Bogota, the materials for which had to be carried over wretched roads from the river some 8,000 ft. up to the plateau. One of these, 25 miles long, extends from the city in a northwesterly direction to the edge of the plateau, whence it is possible to reach the river by a bad road. This will connect with the new "National" Railroad, now in operation from the head of navigation at Girardot for about 60 miles. Another line extends from Bogota, nearly due north, 31 miles to salt mines. Salt is a government monopoly. Another extends from Bogota southwest 18 miles to Sibate.

Other railroads connecting with the Magdalena steamboats run 12 miles, extending from Girardot, the head of navigation, southward to Espinal, and 43 miles from Puerto Berrio, about 450 miles above Barranquilla, westward toward Medellin, the capital of the former state of Antiogina, rich in mines.

Widely separated from these is the Buenaventura & Cali, planned to extend from the Pacific port Buenaventura across the western range of the Cordilleras to the upper Cauca valley, perhaps 70 miles. Only 7½ miles of this is built from Buenaventura eastward. It would be apparently of great value to the upper Cauca valley. Americans, Alfred Bishop Mason and Edward H. Mason, are prosecuting this enterprise.

The Santa Marta Railroad extends from the port of that name some 70 miles northeast of the mouth of the Magdalena, southward 42 miles, with 8 miles of branches, and is largely devoted to carrying bananas for the United Fruit Co. At a point 23 miles south of Santa Marta it reaches a lagoon, on which light draft steamboats ply to Barranquilla, 50 miles west.

The remaining line, the Cucuta Railroad, is on the eastern slope of the eastern range of the Cordilleras, from the town of that name, down the Zulia river 34 miles to navigable water near the Venezuela frontier, whence it has an outlet to Maracaibo.

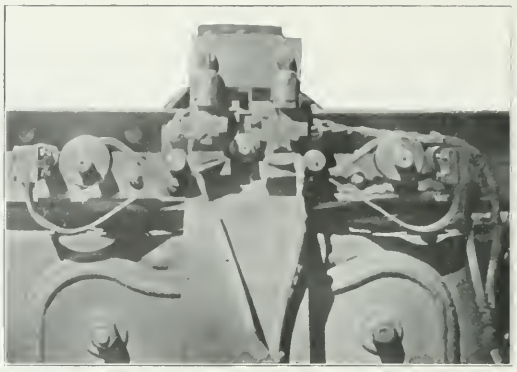
The progress of railroad building, like all other progress, has been interrupted greatly in Colombia by internal disorders, which have succeeded each other at short intervals, and the last of which destroyed no inconsiderable part of the population. Of this population perhaps not more than 10 per cent. are pure blooded whites, 15 per cent. pure-blooded civilized Indians and as much as 40 per

cent. mixed white and Indian blood, something like the bulk of the population of Mexico. The remainder are negroes and men of mixed negro and Indian and negro and Spanish blood. There is a comparatively small negro element in the upper country, however.

The present constitution provides a highly centralized government, and the President is virtually dictator. The actual President is regarded as a capable and wise man; but he was born in 1840. Even with an obedient army it is difficult to enforce order in such a country, because of the great difficulty of communication between its different sections, which will not be entirely removed by the construction of the most needed railroads, as the Pacific coast, Cauca valley and the Magdalena valley will remain isolated territories. With peace and a few hundred miles of railroad there ought to be great deevlopment of the gold mines and perhaps some other mines in Colombia.

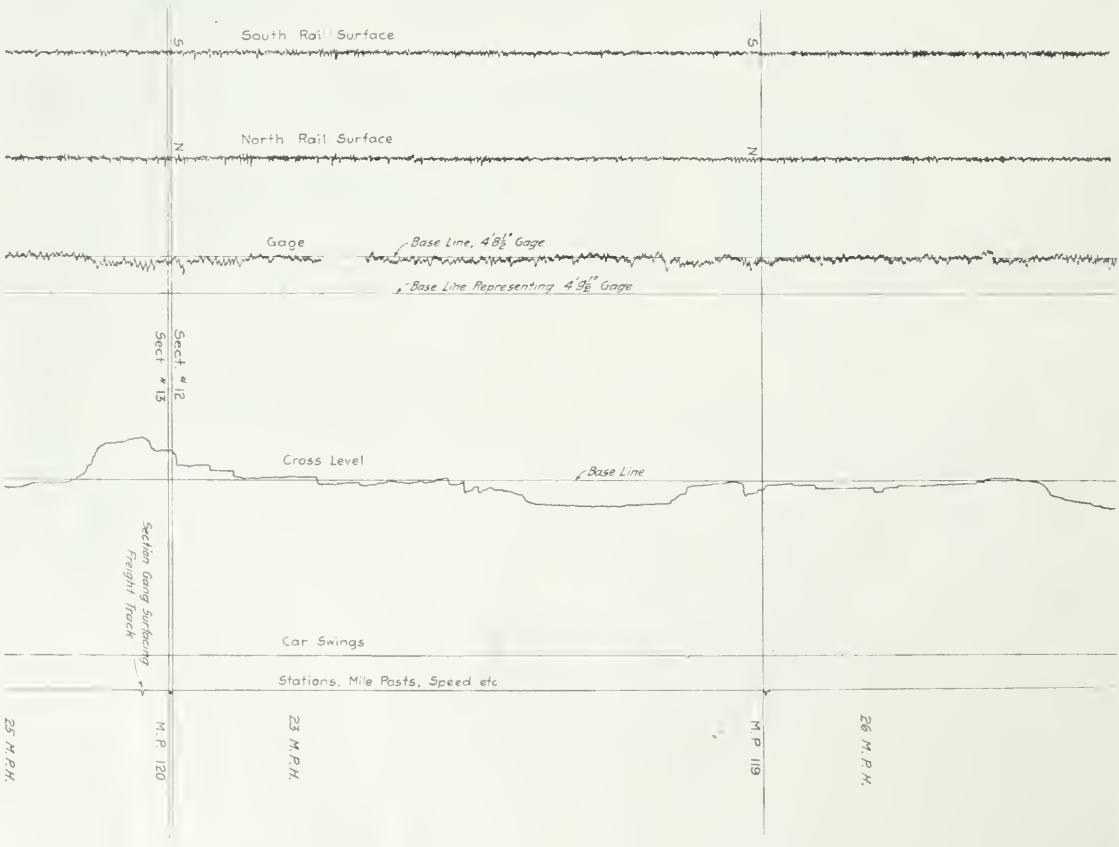
## Track Inspection Car of the Baltimore & Ohio.

The track inspection car of the Baltimore & Ohio, which has been in use three years, records on a moving strip of paper the surface of both rails, the gage, cross-level or superelevation of the rails and the lurches or car swings indicating bad alinement. A section of the record made by the car, reduced about one-half, is reproduced. The two upper lines show the surface of the two rails, and the waved line next below, the variation in gage. Two base lines ½ in. apart, representing 4 ft. 8½ in. gage and 4 ft. 9½ in. gage are traced by a fixed pencil, and the variation of the movable pencil from the upper or standard base line shows to exact scale one-half the amount the gage is wide or tight. The cross level record is made to reduced scale by a moving pencil, which oscillates across



Electrical Contacts of Surface Device.

truck and in the observation compartment at the back end. In making observations the car is usually attached directly behind a locomotive, and run over the road at a nearly constant speed of from 25 to 30 miles an hour. Brakes are used on the front truck only, and the wheels of the rear truck are made with flat treads and of uniform diameter. Two observers are required—one at the recording table to make the required notes on the moving paper, and




Section of Baltimore & Ohio Track Inspection Car Record.

the base line and indicates the variation from true level. On the base line next to the bottom an electromagnet, in circuit with suitable apparatus, indicates by a small offset, sudden lurches of the car. The bottom base line is for recording by means of a push button and electro-magnet the position of mile posts, stations, track tanks or any unusual object or condition.

The car is an old private car mounted on two standard six-wheel trucks. All of the recording apparatus is mounted on the rear one looking out to record with a push button the position of mile posts, stations, etc. About 200 miles of track a day can be covered by the car under ordinary conditions, although 300 miles have been made under favorable circumstances. It requires 20 days or more to go over the entire system with the car.

The accompanying illustrations are from photographs taken when the car was in the shops for adjustment before starting on a trip. Two views of the rear truck show the arrangement of the gage

View of Truck Showing Gage Device.

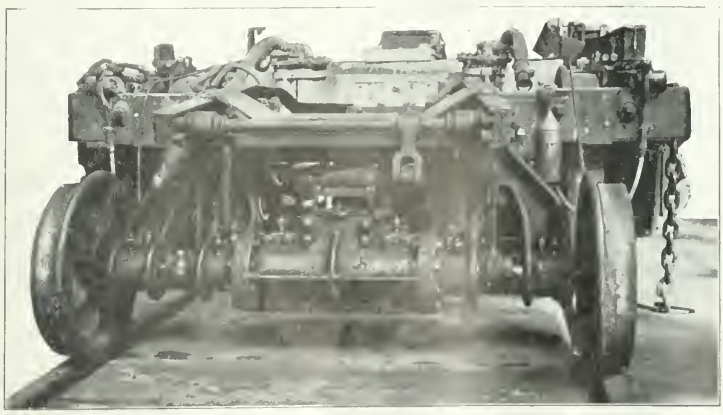
and surface recording devices. The surface device consists of a 5-in. I-beam, mounted over the truck side sill and supported only at the ends by columns resting on the journal boxes of the front and back axles. On the middle journal box, outside and inside of the pedestal, two wide heavy plates are bolted and these work vertically in yokes attached to the I-beam above. This arrangement gives a fixed base line 10 ft. 6 in. long formed by the I-beam and a movable point in the center which rises and falls with variations in surface of the rail. On the outside standard of the middle axle are two adjustable electrical contacts and two corresponding contacts are fastened to the fixed I-beam. One contact records all variations in surface $\frac{3}{8}$ in. or over and the other all variations $\frac{5}{8}$ in. or over. The inside standard carries a lug working in a vertical slot in the yoke mounted on the I-beam. Above the lug and mounted on the yoke is a double brass sheave, and below it is a single sheave. Phosphor bronze wires are attached to the top and bottom of the movable lug; one passes down around the lower sheave and up over one of the top sheaves; the other passes up over the top sheave and both are carried in to the center of the car and up to the recording levers under the table in the observation room. The smallest variation in the relative position of the middle wheel and the fixed base line formed by the I-beam is thus transmitted to the recording pencil. This mechanism is applied on both sides of the truck to measure the surface of both rails simultaneously. To provide for movements of the truck relatively to the table the wires are carried over an idler sheave carried in a rocking frame under the recording table. This sheave maintains a uniform tension on the wires by means of a strong spring attached to the rocking frame and allows for all movements of the truck without appreciable error.

The gage device is a two-wheel trailing truck hung from two I-beams bolted on top of the six-wheel truck frame and arranged to be lifted clear of the track when desired by an air cylinder operated by a valve from within the car. The wheels are about 18 in. in diameter, and have flat treads and sharp flanges. They are mounted on short shafts or axles carried in bearings in the supporting yoke. To the ends of these axles are attached hardened racks working on a common pinion, the whole being surrounded by a strong spiral spring bearing on collars shrunk on the axles back of the racks. A cast-iron case encloses the whole mechanism. The spring forces the wheels out tight against the inside of the head of the rails and their movement inward is resisted by its pressure. A system of sheaves and wires similar to that used for the surface device transmits the relative movement of the two wheels in or out to the levers under the table which actuate the recording pencil. When the truck is drawn up off of the rails a spiral clutch automatically grips the axles and draws them inward against the spring pressure until they register 4 ft. 8 in. gage. They are locked in this position, and the recording pencil makes a straight line on the paper $\frac{1}{4}$ in. above the 4 ft. 8$\frac{1}{2}$ in. base line. The clutch releases automatically before the wheels drop down on the rails.

Interior of B. & O. Track Inspection Car Showing Electrical Clocks and Recording Table.

The apparatus for indicating the cross level consists of a heavy pendulum swung under the recording table in a tank of thick oil to retard sudden movements. This is connected by levers to the pencil above. Car swings are also recorded by a pendulum under the table which has a fan blade at the bottom to soften the swing. The top extends above the table and carries two small copper balls attached to the upper ends of pieces of spring steel about 6 in. long riveted at the bottom of the pendulum. These balls normally lie close against the pendulum, but any sudden swing causes them to fly out violently and strike a nest of fine copper wire attached to a support on the table. An electrical contact is thus made, which actuates the electro-magnet of the car swing pencil, and makes a notch in the line traced on the paper.

The paper is carried in rolls under the table, and is pulled under the pencils at a uniform space rate of 8 in. to the mile, the feed being attached to the shaft of the Boyer speed recorder and turned by the middle axle of the truck. A carbon and original are made at the same time. Mounted on one side of



End View of Gage Device Showing Lifting Shaft.

the car is a case containing six electrical counters or clocks. Two are used for recording the number of ⅜-in. low spots in each rail, two for ⅝-in. low places and two for car swings, only one of which is used at present, the other having been installed for a second car swing device since abandoned. These record each electrical contact made. Current for operating them is obtained from a storage battery carried under one of the seats in the car.

Connected in the counter circuits are the electro-pneumatic valves for throwing a colored liquid on the track to mark the bad places. Three valves and nozzles are used, one ejecting a yellow wash on the rail to indicate car swings (bad alinement), and one for each rail ejecting a whitewash to mark all ⅜-in. low spots. These valves are mounted under the car floor, and have a nozzle projecting down close to the inside of the rail. The fluid is under air pressure from the brake system, and when a contact is made by either surface device or the car swing pendulum a small quantity is instantaneously squirted out by the electromagnet raising a plug valve against a spring. A spot from 6 in. to 1 ft. long is marked on the track within a foot or two of the low place or point where the car lurched.

Before taking the car out on the road it is carefully calibrated and adjusted on a piece of level test track true to gage, and a short preliminary run is usually made to verify the working of the apparatus. In making runs the observation room is connected by a bell with the cab of the locomotive to give signals, and all the counters are first set to zero. The table observer marks on the margin of the record the speed as shown by the recorder at frequent intervals, and identifies the mile posts, stations, etc. He also manipulates the three-way valve by which the gage device is raised and lowered to the track. The engineman gives a bell signal on approaching a switch crossing or other obstruction which might interfere with the truck wheels to warn the operator. The second observer takes general observations and attends to the wash valves.

Northern Pacific Passenger Station at Butte, Montana.

In using the car it has been found that while the gage and surface devices are accurate and reliable, the cross-level and car-swing devices do not give equally good results. The heavy pendulum of the cross-level apparatus is affected by centrifugal force when rounding curves, and tends to displace laterally in proportion to the speed. Not much reliance is placed on it, but no apparatus yet designed has proved more accurate than the device used. A number of different devices have been tried to record car swings, but without complete success. The one now used, which is the best of those tried, is defective in being too sensitive to small disturbances. The pendulum occasionally vibrates with increasing amplitude and finally makes a contact when the car gives only a slight lurch. The device indicates in a general way, however, the riding qualities of the track and always detects any bad lurches.

The car is taken over the entire system in the fall of each year, and records are kept for each division separately. The carbon copy is given to the division engineer for future reference, and the original is preserved as an office record. After the inspection is completed a table is prepared showing the order of merit of the divisions, although no system of awarding prizes is in force. In making up this table an arbitrary basis is assumed. The total number of ⅝-in. low joints, ⅝-in. low joints and car swings on each division is taken from the electrical clocks, and the average number per mile of track computed for each. A standard of perfection of 100 is assumed and arbitrary values of 0.2 for ⅜-in. low joints, 0.8 for ⅝-in. low joints and 0.4 for car swings are assigned. The average number per mile is multiplied by these values and the total is subtracted from 100, expressing the standard for each division as a per cent.

The idea of the car was originated by Mr. L. F. Loree, who was at the time President of the Baltimore & Ohio. The general features were outlined by Mr. M. L. Byers, then Engineer of Maintenance of Way, who turned over the detail work to Dr. Coleman Sellers, of Philadelphia. After the car was built it was changed and improved in a number of its details under the direction of Mr. A. A. Miller, Assistant Engineer. We are indebted to Mr. J. B. Dickson, Chief Engineer of Maintenance of Way, for the illustrations and information.

## New Northern Pacific Passenger Station at Butte.

The new passenger station of the Northern Pacific, recently opened at Butte, Mont., replaces a 24 ft. x 68 ft. building which the city had long since outgrown. Two views of the new station are shown herewith. The baggage and express rooms and the restaurant are in detached, one-story, 38 ft. x 112 ft. buildings on each side of the two-story main building. The main building is 62½ ft. x 133 ft., with a main waiting room 37 ft. x 89 ft. Adjoining the main waiting room, at one end of the building, is a smoking room for men, 22 ft. x 24 ft., and at the other end is a women's room of the same size. In the second story over these rooms are offices opening on a balcony which surrounds the main waiting room.

The walls of the buildings are brick, the exposed portions being vitrified paving brick with limestone trimmings. Foundations are concrete. The interior finish of the main building consists of terraza floor, terraza and mosaic base, and plaster walls and ceiling. The woodwork is clear white oak. The dining room finish is like that of the main building. The kitchen and the baggage and express rooms have cement floors. The cost of the buildings was $40,000.

Main Waiting Room in Butte Station.

## Car Cleaning.*

BY B. F. FLORY,
Mechanical Engineer, Central Railroad of New Jersey.

The car-cleaning force should be under the direction of a man who understands the effects of the various cleaners and methods on the different parts of the car. The yards should be so located and of such size that the force can go from one car to another without waste of time. Racks should be put in at convenient places for the cleaning of carpets, seats, mattresses, etc. Air or vacuum lines should be run through the entire yard, so that cars can be blown out or cleaned with a vacuum system without having to move the car. The car should be built with as little moulding or carving as possible to give a good appearance. The car with a plain interior, relieved by ornamentation by inlaying, presents few places for the dust to lie on. Steam pipes should be kept 3 or 4 in. from the floor. Seats should have swing foot-rests, and the seat ends preferably made in one piece. The seats for smoking cars should be of leather, or of some substitute. The hoppers should be placed so that they will not foul the trucks.

For cleaning the outside body of the car soap and water are used by some roads. This has to be done quickly, especially in warm weather, as part of the soap may dry before it can be wiped off. This soon gets into the varnish, and every time it gets wet the soap eats into it deeper and deeper and soon spoils the looks of the car.

*Extracts from a paper read before the New York Railroad Club, Oct. 19, 1906.

Cold water applied to cars in warm weather and hot water applied to cars in cold weather will deaden the varnish.

Oxalic acid is sometimes used when cars are very dirty, and if used properly and followed by oil it brings out luster and adds life to the varnish. The car, however, should be washed quickly with water after the oxalic acid is put on and before the oil is applied. Oil emulsion is probably the best thing for cleaning the car if applied at proper intervals. It is not necessary to apply this every trip. The car can be washed or rubbed off dry, but oil emulsion should be used about every two months. This will keep the varnish in good shape between shoppings.

The cleaning of the outside of the car varies greatly, according to the condition of the road. On the Central Railroad of New Jersey, which has only one short tunnel, and where anthracite coal is used, we do not find it necessary to use an oil emulsion. We simply wipe off the cars dry, or when they have been in rain or snow they are washed off with clear water. For roads having a number of tunnels and using soft coal, this would not suffice, and some of the other methods mentioned above should be used.

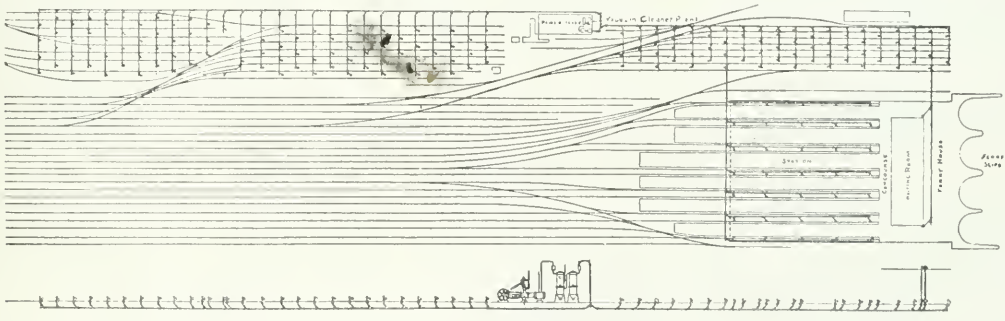
For trucks, wiping with dry waste or with waste with a little oil on it, depending on the condition, is all that is usually necessary. A corn broom, with a little oil on it, is also good if the trucks are dirty. To clean the floor it is best to have the dirt blown out or swept up and then scrubbed with soap and water. The headlinings should be cleaned with mild soap and water and then rinsed with clear water. The interior woodwork should be kept clean by washing with soap and water or dry-wiped with a soft cloth. The water cooler should be cleaned out thoroughly at least once a week.

Curtains having pantasote or other similar material for the backs should be wiped about once a month with a damp cloth. For cleaning the seats, backs and carpets, compressed air or a vacuum system is used. With compressed air some roads leave all the seats and backs in place and then blow them out. Others place the seats in the windows and then blow them out. The carpets are not cleaned in the car, but are taken to racks and then blown out. A test made on one road in the vicinity of New York showed that it took one man about one hour to blow out a car with seats and backs in place. After this the car was dusted by two women, taking thirty minutes per car. On another road, where the seats were removed and blown outside, it took two men one hour to blow out the car and then took two men one-half hour to dust the car. On another road, where the seats are placed in the windows, two men can do about eight cars per day, and the dusting takes two women one hour per car. The carpets can be cleaned at the rate of about five per hour. Taking the average, it takes two men one hour to blow out a car and one-half hour to dust it. At the usual rate of wages paid for this work it would amount to three hours' work at 15 cents, or 45 cents per car. This does not include the cleaning of the carpets, the cost of cleaning which is about 3 cents apiece.

The Central Railroad of New Jersey has installed, at its terminal at Jersey City, a vacuum plant for cleaning both the cars and the station. The plant has been in operation over two years, and was installed at a cost of approximately $18,000. The plant consists of two steam-driven double-acting pumps with vacuum cylinder 20 in. in diameter and 12 in. stroke. These pumps are 20 h.p. each. The pumps are arranged to operate together or independently, and have 5 in. suction connections to the separators. From the separators one header extends west 2,400 ft., being reduced proportionally from 5 in. to 4 in. to 3 in., with 2 in. lateral lines which run at intervals of every 60 ft., or about a car length, distributing outlets to the coach-cleaning yards having ten tracks. On the east end the main line extends 1,300 ft., the pipe having been reduced in the same proportion as on the west and having outlets every 60 ft. A layout of the piping of the yards is shown in the accompanying drawing.

The operation of the plant is as follows: When the pumps are put in operation the air is immediately exhausted from the separators and the pipe lines. With no outlets open the vacuum gage will show about 29 in., and as the outlets are opened the vacuum will drop according to the number opened. The dust and refuse taken from the car is drawn through the pipe lines to the dry separator and enters on a centrifugal line. Within this separator there is an inner cylinder projecting nearly half-way to the center of the separator. The dust takes a centrifugal movement downward around the annular space between the inner cylinder and outer casing, and 90 per cent. is deposited at the bottom of the separator. The lighter particles of dust are drawn up through the inner casings by slow suction as the velocity of the air has been changed, the inlet pipe being 5 in. and the inner cylinder through which the suction must pass is 24 in. diameter. The light dust then passes into a second separator; which is partly filled with water. The water covers a brass disc, which is perforated by several thousand $^1/_{16}$ in. holes. Just above this disc a hood is placed, leaving an annular space between it and the casing for the passage of air, when the air enters underneath the disc which is covered with water. The bubbles of air are large, but upon striking the disc they are broken up into very small bubbles, which creates a foam or fountain which washes out the partially dust-laden air. The hood deflects the air and water against the side of the casing, so that there is no water carried over to the pump. The air is practically cleansed before going to the vacuum cylinder and is then exhausted to the atmosphere. When the machine is shut down the dry separator is opened and the dust drops out and is thrown into the ash-pit under the grates. The valve connection with the bottom of the wet separator is also opened and the muddy water flows into the sewer. The amount of dust taken out from the dry separator averages about one bushel and a half per day. The fittings for the pipes are all of large radius to provide for easy movement of the air. The pipes and all fittings are of galvanized iron and are painted with asphaltum.

The maximum number of nozzles that we can use and retain 14 in. of vacuum, which is what should be had for rapid cleaning is twelve. The vacuum sometimes runs below this if there are any leaks in the pipe line, or if the men leave the nozzle lying down and do not shut off the air. The size of the hose is 1 in. inside diameter. Two sizes of nozzles are used, one 12 in. long with an opening of $^1/_8$ in. wide, which is used for carpets, and one 8 in. long with the same width of opening, which is used for seats and cushions.



Plan of Car Cleaning Yard at Communipaw Terminal; Central Railroad of New Jersey.

The following is the number of cars cleaned per month with the vacuum system: 270 Pullman sleepers, 510 Pullman chair cars, 272 60-ft. coaches, 92 50-ft. coaches, 18 combination cars (having plush seats), 31 café cars, 62 dining cars, 78 club cars, 13 private cars, a total of 1,346 cars cleaned per month.

The cleaning of the Pullman cars is done by a force of nine men who have nothing to do with the cleaning of other cars. The sleeping cars have the mattresses, seats, backs and carpets removed and all are cleaned outside on racks. They could just as well be cleaned inside the car, but it is more sanitary to have them cleaned where they will get fresh air. The Pullman chair cars are usually cleaned without having anything removed. The same force is used cleaning the Pullman cars with the vacuum system as when compressed air was used; the number of cars cleaned, however, is much greater. The same number of sleeping cars was cleaned by compressed air, but only one-third as many of the chair cars, or about 170 chair cars per month instead of 510. The chair cars, which run to Washington, are cleaned three times a week, and those which run to Philadelphia, Point Pleasant and Atlantic City only twice. On these latter runs only anthracite coal is used, while on the Washington run bituminous coal is used between Philadelphia and Washington.

For our own cars we have a force of three men, two who work on seats and cushions and one on carpets. On a 60-ft. coach, with 37 seats, one man can clean the seats and backs of ten coaches per day of ten hours, at a cost of $13^1/_2$ cents per coach. For cleaning the interior woodwork, by wiping, and the floor by brushing up, it costs about 10 cents per car. The cost for the same work done by compressed air is 45 cents.

The following is the average number of cars cleaned per month when the compressed air system was used: Pullman sleepers, 270;

Pullman chair cars, 170; C. R. R. of N. J. cars, 275. When compressed air was used we had a 45-h.p. compressor in operation, with about the same amount of pipe as with the vacuum system. The same force is used with the vacuum system as when compressed air was used; and as the tables show, 566 C. R. R. of N. J. cars are cleaned per month with the vacuum system, or twice as many as when compressed air was used.

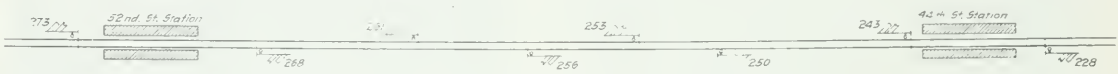
The carpets are cleaned by one man, who makes his hose connection at the middle car of the train to be cleaned and brings all the carpets to that car. A train of eight cars will have their carpets cleaned in one hour. It is quicker to clean in this manner than to move the hose to every car. The cost for cleaning carpets is about 2 cents, against 3 cents for the compressed air. The carpets on all important trains are cleaned nearly every day. On smoking cars having leather, or its substitutes, for seats, the vacuum system is not used except on the carpets.

The advantages of the vacuum system over the compressed air system are as follows: Costs less to clean a car, or the same force can be used to clean more cars. Other men can make repairs in the car, if needed, at the same time the car is being cleaned. All dust is removed from the seats, backs and carpets. The varnish is not injured by having particles of dust or cinders blown against it, as is the case with compressed air. Will keep equipment in better shape and the traveling public in better humor. When equipment is scarce, cars can be cleaned and turned in considerably shorter time than with compresesd air.

There are some places, however, where compressed air is more satisfactory, as in getting the dust and cinders out from between double windows, from ventilators and from the lamps. After this dirt and cinders are blown out, it is, of course, necessary to brush them up or take them away by a vacuum system.

## Signals for the Market Street Elevated and Subway, Philadelphia.

The new Market street elevated and subway line of the Philadelphia Rapid Transit Co. was described in the *Railroad Gazette*, August 18 and 25, 1905. The completed part of the subway extends under Market street from Fifteenth street to Twenty-third street and is four-tracked, the two outside tracks carrying surface cars and the inside tracks carrying elevated trains. There is a station at Fifteenth street for elevated and surface cars and stations at Nineteenth and Twenty-fourth streets for surface cars. Both surface and elevated tracks cross the Schuylkill river on a four-track bridge north of the Market street bridge, and on the west bank the elevated tracks run off on the double track elevated structure, continuing on out Market street, while the surface car tracks descend to the street level and run underneath the elevated road. At the present time the surface tracks in the subway are in use, a small number of cars being run down to Fifteenth street to relieve the congestion on the surface tracks east of the river. The elevated structure and stations are completed, and one track is laid from the bridge to Sixty-eighth street, the western terminal; the other track is laid for part of the distance and will be ready for use in a few weeks. Of course, no trains are yet running on the elevated or on the inside tracks of the subway.




Typical Section of Market Street Elevated Signaling.

The signal apparatus for the elevated section and the inside or express tracks in the subway is being made and installed by the Union Switch & Signal Co., Swissvale, Pa. The system to be used is substantially the same as that installed by the same company in the New York subway (see *Railroad Gazette*, October 7, 1904), with some modifications in details to fit the different conditions of operation and as a result of experience with the earlier apparatus.

In the subway section, including the Schuylkill river bridge, a total distance of about 5,000 ft., there are four block sections and an interlocking zone at the Fifteenth street station. The average length of the block section is 1,000 ft. On the elevated section, from the west bank of the Schuylkill river to the Sixty-eighth street terminal, about 4¼ miles, there are 23 block sections on the westbound track and 22 sections on the eastbound track. These sections vary in length from 400 ft. to 1,400 ft., the longest sections being the approaches to the stations.

One track rail is insulated from the other and carries the return power circuit at 550 volts. At Fifty-sixth street is an A. C. rotary sub-station for supplying the power circuits. Current is tapped out here to a step-down transformer, which reduces the 13,200-volt 3-phase current to 1,100-volt 2-phase current, which is split up into two single-phase currents and used on the A. C. signal mains, one phase being run in each direction from the sub-station. At the end of each block section a step-down transformer, with two secondary coils, delivers current at about 12 volts for the track circuit and 50 volts for the signal lamp. The semaphore signals on the elevated section and the automatic stops are operated by compressed air carried in pipe lines from three points, Sixty-eighth street terminal, Thirty-third street power-house and Fifteenth street terminal. At Sixty-eighth street, where a steam heating plant has been put in, and at Thirty-third street the compressors are steam-driven, but at Fifteenth street a motor-driven compressor will be installed.

The signals in the subway are the same in form and general arrangement as those used in the New York subway, with two modifications. The small semaphore disks have been discarded, and instead of colored glass slides operated by electro-pneumatic valves in the relay circuits two sets of colored lamps are used behind each bull's-eye. The front and back contacts of the track circuit relays make or break the lamp circuits direct. The color indications will be the same; red for stop, green for clear or proceed and yellow for caution. All the other details, relays, inductance coils, grid resistance and automatic stop are identical with the apparatus installed in the New York subway. The double overlap is used, so that one full block section separates a train from the one ahead at all times.

On the elevated section, which is a fairly level tangent, the signals are semaphores mounted on iron poles 15 ft. above the track. The blades are operated by direct acting air cylinders in the box at the base of the pole. As all trains on the elevated will normally make all station stops the distant signal at the approach to the station has been omitted and the overlap of the section beyond the station done away with, so that a following train can run up to the home signal nearest the station and enter the station block immediately after the preceding train has cleared the platform. A short overlap of 600 ft. to 700 ft. is used ahead of the home signal approaching a station where the station block is over 1,000 ft. long. This is an additional safeguard for a train stopped just beyond the home signal and still permits a following train to run up to the home signal while a train is standing at a station.

There will be two electro-pneumatic interlocking plants, one at Sixty-eighth street loop and one at Fifteenth street, where there is a cross-over at the entrance to the station for switching trains from the eastbound to the westbound track. The Fifteenth street machine, which is of standard design, will control two switches, four signals and two dwarfs. The machine at Sixty-eighth street will control four switches, 13 signals and six dwarfs.

We are indebted to Mr. William S. Twining, Chief Engineer of the Philadelphia Rapid Transit Co., for the information.

## Records of Fast Runs.

The full page table of fast and unusual runs of steam locomotives published herewith is of the nature of an index to records which have been published in the *Railroad Gazette* during the past 26 years. It is a condensation and revision of the tables published in the issues of June 11, 1897; January 11, 1901, and December 15, 1905. The table of 1897 was published in *Modern Locomotives* and the table as now revised appears on page 98 of the *Locomotive Dictionary*, which has just been published by the *Railroad Gazette*.

In the table the time given is in each case that from the beginning to the end of the run, including stops.

The improvement which has been made in locomotive service since 1895 is shown not so much in higher speeds per se as in the heavier trains now hauled without diminution of speed, and at sustained speeds for long distances.

Concerning certain runs which appear in the table, the following notes will be found of interest:

March 1, 1901.—Grade descending, mostly at 30 ft. per mile.

March 24, 1902.—Descending grade; some of the way 32 ft. per mile.

June 21, 1902.—Altoona is 861 ft. 6 in. higher than Harrisburg.

June 19, 1903.—Ran through without a stop; two engines all the way. Weight of train 1,080,000 lbs.

June 9, 1904.—Engines changed at Bristol. One car left at Bristol. Weight shown is average for whole journey. First engine had four drivers 6 ft. 8 in. in diameter; cylinders, 18 in. x 21 in.; second engine as shown in table.

1905.—Eighteen hours is the regular schedule time of one day train each way between New York and Chicago over the New York Central, and of one over the Pennsylvania. The Pennsylvania line is about 60 miles shorter than the New York Central.

June 19, 1906.—One more car than on the run of July 20, 1904. A distance of 12 miles was traversed in eight minutes.

The following table, taken from the larger one, shows the best

# FAST AND UNUSUAL RUNS FROM 1880 TO 1906.

| Month, day, year. | Railroad. | From. | To. | Dist. Miles. | Time. h. m. s. | Speed miles. per H. | Cars. No. | Weight. Lbs. | Locomotives. Type. | Cyls. | Diam. dri-vers. In. | Weight on drivers. Lbs. | Weight of engine. Lbs | Month, day, year.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-14-'80 | P. R. R. | Philadelphia. | Jersey City. | 90 | 1:33:00 | 58.06 | 2 | .... | 4-4-0 | .... | .. | .... | .... | 6-25-'80 |
| 0- 0-'80 | Gt. N. (Eng.) | London, | Grantham. | 105.5 | 1:51:00 | 66.5 | . | .... | 4-4-2 | .... | 96 | .... | .... | 8- 6-'80 |
| 4-22-'82 | W. Jersey. | Camden. | Cape May. | 81.5 | 1:23:30 | 58.63 | 3 | .... | 4-4-0 | .... | .. | .... | .... | 4-28-'82 |
| 7-12-'83 | S. B. & N. Y. | Syracuse | Binghamton. | 79 | 1:23:00 | 57.11 | 2 | .... | 4-4-0 | .... | .. | .... | .. | 7-20-'83 |
| 5- 9-'84 | P. & R. | N. Y. Div. | M. P. 48. | 14 | 0:11:19 | 74.2 | 4 | .... | 4-4-0 | .... | .. | .. | .. | 1- 6-'84 |
| 5- 8-'85 | L. S. and N. Y. C. | Chicago. | New York. | 964 | 22:15:00 | 42.38 | .. | .... | .. | .... | .. | .... | .... | 5-15-'85 |
| 7- 9-'85 | W. Shore. | Alabama. | Gen. Junc. | 36.3 | 0:30:00 | 72.60 | 3 | 153,660 | 4-4-0 | 18x24 | 68 | 62,500 | 94,500 | 8-28-'85 |
| 6-17-'86 | C. B. & Q. | Princeton. | Burlington. | 170 | 2:58:00 | 57.3 | . | .... | 4-4-0 | .... | .. | .... | .... | 7- 2-'86 |
| 7- 5-'86 | Waba-h. | K. City. | Peru. | 263 | 13:15:00 | 41 | . | .... | .... | .... | .. | .... | .... | 7-16-'86 |
| 8- 8-'86 | N. Y. C. & H. R | Syracuse. | Fairport. | 70.25 | 1:01:20 | 68.73 | 2 | .... | 4-4-0 | .... | . | .... | .... | 8-13-'86 |
| 7-10-'88 | L. & N. W.-Cal. | London. | Edinboro. | 400 | 7:52:00 | 50.85 | . | .... | .... | .... | . | .... | .... | ..... |
| 8- 0-'88 | L. & N. W. | Crewe. | Preston. | 51 | 0:59:00 | 61 20 | . | .... | .... | .... | . | .... | .... | 8-24-'88 |
| 8- 0-'88 | L. & N. W. | Preston. | Carlisle. | 90 | 1:39:00 | 60 | .. | .... | .... | .... | .. | .. | .... | 8-24-'88 |
| 8-20-'88 | N. E. (Eng.) | York. | Neweastle. | 80.5 | 1:18:00 | 62 | 7 | .... | 4-2-2 | 18x24 | 81 | .... | .... | 12-14-'88 |
| 8-31-'88 | Gt. N. (Eng.) | London. | Edinboro. | 392.5 | 7:26:45 | 52 7 | . | .... | .... | .... | .. | 73,000 | .... | 10- 5-'88 |
| 4- 8-'89 | C. & N. W. | Chicago. | Council Bluffs. | 490 | 12:30:00 | 39.2 | 4 | ... | 4-4-0 | 18x24 | 63 | 59,800 | .... | ..... |
| 5-19-'89 | P., F. W. & C. | Ft. Wayne. | Chicago. | 148.3 | 2:59:00 | 49.7 | 5 | ... | 4-4-0 | 18x24 | 62 | .... | 91,900 | ..... |
| 5-26-'89 | Mich. C. | S. Bridge. | Chicago. | 511 | 11:41:00 | 43.74 | . | .... | .... | .... | . | .... | .... | 6- 6-'90 |
| 3-10-'90 | P. & R. | Philadelphia. | Jersey City. | 90 | 1:25:00 | 63.53 | 1 | ... | .... | .... | .. | .... | .... | 3-14-'90 |
| 3-10-'90 | P. R. R. | J. City. | Washington | 226 | 4:18:00 | 52.56 | 3 | .... | .... | .... | .. | .. | .... | 3-14-'90 |
| 3-10-'90 | P. R. R. | Washington | Jersey City. | 226 | 4:19:00 | 52.35 | 3 | .... | .... | .... | .. | .... | .... | 3-14-'90 |
| 6-22-'91 | N. Y. C. & H. R. | New York | Buffalo. | 439.52 | 8:58:00 | 49.2 | 6 | 515,700 | 4-4-0 | 19x24 | .. | .... | 121,300 | 6-26-'91 |
| 8- 0-'91 | Canadian Pac. | Vancouver. | Brockville. | 2,792 | 76:31:00 | 36.49 | 3 | .... | .... | .... | .. | .... | .... | 9-18-'91 |
| 9-14-'91 | N. Y. C. & H. R. | New York. | E. Buffalo. | 436.32 | 7:17:30 | 59.56 | .. | .... | 4-4-0 | 19x24 | .. | .... | .... | 9-18-'91 |
| 10-16-'91 | N. Ry. (France) | Paris. | Calais. | 184 | 3:43.00 | 49.51 | 12 | 311,360 | .... | 13½, 20½x25 | 84 | 67,200 | 96,320 | ..... |
| 11-28-'91 | P. R. R. | Jersey City. | Washington. | 227 | 4:11:00 | 54.22 | 3 | 250,000 | ..... | .... | .. | .... | .. | 12- 4-'91 |
| 12-22-'91 | B. & O. | Philadelphia. | Canton. | 91.6 | 1:41:00 | 54.11 | . | .. | .... | .... | .. | .... | .... | 1- 1-'92 |
| 3-28-'92 | N. Y. C. & H. R. | Oneida. | De Witt. | 21.37 | 0:17:40 | 72.69 | .. | .... | 4-4-0 | 19x24 | 78 | 81,400 | 126,150 | 4- 7-'93 |
| 11-18-'92 | Cent. N. J. | Fanwood. | ..... | 1 | 0:00:37 | 97.3 | 4 | 228,800 | ..... | 13, 22 x24 | 78 | 88,400 | 123,800 | 11-25-'92 |
| 11-18-'92 | P. & R. | Jenkintown. | L'horne | 5 | 0:03:25 | 87.8 | .. | .... | ..... | .... | .. | .... | .... | ..... |
| 12- 0-'92 | L. & N. W. | Crewe. | Rugby. | 76 | 1:11:00 | 64.23 | 3 | .... | ..... | .... | .. | .... | .... | ..... |
| 5- 9-'93 | N. Y. C. & H. R. | Grimesville. | ..... | 1 | 0:00:35 | 102 8 | 4 | ... | 4-4-0 | 19x24 | 86 | 84,000 | 124,000 | 6- 2-'93 |
| 5-19-'93 | N. Y. C. & H. R. | Syracuse. | E. Buffalo. | 146 | 2:21:00 | 62.13 | .. | .. . | 4-4-0 | 19x24 | 84 | 84,000 | 124,000 | 5-26-'93 |
| 5-19-'93 | N. Y. C. & H. R. | Looneyville. | Grimesville. | 5 | 0:03:00 | 100 | .. | .... | 4-4-0 | 19x24 | 84 | 84,000 | 124,000 | 5-26-'93 |
| 5-28-'93 | N. Y. C. & H. R. & L. S. & M. S. | New York. | Chicago. | 964 | 19:57:00 | 48.2 | .. | .... | ..... | 17x24 | 72 | 65,100 | 104,600 | 6- 2-'93 |
| 8-28-'93 | P., C., C. & St. L. | Seymour. | N. Tower. | 42 | 0:35:34 | 70.96 | 5 | .... | 4-4-0 | . . . | 68 | .... | .... | 8-15-'93 |
| 3-23-'94 | C. & N. W. | C. Bluffs. | Chicago. | 488 | 12:52:00 | 41.1 | 8 | .... | .... | . | . | .... | .... | 4- 6-'94 |
| 4-17-'94 | L. S. & M. S. | Cleveland. | Erie. | 95.5 | 1:35:00 | 60.32 | .. | .... | 4-6-0 | .... | .. | .... | .... | 4-27-'94 |
| 8-26-'94 | A. C. Line. | Jacksonville. | Washington. | 780.8 | 15:49:00 | 49.36 | .. | .... | .... | .... | .. | .... | .... | 9-21-'94 |
| 4- 0-'95 | C., B. & Q. | Chicago. | G'burg. | 163 | 2.45:00 | 59.27 | 6 | .... | 2-6-0 | 19x24 | 68 | 101,000 | 120,000 | 12 13-'95 |
| 4-21-'95 | Camden & Atl | Camden. | Atlantic City. | 58.3 | 0:45:45 | 76.46 | 1 | .... | 4-4-0 | .... | 78 | 87,300 | 122,600 | 1- 3-'95 |
| 8-21-'95 | West Coast. | London. | Aberdeen. | 540 | 8:55:00 | 60.56 | .. | .... | ..... | .... | .. | .... | .. | 9-13-'95 |
| 8-21-'95 | East Coast. | London. | Aberdeen. | 523 | 8:40:06 | 60.35 | .. | .... | ..... | .... | .. | .... | .. | 9-13-'95 |
| 9-11-'95 | N. Y. C. & H. R. | New York. | E. Buffalo. | 436.32 | 6:51:56 | 63.54 | .. | .... | 4-4-0 | .... | .. | .... | .... | 9-27-'95 |
| 9-24-'95 | N. Y. C. & H. R. | Albany | Syracuse. | 147.84 | 2:10:00 | 68.23 | 2 | .... | 4-4-0 | 19x24 | .. | 84,000 | 121,000 | 10- 4-'95 |
| 10-24-'95 | L. S. & M. S. | Erie. | Buffalo. | 86 | 1:10:36 | 72.91 | .. | .... | 4-6-0 | 17x24 | 66 | 88,500 | 113,500 | 11- 1-'95 |
| 10-24-'95 | L. S. & M. S. | Chicago. | Buffalo. | 510.1 | 8:01:07 | 63.61 | .. | .... | .... | .... | .. | .... | .... | 11- 1-'95 |
| 10-24-'95 | P. R. R. | J. City. | Philadelphia. | 89.6 | 1:33:21 | 57.6 | 6 | 548,657 | 4-4-0 | 18½x26 | .. | 91,600 | 134,800 | 1-17-'96 |
| 5- 7-'96 | Mich. C. | Windsor. | St. Thomas. | 11.2 | 1:43:05 | 64.72 | 3 | 230,050 | 4-6-0 | 19x24 | 68 | 96,300 | 123,500 | ..... |
| 5- 7-'96 | Mich. C. | St. Thomas. | Fort Erie. | 118.2 | 1:47:15 | 66.13 | 3 | 230,050 | 4-6-0 | 19x24 | 68 | 96,300 | 123,500 | ..... |
| 6-10-'96 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:48:00 | 69.4 | 6 | .... | 4-4-2 | 13, 22 x26 | 84½ | 80,000 | 141,000 | 6-19-'96 |
| 6-20-'96 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:57:00 | 58.42 | 11 | 701,450 | 4-4-2 | 13, 22 x26 | 84½ | 78,600 | 141,000 | 6-26-'96 |
| 7- 3-'96 | C., M. & St. P. | Forest Glen. | Nat. Ave. | 74.0 | 1:22:00 | 54.2 | 13 | 974,390 | 2-4-2 | 13, 22 x26 | .. | 71,600 | 140,700 | 1-22-'97 |
| 1-21-'96 | S. & R. | Weldon. | Sbops. | 76.8 | 1:12:30 | 63.56 | 3 | .... | 4-4-0 | 19x24 | 68 | 75,000 | 118,500 | ..... |
| 2-15-'97 | C., B. & Q. | Chicago. | Denver. | 1,025 | 18:53:00 | 54.27 | 1 | 72,000 | ..... | .... | . | .... | .... | 2-26-'97 |
| 3-11-'97 | Char. & Sav. | Cent. Junc. | Ashley J. | 102 | 1:40:00 | 61.02 | .. | .... | 4-4-0 | 17x24 | 64 | 57,000 | 90,000 | 4- 2-'97 |
| 4- 9-'97 | Atlantic Coast L. | Florence, S.C. | Rocky Mt. | 172.2 | 3:00:00 | 57.70 | 5 | .... | 4-4-2 | 19x24 | 72 | 76,000 | 129,620 | ..... |
| 4-21-'97 | Lehigh V. | Alpine. | Geneva Junc. | 44 | 0:33:00 | 80.0 | 4 | .... | 4-4-0 | .... | .. | .... | .... | ..... |
| 7-14-'97 | Atl. City (P. & R.) | Camden. | Atlantic City | 55.5 | 0:46:30 | 71.60 | 5 | 320,300 | 4-4-2 | 13, 22 x26 | 84 | 78,000 | 143,000 | 7- 9-'97 |
| 7-16-'97 | P., Ft. W. & C. | G. R. & I. Je. | Colehour. | 132.5 | 2:15:00 | 58.8 | 6 | 628,587 | 4-4-0 | 18x24 | 68 | 65,400 | 103,600 | 8-27-'97 |
| 8- 3-'97 | Union Pacific. | Evanston. | Omaha. | 955.2 | 23:55:00 | 39.93 | 3 | 264,755 | 4-4-0 | 19x24 | 69 | 81,000 | 119,600 | 10-22-'97 |
| 8- 3-'97 | Union Pacific. | N. Platte. | Omaha. | 291.0 | 5:35:00 | 52.1 | 3 | | | | | | | |
| 11-29-'97 | Union Pacific. | Cheyenne. | Council Bluffs. | 519.0 | 9:19:00 | 55.7 | .. | .... | .... | .... | .. | .... | .... | 12-17-'97 |
| 12- 4-'97 | Union Pacific. | Sydney. | Omaha. | 414.2 | 7:12:00 | 57.5 | 3 | 276,000 | 4-6-0 | 20x24 | 69 | 103,000 | 131,200 | 12-17-'97 |
| | | | | | | | 6 | 546,000 | 4-6-0 | 20x24 | 69 | 103,000 | 131,200 | |
| 2-13-'98 | Erie. | Jersey City. | Buffalo. | 423.0 | 7:30:00 | 56.4 | 3 | .... | .... | .... | .. | .... | .... | 2-18-'98 |
| 8-20-'98 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:46:45 | 71.2 | 7 | 437,700 | 4-4-2 | 13, 22 x26 | 84 | 76,400 est. | 143,000 est. | ..... |
| 1- 2-'99 | Chic., B. & Q. | Omaha. | Chicago. | 500.2 | 8:43:00 | 57.38 | .. | .... | .... | .... | .. | .... | .... | ..... |
| 4-23-'99 | Chic., B. & Q. | Clyde. | Burlington. | 17.3 | 3:04:00 | 64.33 | 4 | 378,000 | 2-6-0 | 19x24 | 69 | 106,500 | 125,000 | 5- 5-'99 |
| 7- 9-'99 | Del., L. & W. | Bath. | East Buffalo. | 104.0 | 1:30:00 | 69.30 | .. | .... | .... | .... | .. | .... | .... | 8- 4-'99 |
| 7-19-'99 | Vandalia. | Clayton. | Transfer. | 18.0 | 0:14:00 | 77.00 | 8 | .... | 4-4-0 | 20x26 | 75 | 85,800 | .... | 7-28-'99 |
| 7-22-'99 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:51:15 | 65.00 | 8 | .... | ..... | .... | .. | .... | .... | ..... |
| 7-31-'99 | W. J. & S. (Penn.) | Camden. | Atlantic City. | 58.3 | 0:50:30 | 69.30 | 8 | .... | ..... | 21.5x26 | 80 | .... | .... | 8-11-'99 |
| 10- 7-'99 | Penn. W. Pittsbg.. | Ft. Wayne. | Chicago. | 148.3 | 2:50:00 | 52.30 | 6 | 688,857 | ..... | 19x24 | 68 | 112,550 | 138,000 | 11-10-'99 |
| 10-14-'99 | Wabash. | Tilton. | Granite City. | 176.6 | 2:47:30 | 63.30 | 4 | 360,000 | 4-4-2 | 19x26 | 73 | 88,450 | 157,900 | ..... |
| 11-22-'99 | L. S. & M. S. | Buffalo. | Cleveland. | 183.0 | 3:25:00 | .... | 8 | .... | 4-6-0 | 20x28 | 80 | 133,000 | .... | 12- 1-'99 |
| 3-27-'00 | Atch., T. & S. F. | Los Angeles. | Chicago. | 2,236 | 58:00:00 | 38.55 | 2 | 148,900 | .... | .... | .. | .... | .... | 4-13-'00 |
| 4-30-'00 | Chic., B. & Q. | Burlington. | Chicago. | 205.8 | 3:23:00 | 60.80 | 4 | .... | 2-6-0 | 19x24 | 69 | 106,500 | 125,000 | 5-11-'00 |
| 7- 9-'00 | N. Y. C. & H. R. | Rochester. | Syracuse. | 80.7 | 1:25:00 | 56.70 | 7 | 689,400 | 4-4-0 | 19x24 | 84 | 84,000 | 124,000 | ..... |
| 7- 4-'00 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:44:15 | 75.20 | 4 | 364,000 | 4-4-2 | 15, 25 x24 | 84 | 89,200 | 173,600 | 11- 2-'00 |
| 8-16-'00 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:44:15 | 75.20 | 5 | 456,000 | 4-4-2 | | | | | |
| 9-30-'00 | Penn. Lines. | Ft. Wayne. | Clarke J. | 126.0 | 2:38:00 | 47.90 | 9 | .... | ..... | .... | .. | .... | .... | 10-26-'00 |
| 12-21-'00 | Burlington. | Omaha. | Billings. | 892.6 | 16:23:00 | 54.40 | 1 | .... | ..... | .... | .. | .... | .... | 1- 4-'01 |
| 3- 1-'01 | Sav., F. & W. | M. P. 74. | M. P. 69. | 4.8 | 0:02:40 | 107.90 | 3 | .... | 4-6-0 | 19x28 | 73 | 108,000 | 146,000 | 3-22-'01 |
| 9- 5-'01 | Mich. Cent. | Susp. Bridge. | Windsor. | 229.0 | 3:40:00 | 62.45 | 5 | 430,000 | 4-4-2 | 21x26 | 79 | 95,000 | 176,000 | 11-22-'01 |
| 2- 9-'02 | N. Y., N. H. & H. | Harlem R. | Boston. | 228.0 | 4:12:00 | 54.30 | . | .... | .... | .... | .. | .... | .... | 2-21-'02 |
| 3-24-'02 | Penn. | Philadelphia. | Jersey City. | 89.8 | 1:19:00 | 68.17 | 2 | .... | ..... | .... | .. | .... | .... | 3-28-'02 |
| 3-24-'02 | Burlington. | Eckley. | Wray | 14.8 | 0:09:00 | 98.66 | 9 | .... | 4-6-0 | 19x26 | 72 | .... | 156,600 | 4-25-'02 |
| 6-21-'02 | Penn. | Harrisburg | Altoona. | 131.4 | 2:10:00 | 60.70 | 3 | 280,824 | 4-4-0 | 18½x26 | 80 | 93,100 | 134,500 | 7- 4-'02 |
| 5-25-'03 | L. S. & M. S. | Toledo. | Elkhart. | 133.4 | 1:54:00 | 70.20 | 4 | 500,000 | 4-4-0 | 20x28 | 80 | 133,000 | 172,000 | 5-29-'03 |
| 6-19-'03 | L. & N. W. | London. | Carlisle. | 299.2 | 5:58:00 | 50.14 | 12 | Note. | Note. | .... | .. | .... | .... | 7-17-'03 |
| 8- 8-'03 | A. T. & S. F. | Chicago | Los Angeles. | 2,267.0 | 52:49:00 | 42.80 | 2 | .... | .... | .... | .. | .... | .... | 8-14-'03 |
| 4-27-'04 | Mich. Cent. | Niagara Falls. | Windsor. | 225.7 | 3:18:00 | 68.38 | 4 | 334,900 | 4-4-2 | 21x26 | 79 | 95,000 | 176,000 | 5-20-'04 |
| 6- 9-'04 | Gt. Western. | Plymouth. | London. | 246.8 | 3:46:48 | 65.30 | . | 300,000 | 4-4-2 | Note. | 02 | .... | .... | 6- 3-'04 |
| 7-20-'04 | Atlantic City. | Camden. | Atlantic City. | 55.5 | 0:43:00 | 77.40 | 5 | .... | .... | .... | .. | .... | .... | 8- 5-'04 |
| 5-14-'05 | Atlantic City. | Atlantic City. | Camden. | 55.5 | 0:42:33 | 78.26 | 5 | 460,000 | 4-4-2 | 21x24 | .. | 99,000 | .... | 12-15-'05 |
| 6- 8-'05 | Penn. | E. Tolleston. | Donaldson. | 50.0 | 0:38:00 | 79.00 | 3 | .... | 4-4-2 | 20½x26 | .. | 109,000 | .... | 12-15-'05 |
| 6-13-'05 | L. S. & M. S. | Chicago. | Buffalo | 525.0 | 7:33:00 | 69.53 | 3 | 350,000 | .... | .... | .. | .... | .... | 12-15-'05 |
| 0- 0-'05 | N. Y. C. & L. S. & M. S. | New York. | Chicago. | 964.0 | 18:00:00 | 53.55 | . | Note. | ..... | ... | . | .... | .... | 12-15-'05 |
| 7- 9-'05 | A. T. & S. F. | Los Angeles. | Chicago. | 2,246.0 | 44:54:00 | 50.00 | 3 | 338,000 | .... | .... | .. | .... | .. | 12-15-'05 |
| 10-23-'05 | Southern Pac. Union Pac. Chic. & No. West. L. S. & M. S. Erie. | Oakland. | Jersey City. | 3,230.0 | 73:12:00 | 44.30 | .. | .... | .... | .... | .. | .... | .... | 12-15-'05 |
| 10-24-'05 | Penn. | Crestline. | Ft. Wayne. | 131.4 | 1:41:20 | 77.81 | 4 | 520,000 | ... | .... | .. | .... | .. | 12-15-'05 |
| 10-24-'05 | Penn. | Crestline. | Clarke J. | 257.4 | 3:27:20 | 74 55 | 4 | | | | | | | |
| 11- 3-'05 | Penn. | Harrisburg. | Chicago. | 717.0 | 12:49:00 | 56.00 | 3 | .... | 4-4-2 | .... | .. | . | Note | 12-16-'05 |
| 5- 5-'06 | Southern Pac. Union Pac. Chic. & No. W. L. S. & Mich So. N. Y. Cent. | Oakland. | New York. | 3,255.0 | 71:27:00 | 45.60 | 3 | Note | ... | ... | . | | . | 5-18-'06 |
| 6-19-'06 | Atlantic City. | Camden. | Atlantic City | 55.5 | 0:43:30 | 76.70 | 6 | Note | 4-4-2 | 20x27 | 86 | 110,000 | 210,000 | 6-22-'06 |

*Date reported in RAILROAD GAZETTE.

records for given distances, no account being taken of loads or grades.

*Best Recorded Speeds of Steam Locomotives.*

| | Miles Distance. | Rate per hr | Date | Road. |
|---|---|---|---|---|
| 1 | 3,275 | 45.60 | May 5, 1906. | Various. |
| 2. | 2,246 | 50.00 | July 9, 1905. | Atchison, Topeka & Santa Fe. |
| 3. | 1,025 | 54.27 | Feb. 15, 1897. | Chicago, Burlington & Quincy |
| 4. | 717 | 56.00 | Nov. 3, 1905. | Pennsylvania. |
| 5. | 525 | 69.53 | June 13, 1906. | Lake Shore & Michigan South'n. |
| 6. | 257 | 74.55 | Oct. 24, 1905 | Pennsylvania. |
| 7. | 131 | 77.81 | Oct. 24, 1905 | Pennsylvania. |
| 8. | 55.5 | 78.26 | May 14, 1905. | Atlantic City. |
| 9 | 50 | 79.00 | June 8, 1905. | Pennsylvania. |
| 10. | 15 | 98.66 | Mar. 24, 1902 | Chicago, Burlington & Quincy. |
| 11. | 4.8 | 107.90 | Mar. 1, 1901. | Savannah, Florida & W. |

The table below shows the schedule speeds of ten notable regular trains now running on American railroads. The fast trains between New York and Philadelphia, which for years were notable as the fastest trains in America, are now outclassed by the New York-Chicago trains. The Pennsylvania's Chicago train is regularly scheduled from Jersey City to North Philadelphia, 84 miles, in 83 minutes.

*Scheduled Speeds, American Railroads, August, 1906.*

| | From. | To. | Railroad. | Distance, miles. | Time, hrs.min. | Speed, miles per hour. |
|---|---|---|---|---|---|---|
| 1. | Oakland | Chicago. | S. P., U. P., C. & N. W. | 2,274 | 67:30 | 33.7 |
| 2. | Los Angeles | Chicago. | Atch., Top. & S. F., | 2,267 | 66:15 | 34.2 |
| 3. | New York | Chicago. | N. Y. C. & H. R. and L. S. & M. S. | 964 | 18:00 | 53.5 |
| 4. | Jersey City | Chicago. | Pennsylvania. | 905 | 17:46 | 50.9 |
| 5. | New York | Buffalo. | New York Central. | 440 | 8:15 | 53.3 |
| 6. | New York | Boston. | N. Y., N. H. & Hart. | 232 | 5:00 | 46.4 |
| 7. | Washington | Jersey City. | Pennsylvania. | 224 | 4:46 | 47.0 |
| 8. | Jersey City | Washington. | C. of N. J., P. & R., Balt. & Ohio. | 226 | 4:48 | 47.1 |
| 9. | Atlantic City | Camden. | W. Jersey & Seashore. | 59.0 | 0:52 | 68.1 |
| 10. | Camden | Atlantic City. | Atlantic City. | 55.5 | 0:50 | 66.6 |

HARRISBURG TO ALTOONA IN TWO HOURS THREE MINUTES.

One of the records in the table of fast runs published in this issue of the *Railroad Gazette* has already been broken—that from Harrisburg to Altoona, over the Middle division of the Pennsylvania Railroad. On August 24, 1906, train No. 11, consisting of an engine and four cars, was run from Harrisburg to Altoona (131.4 miles) in 123 minutes, or at the rate of 64.1 miles an hour. The engine was No. 1,080, of the Atlantic type, (4-4-2) Pennsylvania Railroad class E-2; cylinders, 20½ in. x 26 in.; diameter of driving wheels, 80 in.; weight on drivers, 109,000 lbs.; weight of engine in working order, 176,600 lbs. The weight of the four cars and the mail bags contained in them is estimated at 375,750 lbs., and this with the weight of the tender, loaded, (132,500 lbs.) makes the total estimated weight of the train 684,850 lbs.

## Bridge Disaster at Atlantic City.

By the derailment of a passenger train on the West Jersey & Sea Shore Railroad at the drawbridge about one mile from the terminus of the road at Atlantic City, N. J., last Sunday afternoon, 52 or more of the 80 passengers on the train were killed, most of them being drowned, and nearly all of the rest were injured. The number of killed is not yet accurately known, as four or more persons are missing. The motorman of the train was killed, but the conductor and the other trainman escaped. The train was No. 1,065, from Camden to Atlantic City, over the electric line, by way of Newfield, and consisted of three passenger cars, the foremost being the motor car. While running at ordinary speed, probably between 20 and 40 miles an hour, one of the cars, probably the leading car, jumped the track at or near the entrance to the draw span of the bridge and the whole train immediately plunged off the side of the bridge into the water of the "Thoroughfare." The first two cars were quickly submerged and nearly or quite every person in them appears to have been drowned. The last car rested on the others, with its rear end leaning against the cribbing adjacent to the center of the drawbridge. The rear brakeman succeeded in working the pneumatic apparatus so as to open the rear door of this car before it had fallen off the bridge, and through this opening some of the passengers escaped.

The cause of the derailment is obscure. The first reports had it that the first right-hand rail on the draw span was out of position, but there appears to be no evidence of this. This rail was found displaced and somewhat bent after the accident, but the flagman of the bridge was within a few feet of it just before the train came along and he noticed nothing wrong. There was nothing to distract his attention and he gave the usual all-right signal with a flag. The trucks of the first two cars were not raised from the bottom of the river until Tuesday. They were then carefully examined, and slight abrasions were found on the wheels of the second car, but none on those of the first car. It seems likely, therefore, that the displacement of the rail was caused by the second car and not the first, although the evidence seems to be tolerably clear that the leading car was the first to run off the track. The evidence concerning the speed of the train thus far published is so conflicting as to be worthless.

The bridge is a double-track trestle several hundred feet long with a steel deck span about 75 ft. long. The draw span rests on a pneumatic cylinder, by which the whole span is lifted about 8 in., when it has to be turned to permit the passage of a vessel. The bridge is new, having been built during the past year in connection with the electrification of the line. At the ends of the draw the rails drop into troughs of angle iron on the fixed span, when the bridge settles into place. The newspapers have printed many statements to the effect that the rail at the point of derailment was not in its proper place in the trough, but no coherent evidence is produced to this effect.

The tracks are suitably equipped with mechanical interlocking signals, and the employment of a flagman appears to have been designed as an additional safeguard. The photographs published in the newspapers indicate that the bridge has an outside timber guard rail about 8 in. x 10 in., but no inside guard rails.

The Pennsylvania Railroad, which controls the West Jersey & Sea Shore, issued a statement on Monday to the effect that the cause had not been discovered; that there was no defect in either the drawbridge or its mechanism to cause the derailment, and that the bridge in all respects is of the most approved modern type. The interlocking signals indicated clear for the train, and this they could not have done if the rails had not been exactly in place. On Tuesday another statment was issued as follows:

"After thorough investigation the Pennsylvania Railroad officials have found no explanation of the accident on the Thoroughfare Bridge Sunday. All possible theories advanced were traced to the bottom, but the cause of the derailment is no better known than it was at first.

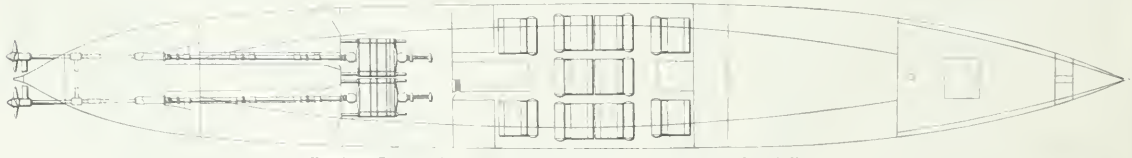
"It was hoped that the trucks of the cars when raised out of the water would afford some clue, but they did not. They were carefully examined by officials of the company, including General Manager Atterbury, Chief Electrical Engineer George Gibbs, General Superintendent of Motive Power A. W. Gibbs, and others. The trucks were intact and there was nothing about either the wheels or the other parts to throw any light on the matter.

"Thorough examination of the bridge and the mechanism used in moving the draw showed that these were in perfect shape. All evidence shows that the rails were exactly in place. Aside from the fact that the interlocking signal could not have shown a clear track otherwise, the bridge tender is positive that the rails on the draw and those on the stationary part of the bridge fitted precisely.

"When the train approached he was standing within three or four feet of the point where the rails joined, and he looked at the track to see that it was all right. The officials examined the bridge structure and found it strong and safe in every respect."

## New Southern Pacific Steamer "Creole."

The "Creole," recently launched by the Fore River Shipbuilding Company, is the first ocean going, twin screw, turbine steamship built in this country. Her gross tonnage is about 7,000 tons; displacement, 10,600 tons, and dead weight carrying capacity, 4,500 gross tons. She is 440 ft. long over all and 416 ft. long on the water line. The beam is 53 ft. and depth 37 ft. from the upper deck. She will draw when loaded 26 ft. of water.



Engine Deck Plan of Southern Pacific Steamer "Creole".

The accompanying drawing shows the boilers and turbines. There are ten Babcock & Wilcox water tube boilers supplying steam to the two 10-ft. reversing Curtis turbines which develop, together, 8,000 brake horse-power. It is estimated that these engines can drive the ship 18 knots per hour, but she is designed for only 16 knots while at sea.

The boat has five decks, and water tight bulkheads divide the hull into four cargo holds which have a total capacity of 335,000 cu. ft. The coal bunkers hold 1,700 tons of coal and the fresh water tanks carry about 800 tons of water. The lower hull is divided into 22 water tight compartments. The boat is built with a double bottom. The "Creole" will carry 152 first class passengers, 58 second class passengers and 258 steerage passengers. She will be fitted with steam steering gear, steam winches, steam windlass and steam capstans. Her other equipment includes a Linde refrigerator plant, an electric light plant, a Brown telemotor and a Clayton fire extinguisher and disinfecting machine. This apparatus blows sulphur fumes through pipes into all parts of the ship where freight or coal is carried.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 19. FRIDAY, NOVEMBER 9, 1906.


The announcement last week of an increase in the annual dividend rate on Pennsylvania Railroad stock from six per cent. to seven per cent., following, as it does, increases by the Union Pacific, Southern Pacific, Atchison, Norfolk & Western and Baltimore & Ohio, was not a great surprise. In common with other roads, the Pennsylvania has enjoyed an unprecedented volume of business during the last two years. More than this, the road is in better condition than ever before to take care of its traffic; many of the far-reaching improvements begun four or five years ago have been completed. The Brilliant cut-off, Enola yards, Altoona yards, low-grade eastbound freight line, Trenton cut-off, Philadelphia terminals, and the Greenville yard are all in use. An average daily freight train load of 3,000 tons behind the tender is moving over the main line of the road in both directions and the terminal yards are filled with cars awaiting shipment. These improvements, all related to each other, have cost many millions and their earning power has just now become evident. It is suggested in the $3,000,000 required for the added one per cent. in dividends on $305,000,000 of capital stock.

Stuyvesant Fish is no longer president of the Illinois Central Railroad. At a meeting of the Board held in New York City on November 7, his long and successful service in that position was brought to an end by the votes of eight of the 13 directors, the vice-president in charge of operation being elected to succeed him. The reason for his dismissal lies in his now famous statement: "I have been president of the Illinois Central for nearly 20 years and I hope to be president for many years longer, but I never have been and I never will be a Harriman president of the Illinois Central." Two weeks ago, after the annual stockholders' meeting in Chicago, we briefly reviewed in these columns the events which led up to the open breach with Mr. Harriman. Mr. Fish now stands defeated by the very men who, three weeks ago, were elected directors by the votes which he, according to agreement, cast for them. It is a curious and disquieting spectacle of a past president of the American Railway Association and of the American section of the International Railway Congress, a railroad executive whose name has been bound up for years with the splendid reputation of his road, having to step down and out because he dared to defy interests representing, as nearly as can be learned, less than one-third of the ownership of the road. The outcome is an evidence at the same time of the tremendous power of Mr. Harriman and of the way in which this power is applied. The Illinois Central is a prize, indeed, and of especial and peculiar value to Mr. Harriman; but hardly worth what he appears to have paid for it. An agreement kept in letter but violated in spirit, a meeting hastily called at a time when a loyal vice-president and director was too ill to attend, and another supporter of the head of the road—no less a person than the governor of the state under which the company holds its charter—could only with great inconvenience be present, a winning over of another vice-president by the hollow reward of a presidency under Harriman, these are the methods of a period of railroad finance which it is disheartening to see revived. As for the 9,000 small stockholders, whether or not the change proves to be for their advantage, they would seem to be, for a year at least, at the mercy of the declarer of the recent Harriman dividends. When the Hill roads bought the Burlington, they took away control from the stockholders by paying for it. The Illinois Central has, it appears, been obtained in a less expensive manner, by winning over the representatives of the shareholders. In Wednesday's election Mr. Harahan received the votes of E. H. Harriman, Cornelius Vanderbilt, John Jacob Astor, Walther Luttgen, John W. Auchincloss, Robert W. Goelet, J. T. Harahan and Charles A. Peabody, president of the Mutual Life Insurance Company.

The order of the Interstate Commerce Commission of September 15 allowing the railroads until November 1 to equalize export cotton rates through the various ports by applying the lowest combination through all the ports without publication and filing, provided the rates were posted in each station affected and mailed to the Commission, has expired by limitation and there is no immediate prospect that it will be renewed. The export cotton business will now have to be carried on under two other provisions of the order of September 15, directing that "no published rates on cotton shall be advanced except on 30 days' notice as required by law," and that until March 1, 1907, carriers may reduce their published export rates on cotton to the various ports of export upon three days' notice." This matter of rates on export cotton is of special interest to the South Atlantic and Gulf ports and to the railroads leading to those ports. It is claimed that, owing to frequent and wide fluctuations in ocean rates from southern ports, these ports

cannot compete with New York and other northern ports for export cotton business unless the railroads are allowed to change their rates as often as the ocean rates change, so as to keep the through rail and ocean rates to European ports substantially equal through all the ports. The roads leading to the southern ports would, of course, prefer stable rates on export cotton if they could be assured of the same amount of tonnage. The practice of equalizing rates has been continued as it has been believed to be necessary in the interests of the ports, the shippers and the railroads. It was on the application of the southern roads that the order of September 15 was issued. Those who favor an extension of that order so as to permit changes either up or down without notice, contend that the privilege of reducing rates on three days' notice will be of little or no practical value, as a road will be reluctant to make a reduction when ocean rates go up, if it knows that it cannot restore the old rate again without 30 days' notice. It is also contended that Congress had the export cotton rates in mind when the Commission was given complete discretion as to the enforcement or modification of the 30-day requirement, and that it was the intention to allow the roads to continue equalization of these rates without restriction. As cotton exports for this season are now fairly under way there is no doubt that the southern ports will be heard from if their business is seriously injured.

## THE C., H. & D.-PERE MARQUETTE RECEIVERSHIPS.

It was a little more than a year ago that the announcement was made that Messrs. J. P. Morgan & Co. had bought the Cincinnati, Hamilton & Dayton-Pere Marquette combination at a price of $160 a share for the controlling C., H. & D. stock. Soon followed in quick succession the sale of the roads to the Erie, the cancellation of this sale and the appointment on December 4, 1905, of Judson Harmon as receiver of each company. Since that time, although interest is in default on $15,000,000 C., H. & D. collateral trust notes, no definite steps have been announced toward putting the roads on their feet financially, which is probably to be done by separating them entirely and turning over each road to one of the stronger companies.

The annual reports of each company, reviewed in another column, are of interest in these days of wonderful railroad prosperity as recalling the financial methods of a corporate institution now happily remote, but common enough in the days of 1893 to 1897. Receiver's balance sheets, receiver's income accounts, receiver's certificates; these are strange terms to-day. But along with them appear new evidences, if any were needed, of the sort of financial management which brought these two roads under the jurisdiction of the court. Without going into the tremendous burden of new capital which was loaded on them, it is instructive to consider the evidences of bad management found in the operating expense accounts and in certain bookkeeping methods.

It is at once noticeable that the receiver has saved money on the non-productive expense accounts and spent more on maintenance. On both roads, considerable savings have been made in salaries of general officers, general office expenses and supplies, and "other general expenses," the saving in the last item being in each case more than half the cost in the previous year. In spite of the fact that the ton mileage of one road increased by over 100,000,000 and of the other by nearly 300,000,000, conducting transportation cost was smaller than in 1905. It is only by examining the unit maintenance figures that the real extent to which the roads were under-maintained during the two previous years can be realized. As shown in the tables given in the reviews of the reports, in 1904 the C., H. & D. was getting along on $767 per mile of road spent for maintenance of way; the Pere Marquette spent only $533. The first of these figures is low enough in all conscience for a road in trunk line territory; the second is absurd. No 2,000-mile railroad with a through Buffalo-Chicago line can be maintained for anything like $533 a mile. Even the $698 spent last year is entirely too low. Beggars, however, cannot be choosers. The 1904 charge of $21 per freight car on the same road is perhaps the worst figure of the whole showing, particularly as little more was spent in 1905, when maintenance cost $25 a car. The hand of the receiver is plainly seen in this item for 1906, when $38 a car was spent, a figure which will undoubtedly be raised as soon as funds are available. Similarly, on the C., H. & D., the cost of freight car repairs rose last year from $33 to $46 a car. There is no need of going into the subject further to prove that neither road was being anywhere nearly kept up to modern standard.

As further illustrating what led to a receivership a few unusual bookkeeping methods mentioned in this year's report of the C., H. & D. in explanation of seeming inconsistencies, are worth notice. It appears, for instance, that over $100,000 of overcharges paid back to shippers by the railroad in 1905 on shipments carried in 1902, 1903 and up to July 1, 1904, that is, in previous fiscal years, was in June, 1905, credited to freight earnings for that month, being at the same time charged direct to profit and loss. A half year's taxes were omitted in 1905, so that in order to bring tax payments up to date this year it was necessary to include this extra amount, thereby charging this year with half of the previous year's payments, besides its own. Most serious of all in its suggestion of impending disaster, is the fact that on $8,250,000 of 4 per cent. refunding bonds which drew interest throughout the fiscal year 1905, only four months interest was charged to income, the remainder being charged to capital account. When a railroad company begins to capitalize its interest payments in order to protect its income account, it is the beginning of the end.

It is clear that these two companies have the unsavory distinction of being the only important railroads in the country in a receiver's hands directly as a result of a financial and operating policy which could tend to no other result. The most remarkable thing about the whole situation is the fact that a company in such unsound condition as the Cincinnati, Hamilton & Dayton was a year ago could be sold to the most prominent railroad banking house in the country at a price for the stock of $160 a share. The necessity which the trunk line community of interest had of getting the combined roads with their large potential power as rate disturbers under control is thereby all the more strongly emphasized.

## THE NETTING AND DIAPHRAGM IN LOCOMOTIVE FRONT-ENDS.

Gradually the mysteries of the locomotive front end have been disclosed. Ten years ago experiments on the testing plant developed the proper form and character of the exhaust jet and the fundamental principles involved in the design of exhaust pipes. Later the stack received attention, first as applied to a small locomotive and more recently as applied to larger and more modern locomotives. Last of all, the petticoat, or draft pipes, have been scientifically investigated. The only parts of the front end which have not yet been carefully studied are the netting and the diaphragm. These two details have no active part in bringing about the draft action, and have naturally been left till the last. From the point of view of draft production the netting and diaphragm are necessary evils. They are like the tubes of the boiler, mere elements, creating resistance to the forward movement of the gases. The effort therefore in perfecting their design should be to reduce their effect upon the draft to a minimum.

The netting, when well designed and properly maintained, offers so little resistance to the movement of gases that its effect is hardly measurable. But if, through neglect, its meshes become filled with soot or solid particles to such an extent as to materially reduce the area of its openings, the netting becomes a serious drag on the draft. Difficulties arising from this cause are reduced by providing a liberal area of netting. When the size of wire has been chosen, there is in fact but a single principle to be observed in the design of this detail, and that is fulfilled when the area of netting is made as large as possible. For locomotives burning bituminous coal the area of the netting should be made equal to the area of the cross section of the smokebox. Thus, a smokebox 6 ft. in diameter should have an area of netting of not less than 28 sq. ft. Thus designed, the resistance of the netting will, under usual conditions, be less than 1 per cent. of the total draft resistance.

The diaphragm absorbs from 30 to 60 per cent. of the energy induced by the draft action. Now that the properties of the exhaust nozzle and stack have been determined, it remains the most important, undetermined element in the arrangement of the front end. There are two functions to be served by the diaphragm, checking the velocity with which the gases flow through the upper tubes sufficiently to equalize the draft action on the fire, and forming the current of gases into a jet sufficiently strong to clear the front end of cinders. The problem in designing is to determine how the diaphragm may be made to perform these functions, and at the same time offer as little resistance as possible to the progress of the gases. That it may serve to check the draft in the upper tubes the upper portion must lie near the tube sheet while the lower edge must be sufficiently near the front of the smokebox to prevent cinders finding lodgment there. The outline by which the diaphragm is extended from top to bottom is often marked by several rather

abrupt angles. If these were to give way to smooth curves, it is not unlikely that the resistance offered would be materially reduced. Again, the discharge from the diaphragm is now ordinarily directed against the front ring of the smokebox. The stream of gases with its burden of cinders is shot into a corner from which the cinders are required to turn and rebound as best they may. These sources of resistance could be reduced by better desiguing. If there were inserted within the smokebox a false bottom of firebrick or of steel, for the purpose of giving smoother lines to guide the flow of gases, then the resistance of the diaphragm could be reduced without interfering with its effectiveness in clearing the front end. Such a false bottom should begin at the base of the exhaust pipe and extend forward in a gradual but constantly increasing upward curve becoming wider as it proceeds, until it meets the front of the smokebox at the bottom of the front door, at which point its curvature should be such as to rise nearly vertically. Above this would extend that portion of the diaphragm which is forward of the nozzle, shaped to correspond with this false bottom, its edge turning up to permit an easy flow of the gases from under it. Such a design would greatly reduce the resistance offered to the flow of the gases. It would be open to a single objection, namely, that it would project all solid particles directly against the netting. Whether this would materially shorten the life of the netting cannot be stated off-hand, but it is certain that if the angles which now lie in the course of the gases, are needed to break up the solid particles, they are expensive devices for crushing coal.

The form of the diaphragm having been determiued, the area of the opening under it should be as large as possible. As a problem of design this detail is similar to that of the exhaust tip. The force of the stream must be sufficiently strong to clear the front end; if stronger than this, energy will be wasted. Perforating the upper portion of the diaphragm is obviously defective since bypassing the gases enfeebles the main jet which has work to do in carrying out the solid particles. The discharge should be in a solid stream, the pressure behind the diaphragm being reduced to a minimum by giving liberal proportions to the opening under it.

## THE VALUE OF INVESTIGATING.

A few years ago the superintendent of motive power of a large railroad succeeded in persuading his directors to allow him to engage a chemist and establish a small testing laboratory. Within a year he was able to demonstrate to the managers that the testing laboratory in the one item of boiler plate in the first six months of its use had saved more than the whole cost of its establishment and maintenance. It is needless to add that it is still in service on that road.

Recently the general manager of a railroad supply company thought that he would like to know exactly the relative merits of his own product as compared with that of his competitors. He, therefore, engaged an independent engineer to make a series of thorough tests, not only of his own product but of all other articles of its class on the market. The report was to be confidential. There was no way of telling at the time what results the investigation would bring forth. They might be to the detriment of this particular manufacturer's product and they might not. It was to be a search after the truth for the truth's own sake. The results justified the expense, for within ten days of presentation of the report an order was booked, based solely upon its representations, that paid fourfold all expenses of the investigation.

Again a railroad company was in trouble; there was a dispute between different departments as to the cause, and an outside engineer was called in to investigate and report. A painstaking examination led to such a showing of facts that each department was held to be a contributor to the trouble, but neither to be wholly responsible. The work was done in such a way that both sides were convinced of its fairness and accuracy and each proceeded to remove the causes specified.

These are instances where special work, in the form of what may be called scientific investigation, has paid—paid not only in satisfaction derived from work well done, but in dollars and cents. Usually an investigation comparing different makes of product is done under government auspices or by a committee of an association from which the commercial aspect of the case is entirely eliminated, but for such work to be done by a business firm with the sole idea of proving its product to be the best on the market, or of making it the best, is as rare as it is commendable. We are all working out the products of the labors of the past; we take advantage of every secret that has been drawn out from nature and make the most of it in its practical application to everyday life, and we one and all recognize our dependence on the work of our predecessors, especially after our attention has been called to it. Most manufacturers, however, are apt at first thought to give more credit to the man who made the practical application of a principle than to the quiet worker in the laboratory years before who by his formulation of the foundation principle made the practical application possible.

An American engineer filled to the brim with practical ideas for short-cuts in shop work was in Germany a few years ago. He visited the shops and on his tours of inspection made frequent suggestions. Whenever he offered one he was greeted with the surprised expression of praise: "You Americans are so practical." It is quite possible that in the past we have been altogether too exclusively practical. Take the locomotive as an example. How little was done up to 1880 in real development except by the unscientific methods of rule of thumb and trial and error. Hardly a master mechanic in the country had the courage of his convictions and dared even to advocate an improvement that he thought would be successful, because he did not have the scientific training back of him to sustain him in his recommendations. If a side rod broke he simply replaced it with another of a heavier section and waited for the new one to break, which it usually did. With the advent of the man with a technical education in positions of control, investigation became more and more common. To-day most large roads have a corps that devotes its time solely to examination of supplies and investigations that lead to improvement in specifications. The reason such a department of tests has become common is that it has been found to pay.

There is, however, something more to be done than mere compilation of specifications and performance of detective work to see that these specifications are lived up to in the supplies furnished. There is the collection of such data as that described in the first part of this article by which a manufacturer may know exactly how he stands with reference to his competitors or what should be done in order to advance the quality of his product. It is in this direction that more work should be done, and the more that is thus accomplished the wider will become the field for further research. The Germans have shown the value of painstaking investigation and its final development in practical form more than any other people. They have long been regarded as a nation of theorists. The old sneer of, "Who reads an American book?" might a few years ago have been paraphrased to read, "Who uses a German machine." The changed reply to either question to-day is as emphatic in one case as in the other. German advancement during the past twenty years has been due not only to persistent study of what others have been doing but to delving into dark regions and then taking advantage of the advance information thus secured.

It is, of course, useless to appeal to the average manufacturer to indulge in pioneer work of this kind on the altruistic basis of the benefits he will confer on humanity, but from purely selfish motives profit can be made out of an impartial investigation of almost any commercial product. It is easy for a salesman to make extravagant statements about the superiority of his particular wares, as he usually knows that his listener is in no position to dispute him. But he also knows that that listener is discounting all that he says by a liberal percentage. If, however, he can back up his statements by proof positive of a character that would be accepted in court as evidence, he has placed himself in an impregnable position. It is for this reason that a scientific investigation pays, and pays well, and independent work of this sort cannot therefore be too strongly urged.

## Cincinnati, Hamilton & Dayton.

The annual reports of the Cincinnati, Hamilton & Dayton and the Pere Marquette are unique among the railroad statements of the year in that both roads are in the hands of a receiver. They were placed in the hands of Judson Harmon, Receiver, on December 4, 1905. The reports, however, cover complete operations for both roads for the fiscal year ended June 30, 1906.

The receiverships came, it will be remembered, as the climax of a long series of new capital issues and buyings of control, resulting in the formation by Eugene Zimmerman and associates of the so-called "Great Central Route," which comprised the Cincinnati, Hamilton & Dayton, the Pere Marquette and the Chicago, Cincinnati & Louisville. The Cincinnati, Hamilton & Dayton was a road tapping rich traffic territory in Ohio and originating a large

amount of business which had hitherto in large part been turned over to the intersecting trunk lines. The Pere Marquette was a newly fledged Buffalo to Chicago trunk line, the Chicago extension having been opened at the beginning of 1904 and the Buffalo connection obtained later in the same year by agreement for traffic rights between St. Thomas, Ont., and Buffalo with the Michigan Central. The Chicago, Cincinnati & Louisville was lately built, and designed to be a through line from Cincinnati to Chicago, but lacked about 30 miles on its northern end of reaching the latter city. As a result of the combination, through traffic originating on the Cincinnati, Hamilton & Dayton, instead of going to the trunk lines at junction points on that road was hauled north from Cincinnati territory to Detroit and thence east or west over the through lines of the Pere Marquette. It was this possession of both a valuable traffic territory and a through line that brought about the taking over of the roads in the interest of the general trunk line community of interest. This purchase was made possible by the fact that the outstanding stock of the Cincinnati, Hamilton & Dayton which controlled the situation was of small amount, so that although the high price of $160 a share was paid, control of the whole combination could be acquired for something over $8,000,000. Following this purchase the roads were turned over to the Erie, the president of the Erie being elected president of the two larger companies. Six weeks later the Erie was allowed to withdraw from its bargain and the roads thus left independent were shortly thrown into a receivership, the Chicago, Cincinnati & Louisville, however, remaining an independent line pending suit.

This review deals with the Cincinnati, Hamilton & Dayton. The report of the Pere Marquette is reviewed in another column. The Cincinnati, Hamilton & Dayton operates a little more than 1,000 miles of line and had gross earnings last year of nearly $8,400,000, against slightly over $8,000,000 in 1905. Operating expenses increased $414,000, chiefly due to expenditures necessary to maintain roadbed and equipment up to modern standards, leaving net earnings somewhat under, instead of slightly over, $2,000,000 as in 1905. Following the income account farther, the bad results under the old management are even more clearly seen. Although there was no substantial increase of taxes during the year 1906, payments under that head increased $176,234, due to charging a half year's taxes, omitted in 1905. Net earnings after taxes consequently showed a decrease of over $200,000, but in this connection attention is called to the fact that the 1906 figures include only actual earnings, while the 1905 figures include items which were not earnings. For instance, In June, 1905, $106,000 of overcharge paid in 1905 on business done in previous fiscal years was credited to freight earnings for that month, the corresponding outgo being charged direct to profit and loss.

There was an increase of $812,000 in interest charges during the year caused by a larger charge of $490,000 interest on $15,000,000 4½ per cent. collateral trust notes and $312,000 larger interest payments on the 4 per cent. refunding mortgage of July 1, 1904. The collateral trust notes were not marketed until late in March, 1905, and the 1905 report included interest for only a fraction over three months. Of the 4 per cent. refunding mortgage bonds $8,250,000 were issued and drew interest from July 1, 1904, but only four months' interest on these bonds was charged to income account in 1905, the rest being charged to capital account. Although no payments have been made on the $15,000,000 collateral trust 4½ per cent. notes since September, 1905, the full year's interest on them has been charged in the 1906 income account. These examples show the way in which the income account was juggled under the old management. Owing to all these larger charges in 1906, the income account shows a deficit of $1,147,631 against a deficit of $241,224 in 1905.

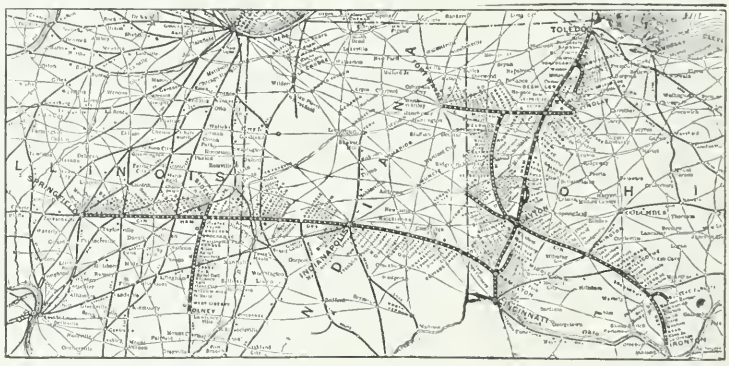
The detailed statement of operating expenses also bears witness to the same sort of management in 1905. General expenses show this most strikingly. Salaries of general officers decreased $9,000, while salaries of clerks and attendants increased $26,000. There was a saving of $10,000 in general office expenses and supplies, of $4,000 in stationery and printing and of $10,600 in "other expenses." The pruning knife of the receiver has here evidently found suitable material. Conducting transportation, in spite of the fact that there was an increase of over 110,000,000 ton miles in the traffic, shows a small decrease from the figure of the previous year. The principal reason for this is that the amounts paid for trackage rights, leased lines, etc., were treated as rentals and charged direct to income account instead of to operating expenses as in 1905. Another reason is to be found in the largely increased train load which rose from 302 tons of revenue freight in 1905 to 371 tons in 1906 and including company freight, from 324 to 400 tons. This well illustrates the success of the receiver in securing operating efficiency.

Instead of decreases, the maintenance accounts, which had been for at least the last two years seriously slighted, shows increases. Maintenance of way rose from $904,000 to $1,143,000, a gain of $239,000, and maintenance of equipment increased by an amount almost as large. The following table shows the unit maintenance charges on the Cincinnati, Hamilton & Dayton during the last three years. This is a striking exhibit of undercharges for maintenance:

| | 1906. | 1905. | 1904. |
|---|---|---|---|
| Maintenance of way, per mile | 1,102 | 871 | 767 |
| " of locomotives, per locomotive | 2,108 | 1,920 | 1,957 |
| " of freight car, per car | 46 | 33 | 39 |
| " passenger car, per car | 487 | 473 | 458 |

It is evident that the 1904 and 1905 figures are much too low for proper maintenance of a railroad like the Cincinnati, Hamilton & Dayton. The low cost of maintenance of way in 1904, the small amount spent on freight cars in 1905 and the small passenger car repair charge in all three years are especially to be noticed.

There are three balance sheets included in the report, the consolidated general balance sheet including both the finances of the railroad company and of the receiver, the railroad company's general balance sheet and the receiver's general balance sheet. There are also corresponding income accounts and profit and loss accounts. The consolidated balance sheet shows current assets of $2,410,000, against current liabilities of $6,823,500. Cash in the receiver's hands is $318,687. On the other hand, unpaid vouchers amount to $2,289,000, and bills payable to $3,098,000. The second largest item among the assets is: Liability interest in stocks owned by Michigan Securities Company, $16,570,000. Leased and auxiliary lines also account for $16,440,000, these two items going far to balance the $47,944,000 of funded debt (including leased and auxiliary lines) outstanding. There was $1,050,946 charged to additions and improvements under capital account during the year. The profit and loss credit balance is $1,769,000. On the other hand, in the receiver's balance sheet there is a loss from December 4, 1905, to June 30, 1906, of $615,000 charged among the assets.




Cincinnati, Hamilton & Dayton.

During this period 5½ per cent. receiver's certificates amounting to $511,830 have been issued to provide funds for interest payments to January 1, 1906, on the following bonds:

| | |
|---|---|
| Dayton & Michigan R. R. consolidated mortgage 5 per cent bonds | $68,200 |
| Cin., Ham. & Dayton Ry. second mortgage 4½ per cent. bonds | 45,000 |
| Cin., Indianapolis & West'n Ry. 1st and refdg. mort. 4 pr. cent. bonds | 93,440 |
| Cin., Ham. & Dayton Ry. refunding mortgage, 4 per cent. bonds | 226,140 |
| Indiana, Decatur & Western Ry. first mortgage 5 per cent. bonds | 79,050 |
| Total | $511,830 |

The principal results of the last two years' operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,038 | 1,038 |
| Freight earnings | $5,996,802 | $5,694,283 |
| Passenger earnings | 1,815,561 | 1,912,855 |
| Gross earnings | 8,398,418 | 8,008,918 |
| Maint. way and structures | 1,143,369 | 903,936 |
| Maint. of equipment | 1,404,704 | 1,201,603 |
| Conducting transportation | 3,640,160 | 3,661,326 |
| Operating expenses | 6,419,140 | 6,004,966 |
| Net earnings | 1,979,278 | 2,003,952 |
| Fixed charges and taxes | 3,247,645 | 2,342,405 |
| Net deficit | 1,147,631 | 241,224 |

Pere Marquette.

The review of the Cincinnati, Hamilton & Dayton report in another column sums up the circumstances leading to the receivership of the two roads and the present situation of that property. In connection with the Pere Marquette there is to be added the fact that in February, 1906, the company began a suit in equity in the United States Court at Grand Rapids, Mich., against William A. Bradford, Jr., President of the Chicago, Cincinnati & Louisville and

others to obtain a decree cancelling $3,500,000 bonds issued in July, 1904, in payment for the capital stock of the Chicago, Cincinnati & Louisville, on the ground that the bonds were issued under circumstances rendering them void in the hands of the then holders and that there was no authority to issue them. A preliminary injunction was issued restraining transfer of the bonds pending suit, which is now in progress. In the meantime the sellers of the stock of the Chicago, Cincinnati & Louisville are in possession of that road.

The Pere Marquette operates 2,333 miles of line. Its gross earnings last year were $13,430,000, an increase of $763,000 over 1905. Operating expenses show a small increase, leaving a gain of $745,000 in net earnings. A large increase in tax payments due to an increase in current payments as a result of the decision of the United States Supreme Court in the Michigan tax case, a considerable decrease in other income due to the fact that while the Pere Marquette received from the Cincinnati, Hamilton & Dayton during the previous year $321,000 as rental, during the last year no payments were made, and a total increase of $522,000 in interest and rentals, resulted in a net deficit from the year's operations of $860,947 against $22,430 in 1905. It is to be observed in this connection as showing that this deficit was not due to the actual operation of the road that the operating ratio for the year was 74 per cent. against 78 per cent. in 1905.

Although general expenses increased, there was a saving as in the case of the C., H. & D., in salaries of general officers, office expenses and supplies and other general expenses, the increase in the total account being due to larger payments to clerks and attendants. Conducting transportation account shows that in 1905 a deficit balance of $91,600 for switching charges was deducted from freight earnings instead of appearing in the expense accounts. An evidence of the better operation of the road lies in the fact that instead of a charge of $92,000 for car mileage in 1905, last year there was a credit in this account which was transferred to miscellaneous earnings. During the first half of the year the amounts paid for trackage rights, including maintenance and operating charges were charged to rents of buildings and other property. Since January 1, 1905, such rental has been charged to income account direct and the maintenance and other operating expenses distributed to the various operating accounts. This change in bookkeeping is responsible for more than half of the decrease in the total conducting transportation expenses. The decrease, however, is important in view of the fact that the total ton miles increased by nearly 300,000,000 during the year. Another evidence of greatly increased operating efficiency is the train load, which amounted to 312 tons of revenue freight against 251 tons in 1905 and, including company freight, 335 tons against 279 tons in 1905. There is a striking increase in the number of miles each ton of revenue freight was carried, from 157 miles to 171 miles.

The amounts spent for maintenance by the road during the last three years are of even greater interest than that of the Cincinnati Hamilton & Dayton as showing how low maintenance can be allowed to run in these days of tremendous betterments. The following table shows the unit maintenance charges for the last three years:

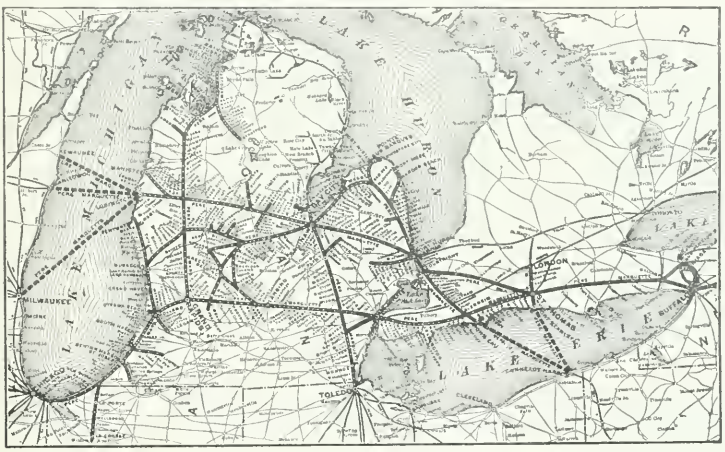
| | 1906. | 1905. | 1904. |
|---|---|---|---|
| Maintenance of way, per mile | 698 | 720 | 533 |
| " of locomotive, per locomotive | 1,890 | 1,940 | 1,333 |
| " of freight car, per car | 38 | 25 | 21 |
| " of passenger car, per car | 437 | 441 | 409 |

The low level reached in any one of these charges in 1904 could not be duplicated on any important railroad in the country. The maintenance of way figure of $533 a mile, the expenditure of $21 per car for freight cars and $409 per passenger car are especially too small. Even last year, although the freight charge has been brought up to somewhere near the necessary level, the other charges are entirely too low for normal.

There are three balance sheets, income accounts and profit and loss accounts, as on the Cincinnati, Hamilton & Dayton. The consolidated balance sheet shows assets of $2,777,000, against current liabilities of $4,496,000. Cash in the receiver's hands was $599,000; on the other hand unpaid vouchers amounted to $2,088,000, and bills payable to $885,000. A profit and loss debit balance of $1,495,491 is shown. During the year $750,909 was charged to capital account for additions and improvements.

Between December 4, 1905, and June 30, 1906, $1,619,180 receiver's certificates were issued to provide funds as follows:

| | |
|---|---|
| For interest payments, due Jan. 1, 1906, on the following bonds: | |
| Pere Marquette R. R. collateral trust indenture 1 per cent. bonds | $57,400 |
| Pere Marquette R. R. consolidated mortgage 4 per cent. bonds | 167,640 |
| Pere Marquette R. R. refunding mortgage 4 per cent. bonds | 184,140 |
| Flint & Pere Marquette R. R. Detroit Division, first mortgage 5 per cent. bonds | 10,000 |
| | $419,180 |
| Also, May 5, 1906, to provide funds for payment of back taxes and penalties in the state of Michigan for the years 1902 03 04 05 | $1,200,000 |
| | $1,619,180 |




Pere Marquette.

The report describes in some detail a decision made in May, 1906, in the Supreme Court of Michigan in the case of the Pere Marquette against the Wabash, affirming the decision of a lower court in a case involving important railroad property rights in Detroit. In January, 1903, a contract between the Wabash and the predecessors of the Pere Marquette covering the double track and property between Delray and Detroit, about four miles, including switching yards, terminal tracks, ferry slips and spur tracks expired in some of its features by limitation. The Wabash then made claim to exclusive ownership of a large part of the property and joint ownership with the Pere Marquette of only the northerly main track. On suit brought by the Pere Marquette, the decision of the lower court was in its favor on all the points involved. With the exception of one minor point, the decision of the Supreme Court is of the same tenor, declaring that the Pere Marquette and the Wabash are owners in common of the double main track from Delray to the switching grounds, of all the spurs and sidings leading therefrom, which reach many industrial points and are several miles long, of the lower of the two ferry slips built several years ago, and of the so-called ferry slip tracks. The case involved construction of leases made in 1881, 1889 and 1890 and of agreements made in 1893 and 1894. An adverse decision would have seriously crippled the road in its position at Detroit.

The principal results of the last two years' operations are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,333 | 2,327 |
| Freight earnings | $9,605,899 | $9,049,573 |
| Passenger earnings | 3,299,447 | 3,127,217 |
| Gross earnings | 13,430,170 | 12,667,420 |
| Maint. way and structures | 1,627,307 | 1,715,232 |
| Maint. of equipment | 1,897,036 | 1,547,548 |
| Conducting transportation | 5,563,681 | 5,843,596 |
| Marine operation | 436,915 | 427,996 |
| Operating expenses | 9,993,094 | 9,915,777 |
| Net earnings | 3,497,076 | 2,751,643 |
| Fixed charges and taxes | 4,519,377 | 2,215,110 |
| Net deficit | 860,947 | 22,430 |

## Detroit & Mackinac.

The Detroit & Mackinac runs from Bay City, Mich., north along the west shore of Lake Huron, and then northwest to Cheboygan, 195 miles. There are 148 miles of short branches, most of which were built to open up timber lands. Most of the traffic of the road is in timber; of the 1,109,055 tons of freight carried in 1906, 11 per cent. was lumber and 42 per cent. forest products other than lumber, that is to say, unsawed logs and pulp wood. A great proportion of the timber is hard wood, since from Presque Isle County northwest the D. & M. taps the hard wood strip which runs north and south through most of the lower peninsula of Michigan. Another important item of freight is stone and sand, 24 per cent. The total freight carried increased 198,215 tons as compared with the year 1905. The company pays 5 per cent. on its $950,000 preferred stock; it has $2,000,000 common stock and $2,950,000 funded debt.

During the year 17 miles of new branches were built and five

miles of branches taken up. Maintenance of way cost $200,400, an increase of $13,600. The maintenance charges per mile were $585 in 1906 and $565 in 1905. In this connection it may be noted that during the past year the company has renumbered all its bridges and culverts and filed their specifications in the Chief Engineer's office. This work had never been done so completely before on this road, and the fact that it has now been done is an indication that the company is falling in line, as regards maintenance, with the higher standards of larger roads. In his characteristic address to the stockholders, President Hawks remarks: "When we bought the Alpena & Northern there were three places where bad reverse curves had been used to detour around houses. These houses have been bought and removed, and line put in proper location as a straight line."

The company had in operation on June 30, 1906, 30 locomotives, 46 passenger cars, 1,616 freight cars and 35 work cars. During the year 17 passenger cars, 381 freight and two work cars were bought. In this connection the President says: "We had two consolidation locomotives with 51-in. drivers that began wearing flat spots on drivers as soon as they left the shop, and the makers could not remedy the trouble, which came from the fact of our having a level and straight road. As these locomotives were pounding track to pieces, we sold them and ordered three new ones, somewhat heavier, and with larger drivers. These were delivered in September, 1906." On this account the cost of maintenance of equipment increased over 100 per cent., being $259,000 in 1906 and $113,000 in 1905. Conducting transportation increased from $306,800 to $384,200. The number of tons carried one mile per mile of road was 274,103, an increase of 48,846. This increase in freight density was taken care of by increasing the average train load from 227 tons to 252 tons.

The principal results of operation for the last two years are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 343 | 331 |
| Freight earnings | $820,487 | $697,818 |
| Passenger earnings | 263,779 | 239,644 |
| Gross earnings | 1,154,826 | 990,545 |
| Maint. of way and struct. | 200,383 | 186,828 |
| Maintenance of equipment | 259,394 | 113,370 |
| Conducting transportation | 384,236 | 306,813 |
| Operating expenses | 873,134 | 635,071 |
| Net earnings | 281,693 | 355,482 |
| Special appropriations | ..... | 296,051 |
| Surplus | 5,257 | 10,918 |

# CONTRIBUTIONS

## Baltimore & Ohio Track Inspection Car.

Pittsburg, Pa., Nov. 5, 1906.

To the Editor of the Railroad Gazette:

I note in your issue of November 2 a very interesting description of the track inspection car of the B. & O. R. R.

I have no criticism of this article to offer, until we reach the last paragraph, in which the names are mentioned of every one who had anything to do with the construction of this car, except that of the one man to whose mechanical genius the entire system of recording devices is due: Mr. C. M. Bennett, late superintendent of the C. & M. V., one of the subsidiary lines of the Pennsylvania lines west of Pittsburg.

The recording apparatus was designed and put in use by Mr. Bennett during the period when Mr. L. F. Loree was general manager of the Pennsylvania lines, and under his direction was used at stated periods over these lines; the installation in the car, however, was not permanent, but the apparatus was removed after each trip, and reinstalled again for the next trip.

After Mr. Loree went to the B. & O. he engaged Mr. Bennett to make one or two trips with his device, over the lines of that system. Following that he arranged with Mr. Bennett for the right to use his invention in a permanently equipped car, to be built by the B. & O.

In carrying out this scheme as I have been informed, the only modifications made were such as would naturally occur in changing a temporary to a permanent installation, and to this extent the gentlemen named in the article are entitled to credit, but no further.

I am constrained to write this in behalf of my late friend, Mr. Bennett, for the reason that he passed to the "beyond" during the past summer and cannot speak for himself.

THOMAS H. JOHNSON,
Consulting Engineer.

The plan for reduced fares for long distances on the Italian railroads goes into effect Nov. 1. Beginning with 150 kilometers (93 miles) the rates are reduced by zones from 10 to 60 per cent., and so that a ticket for 962 miles will be good for any greater distance. For this distance the fares will be $7.14, $11.31 and $16.97 for the three classes respectively. The fare from Rome to Turin will be $4.80 third class against $7.31 heretofore; from Naples to Venice, $5.26 against $8.93; from Modane, at the Italian end of the Mt. Cenis tunnel, to Girgenti, which is about the longest journey possible in Italy (1,111 miles), $7.14 against $19.57. The reductions in the higher class are proportionally not so great.

## Wages on the Pennsylvania and the Reading.

The Pennsylvania Railroad announces that on December 1 the wages of all permanent employees east and west of Pittsburg will be increased 10 per cent., excepting a considerable number of officers whose pay was increased October 1. The total number affected will be about 192,000. An advance of 10 per cent. will mean a monthly increase in pay of $1,000,000—$600,000 on the lines east of Pittsburg and $400,000 on the lines west, the monthly payroll of the combined system averaging about $10,000,000. During the busy months of the year the increased number of employees brings this amount up to nearly $12,000,000.

In connection with the announcement there was published the following interesting list showing how the employees of the road east of Pittsburg and Erie are distributed:

| | |
|---|---|
| General departments and offices | 5,051 |
| General agent, New York | 2,665 |
| General agent, Baltimore | 862 |
| General agent, Washington | 273 |
| General agent, Erie | 87 |
| Juniata shop | 1,886 |
| Altoona machine shop | 5,893 |
| Altoona car shops | 4,158 |
| South Altoona foundries | 924 |
| Philadelphia Terminal Division | 8,687 |
| Philadelphia Division | 11,462 |
| Schuylkill Division | 1,387 |
| Middle Division, Penn. R. R. | 7,229 |
| Bedford Division | 189 |
| Tyrone Division | 1,324 |
| Cambria & Clearfield Division | 844 |
| Pennsylvania & Northwestern Division | 833 |
| West Pennsylvania Division | 2,517 |
| Pittsburg Division | 14,171 |
| Monongahela Division | 3,566 |
| General agent, Pittsburg | 396 |
| Trenton shops | 438 |
| New York Division | 12,166 |
| Amboy Division | 4,090 |
| Belvidere Division | 1,551 |
| Delaware and Raritan Canal | 380 |
| Sunbury & Lewistown Divisions, P. & E. R. R. | 1,986 |
| Eastern Division, P. & E. R. R. | 3,440 |
| Middle & Western Divisions, P. & E. R. R. | 3,719 |
| Buffalo & Rochester Divisions, B. & A. V. | 3,624 |
| Chautauqua Division, B. & A. V. | 1,271 |
| River & Low Grade Divisions, B. & A. V. | 3,639 |
| Baltimore Division, Nor. Cent. | 4,054 |
| Susquehanna Division, Nor. Cent. | 392 |
| Shamokin Division, Nor. Cent. | 192 |
| Elmira & Canandaigua Division, Nor. Cent. | 1,529 |
| Maryland Division, P., B. & W. | 7,145 |
| Delaware Division, P., B. & W. | 1,424 |
| Central Division, P., B. & W. | 663 |
| West Jersey & Seashore R. R. | 2,815 |
| Total | 128,565 |

Quickly following the Pennsylvania announcement it was given out officially that the Philadelphia & Reading would from November 1 increase by 10 per cent. the wages of all its employees receiving $200 a month or less.

## Railroad Decisions in October.

The following abstracts cover the principal decisions in railroad cases handed down during October by the United States Supreme Court and the other federal courts:

*Effect of Release of Damages by Employee.*—A release of damages by an injured railroad employee to the railroad company for injuries caused by coming in contact with a trolley wire stretched across the track will not likewise release the street railway company for liability for its sole negligence in not raising the wire to the proper height. The street railway company contended that the railroad was jointly liable and hence the release of one released the other, but the negligence of the railroad, if any, consisted merely in omitting to inform its employee of the negligence of the street railway company, and this, of course, did not amount to an act of joint negligence. Pittsburg Railway Co. vs. Chapman, 145 Federal Rep. 886.

*Injuries to Employees Engaged in Loading Cars on Barge.*—A gang boss of men engaged in loading cars on barges is a fellow servant of a member of the gang, and the railroad company is not liable for injuries suffered by him in consequence of the negligence of the boss. In all cases where the railroad has provided proper appliances to make work of this character safe, it is not under any personal obligation to see that such appliances are immediately replaced after being temporarily removed by a fellow workman. Baltimore & Ohio vs. Brown, 146 Federal Rep. 24.

*Joint Prosecution for Rebating Under Elkins Act.*—The interstate commerce act as amended by the Elkins act allows the prosecution of the carrier and its agents for the same offense in a single indictment. United States vs. New York Central & Hudson River, 146 Federal Rep. 298.

*Railroad Aid Bonds.*—Where the act authorizing the issuance of county railroad aid bonds is silent on the subject of their execution, they may be executed by the commissioners of the county.

Though the act directs the delivery of the bonds by trustees provided by the act, a delivery by the county commissioners will not invalidate them. Neither will the bonds be invalidated by the fact that they provide for annual instead of semi-annual payments of interest as directed by the statute since the railroad will be entitled to waive a provision in its own favor. Board of Commissioners vs. Tollman, 145 Federal Rep. 753.

*Construction Contract.*—The mere fact that a provision in a construction contract gives the railroad company authority to pay the claims of laborers employed by the contractor and to deduct the amount from that due him under the contract, does not oblige the company to do so in the sense that the contractor's trustee in bankruptcy can compel such payments, without regard to the claim of the company against the contractor because of defective work. Norfolk & Western vs. Graham, 145 Federal Rep. 808.

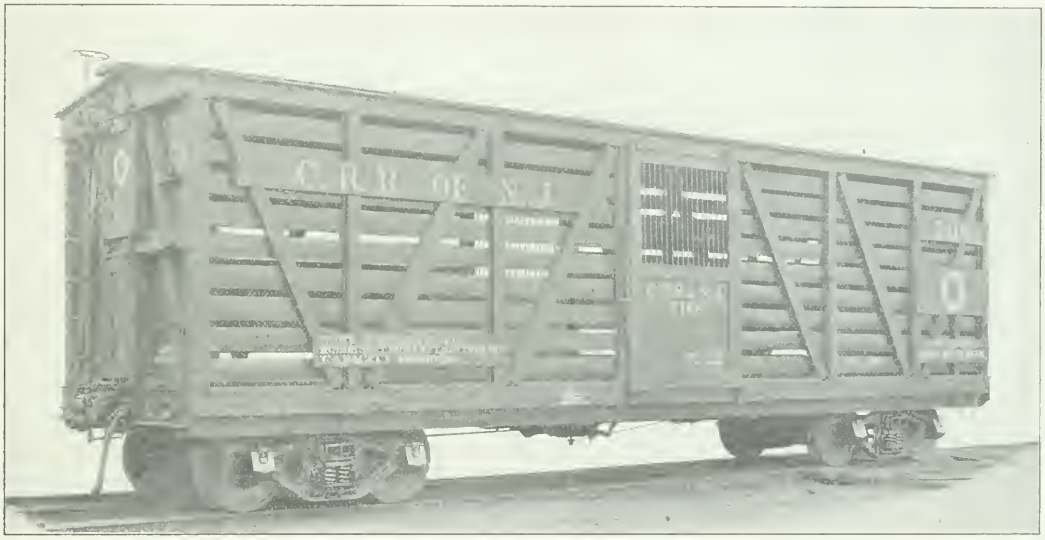
*Montana Employers' Liability Act.*—The Montana statute abolishing the fellow servant rule in cases where injury to an employee is caused by the negligence of any train despatcher, telegraph operator, engineer, etc., does not cover an injury sustained by a servant of a railroad caused by the negligence of the operator of a stationary engine used to draw a plow along the floor of flat cars for the unloading of gravel. The term "engineer" has reference only to locomotive engineers. Reinke vs. Northern Pacific, 145 Federal Rep. 988.

*"Party Interested in the Traffic" Under Elkins Act.*—A refrigerator company organized for the purpose of controlling interstate transportation of a brewing company, entering into contracts for rebates with certain railroads is a "party interested in the traffic" under the Elkins Act and subject to prosecution for its violation. United States vs. Milwaukee Refrigerator Transit Co., 145 Federal Rep. 1,007.

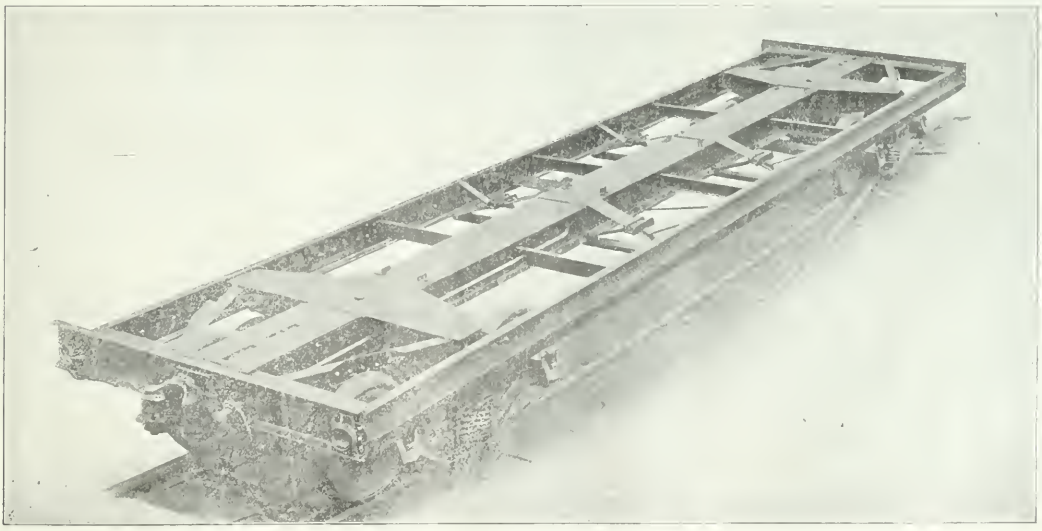
*Right to Sue Under Elkins Act.*—The Attorney-General of the United States has authority to institute proceedings to restrain rebating by interstate carriers on his own motion and is not required to await direction or investigation by the Interstate Commerce Commission. United States vs. Milwaukee Refrigerator Transit Co., 145 Federal Rep. 1,007.

## Steel Underframe Stock Cars for the Central of New Jersey.

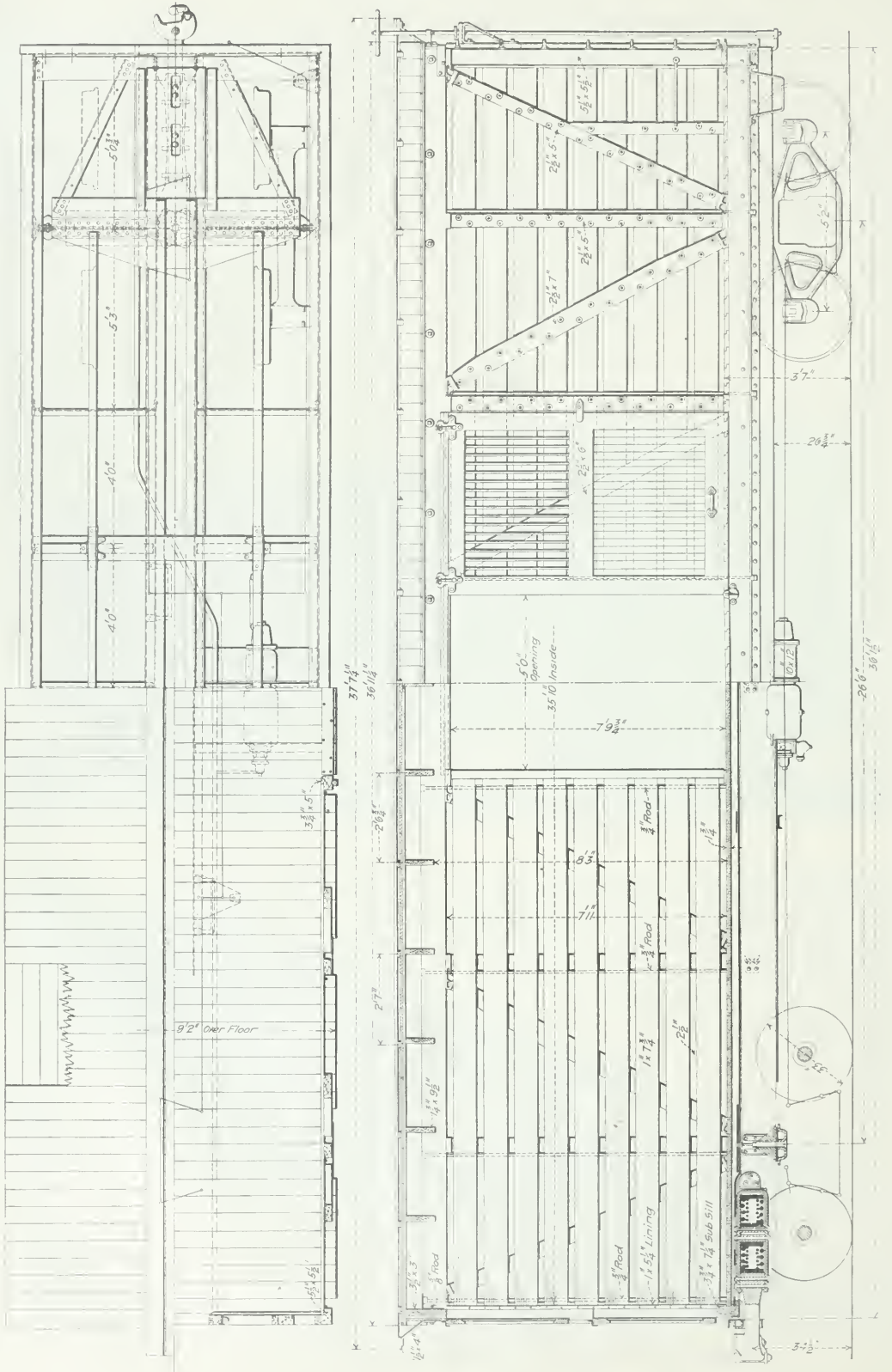
The Central Railroad of New Jersey has recently received from the Middletown Car Works 50 steel underframe stock cars of 60,000 lbs. capacity. They have low floors, 3 ft. 7 in. from top of rail,



Steel Underframe Stock Car; Central Railroad of New Jersey.

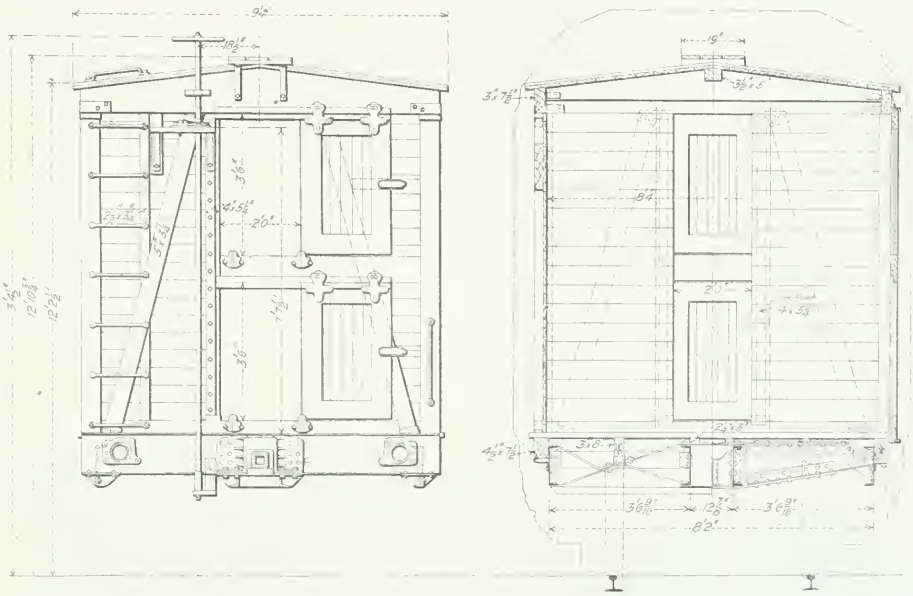


Underframe for 60,000-lbs. Capacity Stock Car; Central Railroad of New Jersey.




Plan and Side Elevation of Steel Underframe Stock Car; Central Railroad of New Jersey.

double end doors for loading lumber and 5 ft. side doors. The inside dimensions are 35 ft. 10 in. long, 8 ft. 3 in. high and 8 ft. 4 in. wide. The underframe consists of a central box girder made up of two 12-in., 20 5-lb. channels spaced 12⅞ in. apart with ¾-in. top and bottom cover plates; similar channels for side sills and end sills, with built-up plate web bolsters. The central girder is designed to carry in addition to its normal load any excess load between bolsters which the side sills cannot carry. This excess load is transmitted by two cross trusses and three channel ties, the cross trusses also serving as supports for the intermediate floor nailing strips. One of



End Elevation and Cross-Section of Steel Underframe Stock Car; Central Railroad of New Jersey.

the illustrations shows clearly the construction of the underframe. The side nailing strips are bolted to a continuous angle 4 in. x 3 in. x 5-16 in., which is riveted to the web of the side sills and gives them some small additional strength and vertical stiffness. The cars are mounted on Bettendorf cast steel trucks.

We are indebted to Mr. George I. King, Vice-President of the Middletown Car Works, for the illustrations.

## Foreign Railroad Notes.

The municipal authorities of Osaka, Japan, have decided to build an electric street railway system, estimated to cost $10,000,000.

The London Motor Omnibus Co., according to its report, during the past year had a gross revenue of $400,000 and paid 10 per cent. dividends. The company operates 38 cars on a working profit of $22 each a week.

The management of the Swiss State Railroads recommends to Parliament that beginning with 1907 the time of workmen in the shops be reduced to 54 hours a week, without decrease in wages, and further that for men who have been employed ten years continuously a vacation of six days yearly be granted, for which the usual wages be allowed.

The Siemens-Schuckert electrical works of Berlin jointly with Swiss works at Oerlikon offer to equip the St. Gotthard Railroad for operation by electricity in connection with the northern outlet of that railroad from Lucerne to Zurich, and in 1909, when the railroad is to be taken over by the state, to undertake the whole traction service, receiving for their pay what the steam service has cost, until the state is ready to purchase the electrical equipment on terms to be agreed upon later.

The manager of a Berlin business which made many shipments by railroad presented some boxes of cigars to certain state railroad employees with whom the firm had dealings in forwarding or receiving goods. These employees reported the presents to their superiors, regarding them as intended to influence them in the discharge of their duties. These superior officers then prosecuted the firm for insulting the employees. The accused protested that it had no idea of influencing the men in their duties, and only gave the cigars as an acknowledgment of courteous treatment. The court, however, imposed a fine of $15, remarking that it seemed not to be as well known as it ought to be that public employees may not receive any presents for performing their duties, even when no bribery is contemplated. The acceptance of a present renders the employee liable to punishment.

The Prussian Minister of Railways has decided to discharge all female ticket sellers as they quarrel so frequently with the employees of the stronger sex, and their quarrels so often end in an attack of nerves that the situation has become intolerable. As a compensation for this loss of employment the women are to be transferred to the telephone service.

## The Atlantic City Disaster.

The cause of the derailment on the drawbridge of the West Jersey & Seashore, at Atlantic City, N. J., October 28, when a train of three passenger cars tumbled off the right hand side of a deck drawbridge, causing the death of 56 persons (55 passengers and the motorman of the train), has been decided by the coroner's jury to be the misplacement of the rail, and the main paragraph of the verdict is given below.

The main facts, reported in the *Railroad Gazette* last week, are substantially as there given, except that the signals are electro-pneumatic, controlled from a mechanical interlocking machine, and that the bridge has no pneumatic apparatus. It is opened and closed by manual power, an attendant and an assistant being on duty day and night, though vessel movements through the draw are few and far between. The draw span is 110 ft. 4 in. long. The rails of the track are 33 ft. long. At the ends each rail rests on the draw for 30 ft. and on the fixed span for 3 ft. and the end of the rail on the shore has a 45 degree miter joint. The end on the draw is fastened by the usual splice bars and the end on the shore is lifted when the bridge is to be opened. Alongside the miter joint, outside of the rail, is a railshoe,5 ft. long, to carry the wheels over the joint without jar. The shoe is supported in a heavy angle iron trough, which also forms a guide for the rail.

Entering the drawspan from the fixed span the rail is found resting in a guide consisting of a bottom plate 16 in. wide supporting two longitudinal angles 3½ in. x 3½ in., one each side of the rail, fitting closely against its base. The first guide (for the right hand or outside rail) is 1 ft. 9¾ in. long; then there is a space 9 in. long, then another guide 10 in. long; then a space of 3 ft. 6 in., then a guide 10 in., then a space 3 ft., and finally a guide 12 ft. 4 in. long, this last one having at the outside of the rail a third angle with the horizontal member at the top and level with the top of the rail, to brace it against any outward thrust of the wheels. The guides are fastened to every tie, the ties being 16 in. apart, center to center.

This right hand rail, resting 3 ft. on the fixed span, was found

to have been pushed to the left (inward), as though a wheel or wheels had gone off the track to the right of it, and it was a little bent in the first 10 ft. of its length; and yet the witnesses say that the first guide was not disturbed. The other guides, including the long one, were found so much broken that nothing could be learned from their appearance to afford any light as to the course of the wheels over them, or whether anything but the wheels came in contact with them. The few eyewitnesses agree that the leading car of the train was the first to go off the track. Its trucks are reported as having been found intact, but the cowcatcher is broken and a part of it is missing. The missing part is supposed to be in the bottom of the river. The car ran some 100 ft. before it climbed the outside guard timber. This timber is 6 in. x 8 in. notched 1½ in. over the ties and bolted to every third tie. There are no inside guard rails. The displaced rail was not distorted in its surface, nor were there any marks on either its upper or its lower surface.

The bridge lock is of the well-known type in which the unlocking of the bridge and lifting of the track rails so that they will clear the guides on the fixed span are done simultaneously by means of a capstan, working through a worm gear and bell cranks. In locking the turning of the capstan simultaneously pushes wedges between the bridge and the shore support, and lowers the rails into the shore guides. The capstan and cranks must complete their movement before the signal levers in the cabin (which is on the fixed span on the Atlantic City side of the draw), are released so as to permit the signalman to set the signals to permit a train to proceed.

The occurrence of a derailment like this will give rise to the query why the interlocking of the signals was not made to depend not only on the bridge being in place, but also on the rails being secure. To this the Pennsylvania officers, having tried both methods, reply that they have deliberately employed the watchman instead of adopting the additional mechanical complication. The chance of a watchman's introducing danger by making a wrong move or by omitting any move, is believed to be less than the chance of a disarrangement of mechanical parts which shall escape detection and lead to the display of a false clear signal, as has been known to occur.

On Wednesday, November 7, the jury listened to the testimony of James M. Whitman, a mechanical engineer who was called in by the Coroner and who had examined the cars and bridge, and after deliberating several hours brought in a verdict finding that the derailment was caused by "the northwest end of the southwest rail on the draw of the bridge being out of its proper position, due, we believe, to the neglect or oversight of the man in charge of the draw." The jury then "strongly recommends that the men employed to operate the drawbridge inspect both ends of the draw before the signal is given for trains to pass the opening ends of the draw." Mr. Whitman testified that a mark which he had found on the motor box of the truck (whether the front or rear truck is not stated) was made by the end of the displaced rail; and that measurements made by him convinced him that there could be no mistake in this conclusion. Certain marks found on the cowcatcher also were made by the protruding rail, Mr. Whitman believes.

There was testimony that Bridge-tender Stewart had had an angry discussion with the captain of the vessel which had passed through the draw a short time before the accident, and the jurymen believe that this may have caused Stewart to be inattentive to his duty. The theory accepted by the jury, based on Mr. Whitman's testimony, appears to be that the rail projected upward far enough to strike the cowcatcher (normally 11½ in. above the rail), and was by that blow further displaced so as to leave it in a position to strike the motor box.

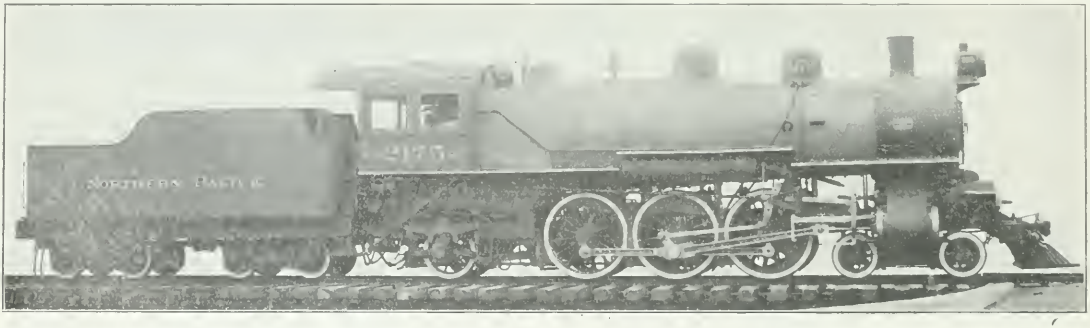
The Coroner's Jury is composed of State Senator Edward S. Lee, who was chairman of Committee on Railroads in the last New Jersey Legislature; Isaac Bacharach, Samuel P. Headley, William Ashmead, Charles Roesch, Jr., and David R. Barrett, City Assessor.

## Heavy Pacific Type Locomotive for the Northern Pacific.

The American Locomotive Co. has recently completed its 40,000th locomotive at its Schenectady Works. The engine, forming one of an order of two, is of the Pacific (4-6-2) type, and is intended for passenger service on the Northern Pacific. It has a number of interesting features and its completion was marked by a special trip of a number of representatives of the technical press to Schenectady as guests of Mr. Geo. M. Basford, of the company. The party spent the day at the works and inspected the locomotive.

The locomotive is of the Cole four-cylinder balanced compound type, with cylinders 16½ in. and 27½ in. in diameter, and a common piston stroke of 26 in. The low-pressure cylinders are on the outside and the high-pressure between the frames. The high-pressure cylinders are set ahead of the low-pressure and extend well out in front of the smokebox to the front edge of the bumper. They are raised at this point and given a slight inclination downward to the rear to secure proper clearance above the front truck, a necessity that has not previously arisen in the case of the other four-cylinder compounds that have been built by this company. Previous engines of this class have had larger driving wheels, so that the cylinders when raised to the height of the wheel centers could still be kept in a horizontal position and be high enough to clear the truck. In this locomotive the driving wheels are but 69 in. in diameter, which brings the cylinders so low that they will not clear the truck, carried on wheels of 33½ in. diameter, without the raising and tilting to an inclination of about one in sixteen.

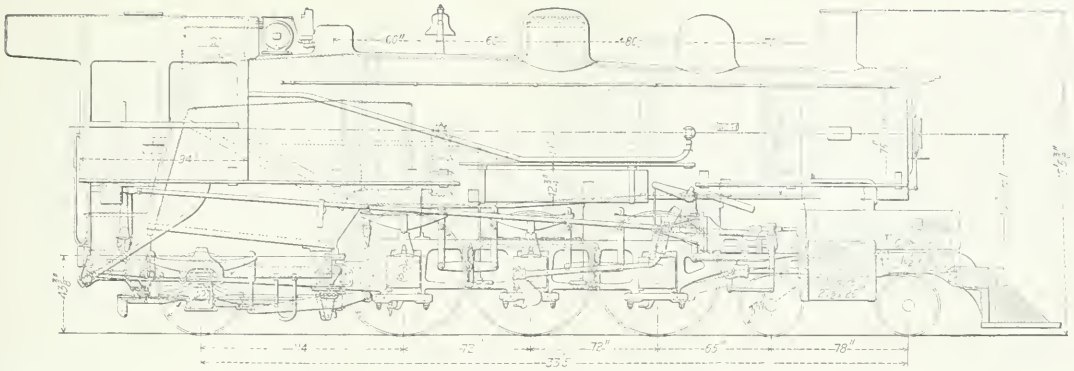
The high-pressure cylinders were set ahead of the low-pressure cylinders 3 ft. 10 in. to obtain a sufficient distance ahead of the front driving axle to use a straight one-piece connecting rod, and not a bifurcated one, straddling the front axle and reaching to the second axle. By this arrangement a length of 91¼ in. was obtained for the high-pressure main rod, that of the low-pressure being 112½ in. If the four cylinders had been located in the same transverse plane, it would have necessitated an increase of from 30 in. to 36 in. between their centers and that of the front driving axle in order to have obtained a suitable length for the high-pressure rod. This would have involved a similar increase in the length of the boiler and tubes, whereas with the design, as worked out, there was no radical change in the wheel base and boiler from other engines of the same class on the road. The front of the boiler was simply extended and the flues kept the same length as in the simple Pacific engines, but the center line of the low-pressure cylinders was set 12 in. farther from the front drivers.



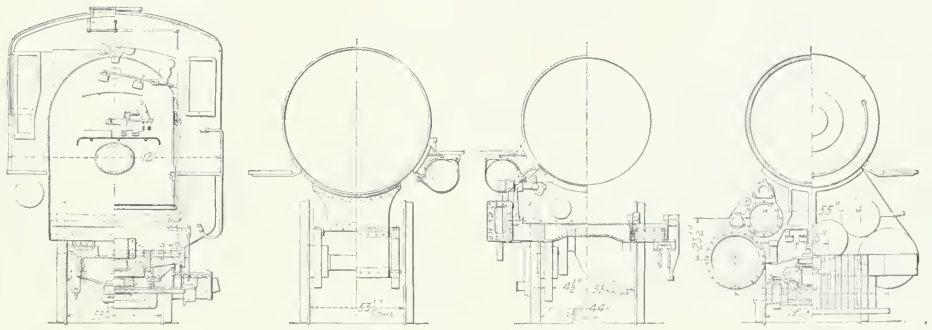

Cole Four-Cylinder Balanced Compound Pacific (4-6-2) Type Locomotive for the Northern Pacific.

The crossheads are of the Vogt type with top bearings, and the crank axle for the front drivers is forged of high carbon steel. It was made by Krupp and is of the form and dimensions shown in the engravings. The boiler presents the novel feature of the use of a combustion chamber as compared with current practice on other roads. On the Northern Pacific, however, such satisfactory results have been obtained by the use of the combustion chamber, in reducing boiler troubles, that the design has been adopted on all recent engines. The experience obtained with this class of boiler has shown that there is a great reduction of tube leakage when their ends are removed some distance from the hottest part of the fire. In addition to this, the combustion chamber gives ample opportunity to work the ends of the tubes without removing the brick arch.

As far as evaporative efficiency is concerned, engines with the combustion chamber steam equally as well as those without it. The increase of firebox heating surface is, therefore, apparently fully equivalent to the loss of tube heating surface occasioned by the necessary reduction of length. In this case the tubes have a length of 16 ft. 9 in. and the combustion chamber a depth of 3 ft. ½ in. This experience seems to corroborate the soundness of the



Side Elevation of Cole Four-Cylinder Balanced Compound Pacific (4-6-2) Locomotive. Built by the American Locomotive Company for the Northern Pacific.



End Elevations and Cross-Sections.

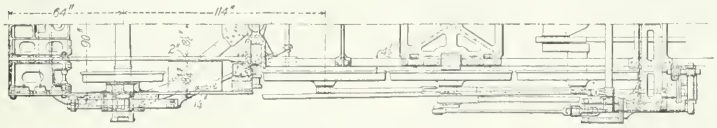
claim of Mr. H. H. Vaughan in his formula regarding the relative value of firebox and tube heating surfaces. According to this formula

$$h = \frac{H}{\sqrt{l}}$$

in which

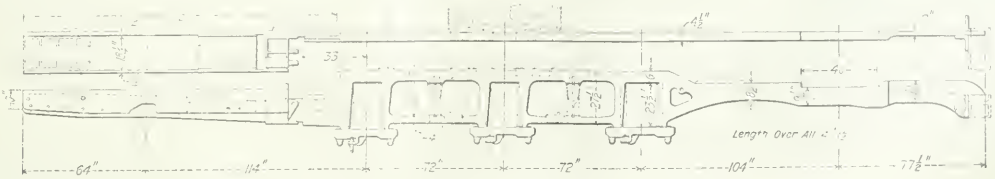
h = the tube heating surface as equated for firebox heating surface.
H = tube heating surface in sq. ft.
l = tube length in feet.

In the engine under consideration the tube heating surface is 2,667 sq. ft., and, as equated for firebox heating surface, according to the Vaughan formula, it is equivalent to 652.08 sq. ft. of fire-

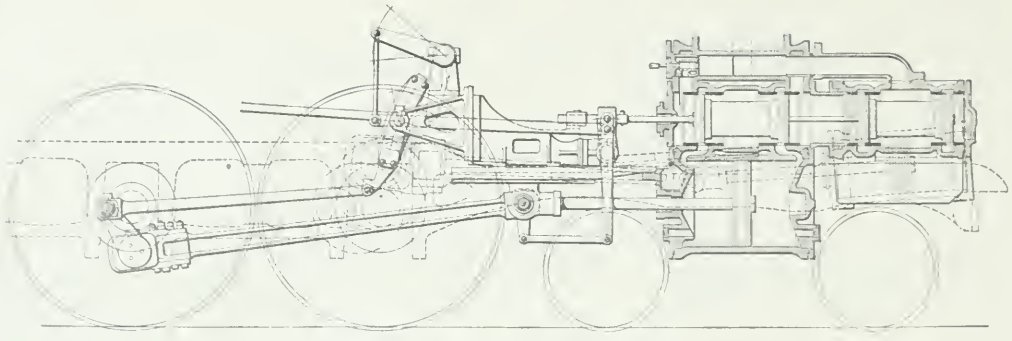


Half Plan of Machinery.

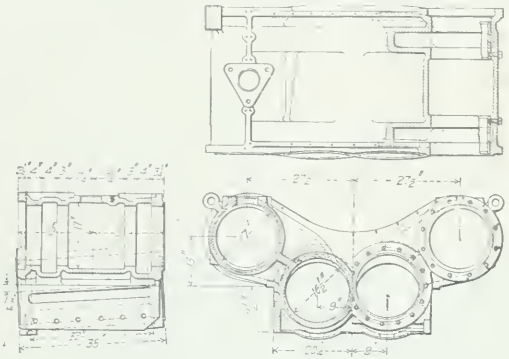
box surface. If the tubes had added to their length the depth of the combustion chamber, their total heating surface would be 3,147 sq. ft. At present the total firebox heating surface is 241.8 sq. ft., of which 61.5 sq. ft. is in the combustion chamber. According to the Vaughan formula the 160 extra square feet of heating surface that would have been gained in the tubes by extending them to the back of the combustion chamber, is equivalent to 56 sq. ft., showing that the present arrangement should be the more efficient of the two. In making this calculation the revised length of the tubes is taken at 19 ft. 9 in., and the result shows the falling off in tube efficiency per foot of length as the total length is increased. The use of the crank axle and the crowded condition between the frames necessitated the use of the Walschaert valve gear. It is driven from an eccentric crank on the low-pressure crank pin, and, as will be seen by a reference to the plan, it works in a straight line from the crank pin to the rocker. It was impossible to carry it forward in the same line to the valve stem because of the necessity of setting the valve stem in, in order to use one stem for the two valves of the high and low-pressure cylinders on each side, the arrangement of which is clearly shown by the illustration of the valve motion. The steam chests are horizontal and parallel to the low-pressure cylinder, and the space between the valves serves as the receiver. The valves are of the piston type and of the same diameter; that of the high-pressure cylinder being arranged for inside admission and that of the low-pressure for outside admission. The low-pressure cylinders are cast with half saddles, while the high-pressure cylinders are cast with their steam chests in one piece. The frames are in one piece from the splice of the rear frame back of the rear driving pedestal to the front bumper with a deep single rail at the front of the full width of the main frame (41½ in.) to a point just in front of the low-pressure cylinder seat where it is narrowed to 2 in. At this point the high-pressure cylinder is bolted on each side with six 1⅛-in. bolts. These cylinders thus form a cross-tie between the frames. The frame is exceptionally rigid in cross bracing. Starting at the forward end there is the front bumper, then comes the high-pressure cylinders and then the low-pressure cylinders. Back of this in the clear space left between the frames is a system of stiff cross bracing. Immediately back of the low-pressure cylinders there is a steel casting that serves not only as a cross tie for the frames but as a support for



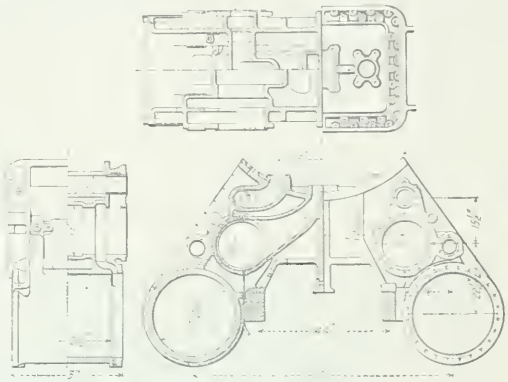
Frame for Four-Cylinder Balanced Compound Locomotive; Northern Pacific.



Arrangement of Walschaert Valve Gear.



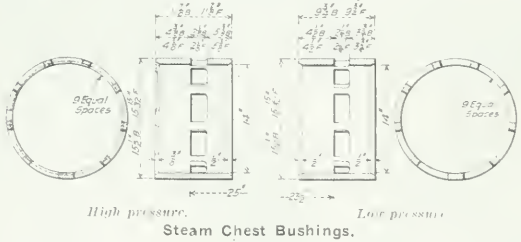
High Pressure Cylinders.



Low Pressure Cylinders.

the guides of both high and low-pressure crossheads, and a fastening for the rocker boxes, reverse shaft box and link bearing. Back of this again, and in line with the second driving axle is another broad open cross-tie shown in the plan. Then comes a cross-tie to which the waist buckle plate is attached. The lower rail of the frame is also cross-braced between the wheels. The front of the firebox rests on expansion pads while the back end is carried by the usual buckle plate. Finally the frame is held at the rear in the ordinary manner by the deck plate. It will thus be seen that the frame is well provided with cross-bracing throughout its whole length, and that with braces of such width that it will be almost impossible for any yielding to occur.

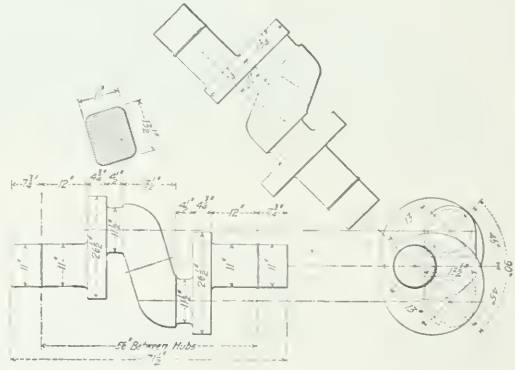
The use of a four-cylinder balanced compound locomotive for heavy passenger service on the Northern Pacific marks another step in advance in the introduction of this type of locomotive and a recognition of its especial adaptability for this class of work. This is particularly emphasized by the fact that by the elimina-



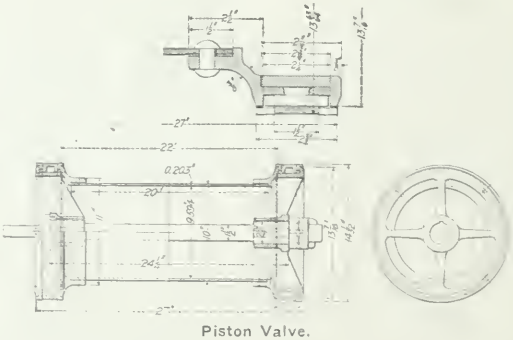

Steam Chest Bushings.

tion of the hammer-blow an increase in weight of 11,000 lbs. on the driving wheels over that permitted with the simple engine of the same class has been allowed.

Another advantage that it is expected will be gained is the sustained development of a higher horse-power without an increase in the size of the boiler. This expectation is based on tests made with a balanced compound locomotive on the New York Central, in which it was shown that with identically the same size of boiler the compound engines developed from 20 to 30 per cent. higher horse-power on a sustained run than the original simple engine. In actual service the compounds developed 1,688 indicated horse-power at 67 miles an hour and 1,980 horse-power at 75 miles an hour, while the simple engine developed only from 1,400 to 1,500 horse-power.

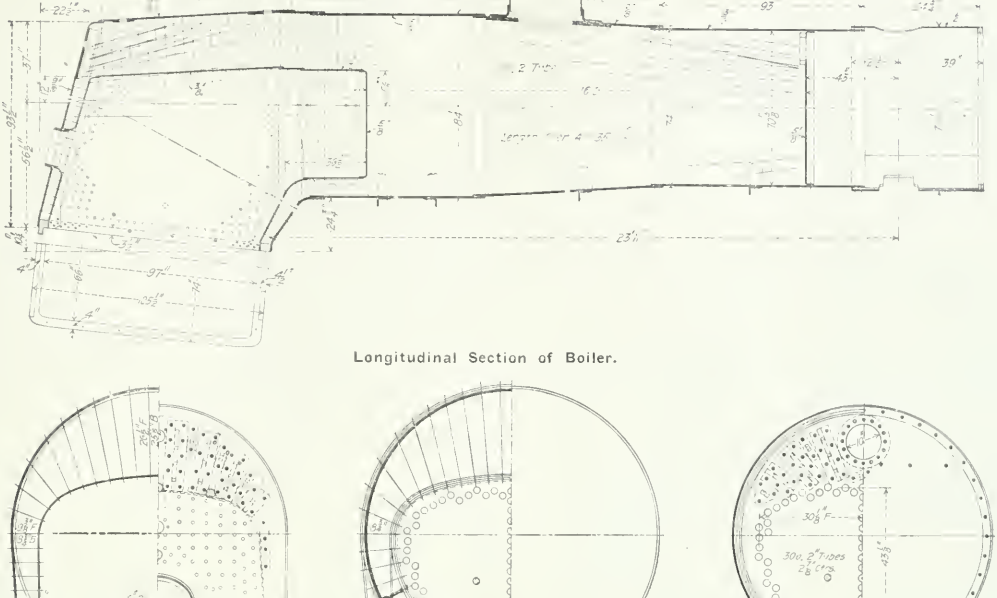


Crank Axle.

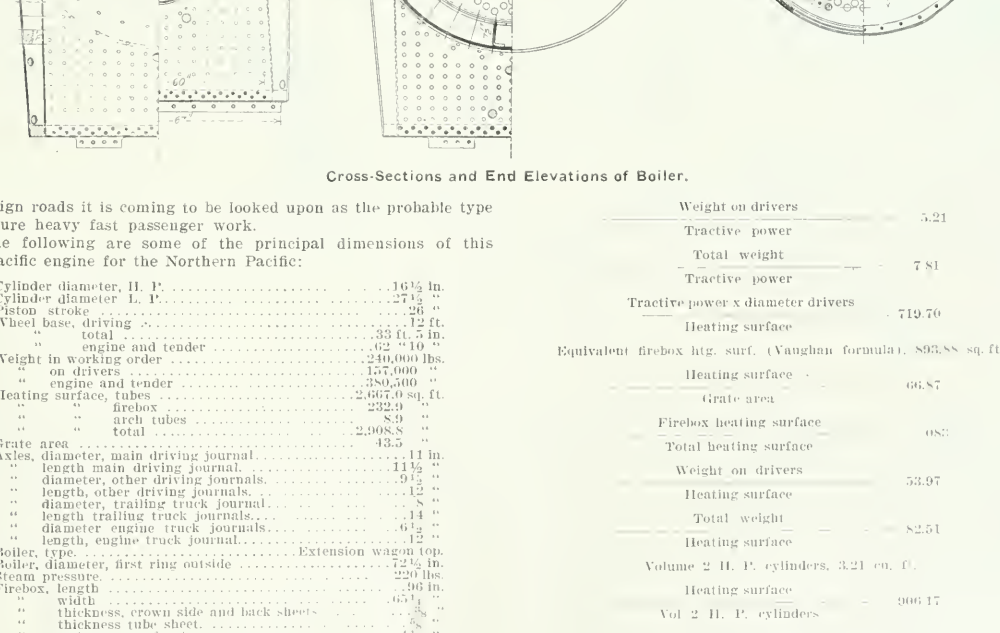


Piston Valve.

* This type of locomotive has not been in service long enough in this country to have developed all of its good or bad qualities, nor have we, as yet, any thorough information as to the life and cost of maintenance, but from what has been done and the records



Longitudinal Section of Boiler.



Cross-Sections and End Elevations of Boiler.

of foreign roads it is coming to be looked upon as the probable type for future heavy fast passenger work.

The following are some of the principal dimensions of this new Pacific engine for the Northern Pacific:

| | |
|---|---|
| Cylinder diameter, H. P. | 16½ in. |
| Cylinder diameter L. P. | 27½ " |
| Piston stroke | 26 " |
| Wheel base, driving | 12 ft. |
| " total | 33 ft. 5 in. |
| " engine and tender | 62 " 10 " |
| Weight in working order | 240,000 lbs. |
| " on drivers | 157,000 " |
| " engine and tender | 380,500 " |
| Heating surface, tubes | 2,667.0 sq. ft. |
| " " firebox | 292.9 " |
| " " arch tubes | 8.9 " |
| " " total | 2,968.8 " |
| Grate area | 43.5 " |
| Axles, diameter, main driving journal | 11 in. |
| " length main driving journal | 11½ " |
| " diameter, other driving journals | 9½ " |
| " length, other driving journals | 12 " |
| " diameter, trailing truck journal | 8 " |
| " length trailing truck journals | 14 " |
| " diameter engine truck journals | 6½ " |
| " length, engine truck journal | 12 " |
| Boiler, type | Extension wagon top. |
| Boiler, diameter, first ring outside | 72½ in. |
| Steam pressure | 220 lbs. |
| Firebox, length | 96 in. |
| " width | 65½ " |
| " thickness, crown side and back sheets | ⅜ " |
| " thickness tube sheet | ⅝ " |
| " water space, front | 4½ " |
| " water space, sides and back | 4 " |
| " crown staying | Radial |
| Tubes, number | 306 |
| " diameter | 2 in. |
| " length | 16 ft. 9 " |
| Exhaust nozzle | Single |
| Exhaust nozzle, diameter | 5⅜ in., 5⅝ in. and 5⅞ in. |
| Smokestack, diameter | 18 in. and 20 in. |
| Tank, water capacity | 7,000 gals. |
| Tank, coal capacity | 12 tons. |
| Valves, travel | 6 in. |
| " steam lap | 1 in. |
| " exhaust clearance, H. P. | 3/16 " |
| " exhaust clearance, L. P. | 3/8 " |
| " lead | ¼ " |
| Wheels, diameter drivers | 69 " |
| " " front trucks | 33½ " |
| " " trailing truck | 45 " |
| " " tender | 33½ " |
| Ratio of high to low pressure cylinders | 1 to 2.78 |
| Tractive power | 30,340 lbs. |

| | |
|---|---|
| Weight on drivers / Tractive power | 5.21 |
| Total weight / Tractive power | 7.81 |
| Tractive power x diameter drivers / Heating surface | 719.70 |
| Equivalent firebox htg. surf. (Vaughan formula) | 893.88 sq. ft. |
| Heating surface / Grate area | 66.87 |
| Firebox heating surface / Total heating surface | .083 |
| Weight on drivers / Heating surface | 53.97 |
| Total weight / Heating surface | 82.51 |
| Volume 2 H. P. cylinders, 3.21 cu. ft. | |
| Heating surface / Vol 2 H. P. cylinders | 906.17 |
| Grate area / Vol 2 H. P. cylinders | 13.55 |

In the construction of the engine cast steel is used for the axle boxes and wheel centers in addition to those parts already mentioned. It is equipped with the Westinghouse-American driver truck and engine brakes.

A company has been incorporated in Natal, South Africa, to build a large iron and steel mill at Vryheid, to mine coal at Hlobane, and build a railroad 37 miles long. The road is to cost about $1,000,000 and is to be operated by the government. The concession given to the new company provides that it shall spend $1,250,000 on the iron mills and sell coal to the Government at $1.25 per ton.

## The Tehuantepec National Railway.

While the type of canal to be adopted at Panama has only lately been decided upon, and its completion will probably require from eight to ten years, the Tehuantepec National Railway, which is to accomplish, though in another way, the same results commercially as the Panama Canal, is now almost ready to be put in complete operation for through traffic. In the *Railroad Gazette* of July 15, 1904, E. L. Corthell, who had himself been associated with a similar project, described the long and interesting history of the attempt to make a satisfactory line of communication across the Tehuantepec isthmus. The project was commented on editorially in our issue of July 28, 1905, at the time when the announcement was made that the American-Hawaiian Steamship Company had concluded a contract with the Tehuantepec National Railway for operation of connecting steamship lines on both the Pacific and Atlantic oceans. Through the courtesy of S. Pearson & Son, Limited, of London, joint lessees with the Mexican Government of the road, we are enabled to present late facts in regard to the present state of the route and two new official maps of the railroad and its connections.

The Tehuantepec National is 189 miles long and runs from Coatzacoalcos, on the Gulf of Mexico, south across the Isthmus to the Pacific port of Salina Cruz. The present contract on which the firm of S. Pearson & Son, Limited, is now engaged has involved the entire reconstruction of the railroad from end to end, in order to put it in shape for heavy traffic, and the construction of notable harbor works at each of the two terminals. The railroad had previously been built piecemeal across the Isthmus and was of poor construction, entirely unsuited to heavy traffic.

The Tehuantepec National Railway, Showing Railroad Connections.

The line as reconstructed has been improved throughout. Gradients have been reduced to a maximum of 1.6 per cent., compensated, and curvature to a maximum of 11 deg. 40 min. The line rises gradually from the Atlantic terminus, reaching a maximum elevation above sea level of 855 feet at Niza Conejo, and thence drops quickly to sea level again at the Pacific at Salina Cruz. The rails, originally 56-lb., have been replaced by 80-lb. rails of the Am. Soc. of C. E. section. Ties are spaced 13 to 14 to a 30-foot rail length. Some ties are native hardwood, but most of them are creosoted American pine or California red wood, with Lewis tie plates. Two-thirds of the road is ballasted with crushed rock 12 to 1 in. deep, the remainder with gravel. There is only one short tunnel on the line. There are, however, a number of bridges, all of the recent ones having been designed for consolidation engines with 44,000 lbs. on the driving axles and train loads of 4,000 lbs. per foot. One of the largest bridges is at San Lucretia, 9 miles from the Atlantic terminus, where the Vera Cruz & Pacific joins the Tehuantepec line. It is over the Jaltepec river. This is a five-span steel lattice girder, Pratt type bridge 560 ft. long, with masonry abutments. Most of the more important bridges are of this type, though the plate girder type is also used. The smaller bridges are built with lattice half through girders and the smallest of all with plate deck girders. Culverts on the northern end of the line are concrete; on the central and southern parts, masonry. The number of bridge openings was originally 838, spanned mostly by timber structures. By filling up trestles and replacing small bridges with culverts the number of bridge openings has been reduced to 257, all of which have iron or steel superstructures. Both consolidation and 10-wheel locomotives are largely in use, and all engines are being fitted, if not originally so designed, for the use of oil fuel. At present, most of the oil is imported from Texas, but it is planned to use the mineral oil found on the Isthmus, which is now being exploited and developed.

The headquarters of the road are at Rincon Antonio, a new town 125 miles from the Atlantic and 68 miles from the Pacific terminus. Here large new buildings have been built for the use of the staff and employees. The road includes a 16-mile branch running to San Juan Evangelista. Over the Vera Cruz & Pacific there is connection with the railroads of Mexico and the United States. One problem which has made difficult the operation and reconstruction of the road is the rapid growth of the tropical vegetation. Instead of going to the expense of removing the growth every few weeks, the company has made use of a chemical compound which permanently destroys it. This effects a saving of about $12,000 a year. The roots of the plants as well as the growth above ground are completely killed by this chemical, which is applied hot in liquid form from a tank car which is heated by coiled steam pipes and the chemical spread by steam pressure through an atomizer.

In the reduction of grades and curvature some heavy construction work was done. The line passes through several gorges or canyons where deep rock cutting and steep embankment work were necessary; for instance, 10 miles in the Malatango canyon and 24 miles in the Chivla Pass, the latter the highest land between the two oceans. Here the track is in two horseshoe curves and there is the only tunnel on the line. Here also the maximum gradients and curvature for the rest of the line are exceeded, the grade rising to 2.7 per cent. and the curvature to a maximum of 21 degrees 40 minutes.

Hardly second to the large amount of work necessary on the line of the railroad has been the improvement of the two harbors. The plan provides for a depth of water at the terminal wharves in each ocean of 32 ft. 9 in. at low water. At Coatzacoalcos on the Atlantic side the Coatzacoalcos river empties into the ocean, and through the silt and debris which is brought down, the bar at the mouth of the river between the extensive deep basin inside and the deep water outside normally had about 14 feet of water on its crest. The channel was deepened to 32 ft. 9 in., but a rise in the river in two weeks shoaled the channel to 14 feet. In order to make and keep the channel clear two permanent jetties of stone and concrete blocks are being built, converging from a width of 3,445 ft. at the shores to 919 ft. at the sea ends. By means of these jetties it is expected that the current in the river instead of spreading out and forming a bar will be confined in a narrower channel and wash the silt out into the deep water beyond. The railroad terminal at this point includes wharves extending for 3,640 ft. along the west bank of the river, of structural steel, supported by 6-inch solid steel piles

decked with timber. Behind the wharves are five sheds 400 ft. by 110 ft. The wharves are equipped with 12 electric cranes of 3 tons capacity and electric capstans for handling cars, together with railroad tracks leading out to the railroad. Five of the wharves are now ready and fully equipped. The training walls are nearly finished. There is already plenty of deep water in the river and alongside the wharves and there is soon to be 30 ft. over the bar at the mouth of the river.

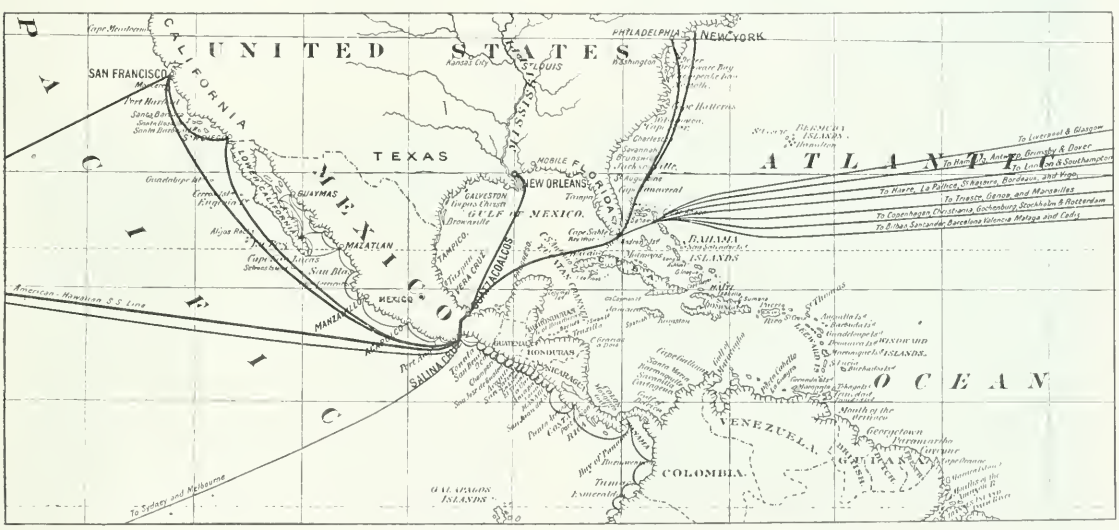
Salina Cruz, instead of being at the mouth of a river, is open to the waves of the Pacific. A long curved shore line with, on the west, a promontory of porphyry rock 245 ft. high jutting out into the sea, has been used as a brace to which to tie a breakwater made out of the rock of the bluff. The stone blasted off has been used as the foundation of a massive work formed of huge concrete blocks put in place by a powerful Titan crane which moves on the completed work. As the water deepens rapidly, the dike will rest at its end in about 59 ft. of water. A similar dike is being built on the east side and when completed there will be an entrance about 650 ft. wide between the two. The east jetty is built by carrying the materials along the shore from the promontory and depositing them by a second Titan crane. These two massive breakwaters, thrown out like giant protecting arms into the sea, will form the outer harbor, or harbor of refuge. The east breakwater is to be five-eighths of a mile long and the west breakwater about 1,900 ft. long. The largest quarry block yet handled for the breakwaters weighs 56½ metric tons. The real harbor will be an inner basin which will be reached by a passage from the outer harbor and in which there will be still water. This harbor will be wholly artificial, occupying on the shore the former site of the old town of Salina Cruz. Excavation of the inner basin is being done by two dredges, one having a 24-in. and the other two 20-in. centrifugal pumps by which sand is pumped into hoppers on the boats which then go out to sea and dump it in deep water. The basin will be about 3,280 ft. long by 728 ft. wide, with 32 ft. 9 in. depth of water at low tide. The entrance, which will be in the dividing wall for passage of ships from the outer harbor to the inner basin, will be 98 ft. wide and will be spanned by two swing bridges. On each side of the entrance three warehouses will be built and tracks will be laid on the wharves for handling freight between rail and ship, assisted by traveling electric cranes. Vessels are to moor alongside the wharf within the basin. The wharves are on the south side of the enclosed tidal basin, the quay wall being formed of concrete monoliths sunk in place and coped with granite. This quay has sheds, electric cranes and capstans similar to the equipment of the wharves at Coatzacoalcos. On the opposite side of the basin a graving dock 590 ft. long and 98 ft. wide by 31 ft. deep is in course of construction. At Salina Cruz, berths for two 12,000-ton steamers are now ready and further wharfage accommodations will soon be available. The harbor works at both these terminals are now far enough advanced to permit the largest ocean-going steamers with perfect safety in all weathers to discharge alongside the wharves direct into cars or warehouses. At both terminals accommodations can be increased almost indefinitely.

The following steamship lines already call regularly at Coatzacoalcos and Salina Cruz: Compania Mexicana de Navegacion, Cia. Nevira de Pacifico, Cuban Steamship Line, Pacific Mail and Cosma Steamship Company. When the two terminal harbors are opened for interoceanic traffic the America-Hawaiian Line will divide its steamers now running between New York and Hawaii via the straits of Magellan into two fleets, one giving regular service between Hawaii, San Francisco and Salina Cruz on the Pacific and the other a weekly service on the Atlantic between New York and Coatzacoalcos. In addition, all steamship lines now running from Europe to Mexico plan to give direct service to Coatzacoalcos and steamship connections are to be established at Salina Cruz with all the Pacific Coast ports of Central and South America as far south as Valparaiso. As indicating the saving in distance which can be effected by use of the Tehuantepec route, the following table is given:

*Distances in Nautical Miles.*

| | | Via Tehuantepec. | Via Panama. |
|---|---|---|---|
| New York | to San Francisco | 4,226 | 5,495 |
| | Acapulco | 2,363 | 3,613 |
| | Mazatlan | 3,017 | 4,055 |
| | Yokohama | 8,666 | 9,835 |
| | Honolulu | 5,699 | 6,688 |
| New Orleans | to San Francisco | 3,091 | 4,700 |
| | Acapulco | 1,262 | 2,861 |
| | Mazatlan | 1,759 | 3,458 |
| Liverpool | to San Francisco | 7,182 | 8,038 |
| | Acapulco | 5,274 | 6,035 |
| | Honolulu | 8,511 | 9,263 |
| | Yokohama | 11,478 | 12,500 |

This shows that the average saving in distance by the Tehuantepec route over Panama to all points on the Atlantic Coast of the United States and Europe is about 1,250 miles. The ordinary freight steamer makes about 250 miles a day, which would mean five days longer via Panama, assuming the time of crossing the two isthmuses to be the same. To pass through the Panama canal will probably take a steamer about a day, while it is expected to send freight across the Tehuantepec isthmus from ship to ship in two days. This would leave four days to the advantage of Tehuantepec.




The Tehuantepec National Railway, Showing Steamship Connections.

The project is being carried on under a partnership contract extending for 51 years from July 1, 1902, between the Mexican Government and S. Pearson & Son, Limited, of London. The contractors are the managers of the company's affairs. The working capital is to be furnished in equal shares by the two parties to the contract. The surplus earnings after payment of all expenses, fixed charges and losses is to be divisible between the government and the contractors as follows: During the first 36 years, 65 per cent. to the Government and 35 per cent. to the contractors, with slightly increased percentages going to the Government during the remainder of the contract. At the close of the 51-year period the property is turned over to the Mexican Government. In May the Mexican Congress passed a law authorizing an increased expenditure of $12,250,000 to be used in completion of the port works at Coatzacoalcos. Extracts from the law are as follows:

"Article 1. The Executive of the Union is empowered to take $5,000,000 from the treasury reserves, and a sum not exceeding $2,000,000 from the surplus to be obtained in the current fiscal year of 1905-1906, for the exclusive purpose of paying the cost of the works which are being executed at the ports of Salina Cruz

and Coatzacoalcos, in accordance with the contract promulgated on January 24, 1900.

"Art. 2. The Executive is also empowered to emit, in the course of the fiscal years 1906-1907, 1907-1908 and 1908-1909, interest bearing treasury notes, running for not more than two years. The proceeds of these notes will be devoted to the payment of the works referred to in the foregoing article.

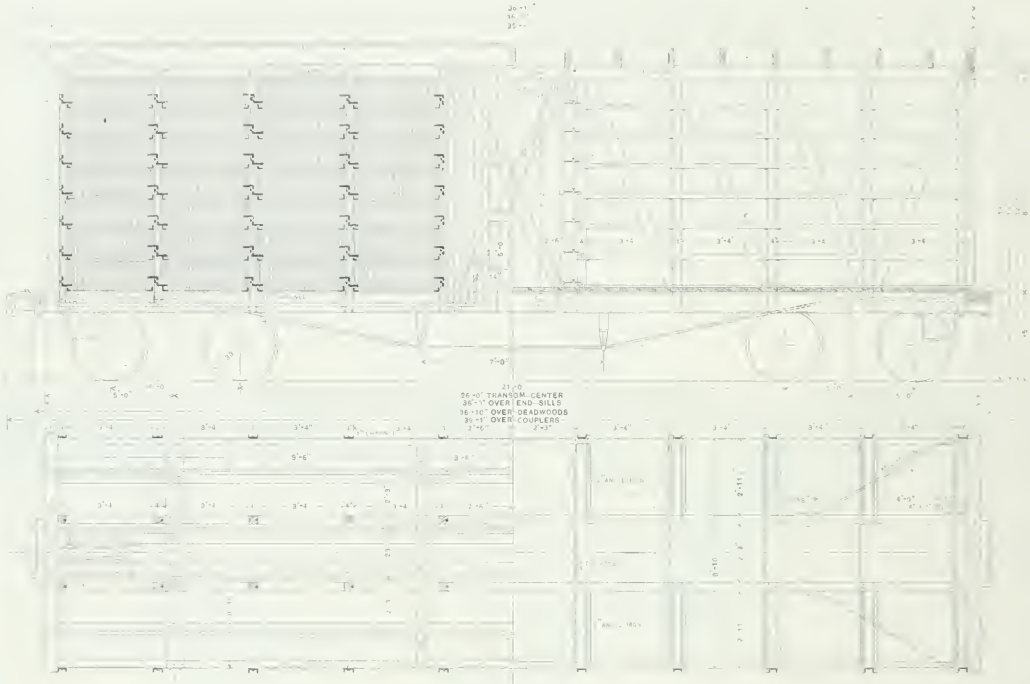
"Art. 3. On no account shall there be issued in one and the same fiscal year more than $4,000,000 of treasury notes, and the amount of those emitted in the years 1906-1907, 1907-1908 and 1908-1909, according to the second article of this law, shall not exceed $5,250,000.

The total cost of the port works at Coatzacoalcos and Salina Cruz is estimated at $65,000,000. About $35,000,000 has already been spent, leaving $30,000,000 still to be provided for. To provide this sum in the most convenient manner is the object of the bill.

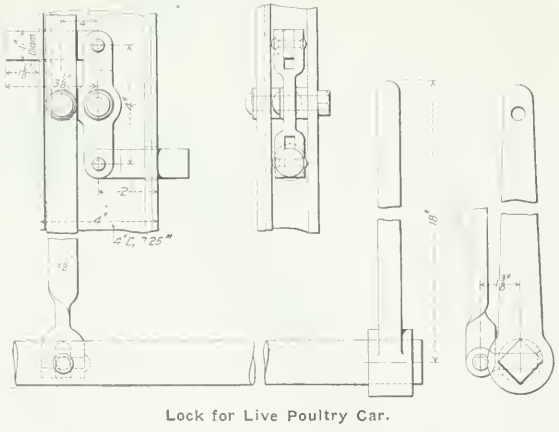
The management of the railroads of Alsace-Lorraine, which are the property of the German Empire, has notified its employees that it regards two associations (socialistic) of railroad employees, known as the "Railroaders of Germany" and the "South German Railroad Union," as hostile to public order, and that membership or support of either will be considered incompatible with service on the Imperial railroads, and will be cause for dismissal from the service. In the place where this notice was first posted, where there are railroad shops, one of these organizations is said to have 900 members.

## A New Live Poultry Car.

A new kind of live poultry car is illustrated by the accompanying drawings. To permit the coops to be inserted and withdrawn from the outside, the side frame bracing is transferred to a position at the back of the coops over the intermediate sill next the center sill. The side posts are 4-in. channels riveted to channel iron side sills and plates and the coops slide on angle irons riveted to these posts. Additional strength is given the side frame by an X brace of channel irons riveted to the side sill and plate in the space ordinarily occupied by the door opening. The car has a center aisle 27 in. wide and end doors the width of the aisle and 6 ft. high. Small side doors, 5 ft. high and 28 in. wide, are also put there in front of the X braces, as a matter of convenience. The car holds 112 coops, giving it a capacity of 6,720 chickens.




Bundy Live Poultry Car.




Lock for Live Poultry Car.

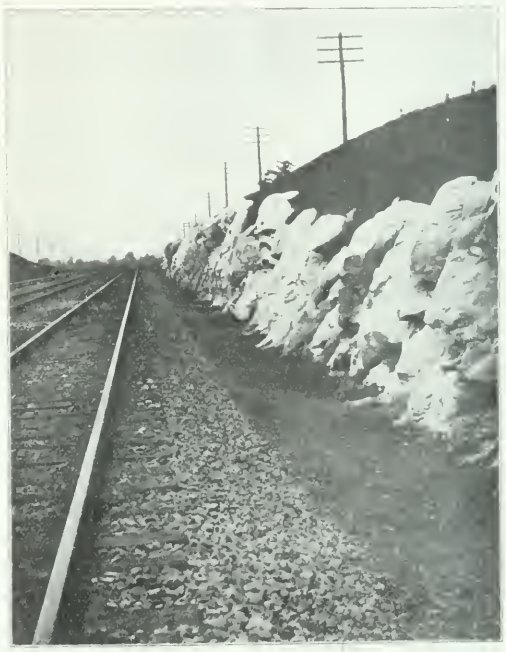
End Elevation and Cross-Section.

The coops are locked in place by a special locking device, a drawing of which is shown. All of the locks on one side of the car are thrown by a single lever at the middle of the car, lengthways. The principal advantages of the coop arrangement are the ease with which it can be removed and cleaned and replaced, thus making it easy to keep the coops and the car in sanitary condition. There are troughs on the aisle side of the coops and overhead is a water tank with pipes to the troughs for watering the poultry in transit. The car was designed by Mr. C. L. Bundy, Superintendent of the coach department of the Hicks Locomotive & Car Works, Chicago Heights, Ill.

### Experimental Roadbed on the Pennsylvania.

About a year ago on the suggestion of President Cassatt a committee of engineering officers of the Pennsylvania Railroad was appointed to prepare plans for a proposed standard roadbed section that would be perfectly drained, amply ballasted and present a neat and pleasing appearance to travelers on passing trains. Four short stretches of track on the main line were rebuilt last summer in accordance with the plans submitted by this committee. One five-mile section is near Lancaster on the Philadelphia division and another is near Newport in the Middle division. One section 2½ miles long is near Cresson on the Pittsburg division and a similar section is near Hillside about 50 miles east of Pittsburg. The accompanying illustrations show the appearance of this track in rock and earth cuts. The ditch on each side is 10 ft. 6 in. wide with the bottom 3 ft. 6 in. below the level of the top of the ties. This gives a decided slope away from the ballast and provides a waterway large enough to carry off any heavy rain. The ditch is not paved or sodded, but sprinkling with crude oil has been tried in places to keep down dust and weeds. The banks above the ditch are sodded to prevent washing down. In building these experimental sections, about 5,000 cu. yds. of additional ballast per mile were required to raise the tracks and provide better drainage. The greatest expenditure, however, was in cutting down the slopes and sodding the banks, which amounted to about 60 per cent. of the whole cost of the improvement.

Pennsylvania Experimental Roadbed in Earth Cut.



Pennsylvania Experimental Roadbed in Rock Cut.

### The Pennsylvania's 50-Year Dividend Record.

The dividend of 3½ per cent. on the Pennsylvania stock declared November 1, marks a jubilee anniversary in the completion of 50 years of consecutive dividends. Since dividends were first begun in 1856 the company has made the remarkable record of never having failed to pay a cash dividend for each semi-annual period. The dividend of 3½ per cent. is on $305,794,500 stock and amounts to $10,702,807. The first dividend in May, 1856, of 4 per cent., was on $10,886,004, and amounted to $435,440. In addition to the cash dividends the Pennsylvania has at irregular intervals beginning May, 1864, declared scrip dividends in twelve different years. The largest dividend of this kind was 30 per cent. in 1864, when 10 per cent. in cash was also paid. In those days the rates received for transportation were very high, and railroads largely followed the policy of paying out profits as they were earned. The total scrip dividends aggregate $25,512,139 par value. The lowest rate of cash dividend paid in any one year was 3½ per cent. in 1877. The total cash dividends paid by the Pennsylvania aggregate $269,116,854. The total cash and scrip dividends together are $294,628,993, an amount nearly equalling the present capital stock.

Stock allotments, conferring valuable rights to stockholders, have been a feature of the company's operations, in raising new capital for improvements. There have been numerous such allotments, covering the last 42 years, but the greatest were in 1901 and 1903, these allotments being of 33⅓ per cent. in par value to $50,500,800 and $75,094,750 respectively. The outstanding stock of the company from 1856 to 1861 was less than $11,000,000. During this period the dividend ranged from 6 to 10 per cent. Up to 1872 the capital stock had not reached $50,000,000, and the semi-annual dividend disbursements did not exceed $2,000,000. Between 1875 and 1880 the rate dropped to 4 per cent. per year for most of the time. By 1888, the capital stock outstanding had reached $106,545,400, and by 1893 it was $129,215,800. At this latter figure the dividend remained at 5 per cent. per year for seven years. Then, in 1900, an extra dividend of 1 per cent. was declared, followed 18 months later by the establishment of the dividend on a regular basis of 6 per cent. per year, which has since been maintained up to to-day.

The rate of the semi-annual cash dividends declared, the amount of capital stock outstanding and the dividend disbursement each six months since May, 1892, when 6 per cent. per annum was being paid, is shown below:

| | Capital. | Rate. | Disbursed. |
|---|---|---|---|
| May, 1892 | $126,774,050 | 3 | $3,803,221 |
| November, 1892 | 126,774,500 | 3 | 3,803,235 |
| May, 1893 | 126,771,500 | 2½ | 3,169,362 |
| November, 1893 | 129,245,800 | 2½ | 3,231,145 |
| May, 1894 | 129,289,000 | 2½ | 3,232,225 |
| November, 1894 | 129,296,900 | 2½ | 3,232,422 |
| May, 1895 | 129,299,750 | 2½ | 3,232,493 |
| November, 1895 | 129,300,700 | 2½ | 3,232,517 |
| May, 1896 | 129,301,850 | 2½ | 3,232,546 |
| November, 1896 | 129,303,050 | 2½ | 3,232,576 |
| May, 1897 | 129,303,250 | 2½ | 3,232,581 |
| November, 1897 | 129,303,550 | 2½ | 3,232,588 |
| May, 1898 | 129,304,550 | 2½ | 3,232,613 |
| November, 1898 | 129,304,900 | 2½ | 3,232,622 |
| May, 1899 | 129,305,200 | 2½ | 3,232,630 |
| November, 1899 | 129,305,450 | 2½ | 3,232,636 |
| May, 1900 | 139,186,100 | 2½ | 3,479,652 |
| November, 1900 | 151,474,950 | 2½* | 3,901,548 |
| May, 1901 | 151,502,100 | 2½* | 3,787,560 |
| November, 1901 | 202,003,200 | 2½* | 7,070,112 |
| May, 1902 | 200,374,850 | 3 | 6,131,245 |
| November, 1902 | 204,371,850 | 3 | 6,131,245 |
| May, 1903 | 204,380,950 | 3 | 6,131,428 |
| November, 1903 | 288,716,750 | 3 | 8,661,502 |
| May, 1904 | 296,485,550 | 3 | 8,894,566 |
| November, 1904 | 301,284,250 | 3 | 9,038,527 |
| May, 1905 | 301,285,250 | 3 | 9,038,578 |
| November, 1905 | 302,513,300 | 3 | 9,075,399 |
| May, 1906 | 305,210,000 | 3 | 9,156,300 |
| November, 1906 | 305,794,500 | 3½ | 10,702,807 |

*And 1 per cent. — *Wall Street Journal.*

The Wurtemberg State Railroads contemplate a new schedule of wages for shop hands revised as follows: The management prepares

a tentative schedule, a copy of which is sent to every member of the committees representing the different classes of workmen. At the meeting of each of these committees when they consider this schedule a representative of the management will be present. The final schedule will be issued after considering the reports of all these committees.

## Balanced Compound Prairie Type Locomotives for the Atchison, Topeka & Santa Fe.

The Baldwin Locomotive Works has recently delivered to the Atchison, Topeka & Santa Fe 56 four-cylinder balanced compound Prairie (2-6-2) type locomotives, which are the heaviest six-coupled locomotives ever turned out by the builders. They have a tractive power of 37,840 lbs. when working compound. As the weight on the driving wheels is 174,700 lbs. the factor of adhesion is 4.61. The distribution of weight on the truck wheels is not excessive, but the driving axle loads are very high, 58,233 lbs. The use of the four-cylinder compound system of balancing makes possible the use of a weight on each driving axle, which, a few years ago, would have been considered quite unsafe. These locomotives are intended for fast freight service on a part of the Santa Fe having 10 degree curves, and with grades from .6 per cent to 1.25 per cent. Heretofore the balanced compound has been considered as exclusively a type for passenger service, chiefly because the perfect balancing obtained made possible high speeds and greater adhesive weight per axle. The application of the principle to locomotives for fast freight service is novel, but entirely in line with the demand for quick transportation of perishable commodities. The growing traffic in fruits and Oriental imports from California has resulted in the adoption of through freight schedules by the transcontinental roads, which to-day exceed in average speed the passenger schedules of a few years ago. These locomotives, with their large boilers and ample cylinder dimensions, will be able to handle these fast through freights in better time and with more reliability than ever before.

*General Dimensions.*

| | |
|---|---|
| Wheel base, driving | 13 ft. 8 in. |
| Wheel base, total engine | 33 ft. 9 in. |
| Wheel base, total engine and tender | 64 ft. 7½ in. |
| Heating surface, firebox | 207.3 sq. ft. |
| Heating surface, tubes | 3,810.5 sq. ft. |
| Heating surface, total | 4,017.8 sq. ft. |
| Grate area | 55.5 sq. ft. |

*Wheels and Journals.*

| | |
|---|---|
| Drivers, number | 6 |
| Drivers, diameter | 69 in. |
| Truck wheels, diameter | Front 42¼ in., back 50 in. |
| Journals, driving axles | 11 in. x 10½ in. and 10 in. x 12 in. |
| Journals, track axles | 6½ in. x 12 in. and 8 in. x 14 in. |

*Cylinders.*

| | |
|---|---|
| Cylinders, diameter | 17½ in. and 29 in. |
| Piston, stroke | 28 in. |
| Valves, type | Balanced piston |

*Boiler.*

| | |
|---|---|
| Type | Extended wagon top |
| Working steam pressure | 225 lbs. |
| Diameter | 76 in. |
| Thickness of sheets | 7/8 in. and 29/32 in. |
| Staying | Radical |
| Crown sheet, thickness | 5/8 in. |
| Tube sheet, thickness | 9/16 in. |

*Firebox.*

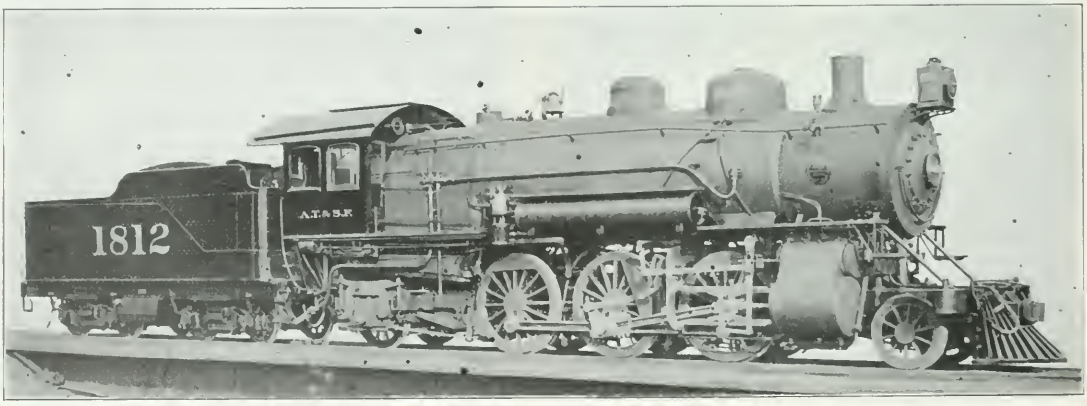
| | |
|---|---|
| Length | 108 1/16 in. |
| Width | 71½ in. |
| Depth, front | 83½ in. |
| Depth, back | 70½ in. |
| Thickness of sheets | 5/8 in. |
| Water space | Front 4½ in., back 4 in., sides 3 in. |

*Tubes.*

| | |
|---|---|
| Number | 342 |
| Material | Iron, No. 11 gage |
| Length | 19 ft. |
| Diameter | 2¼ in. |

*Tender.*

| | |
|---|---|
| Water capacity | 9,000 gal. |
| Coal capacity | 12 tons. |
| Wheels, diameter | 34¼ in. |
| Journals | 5½ in. x 10 in. |




Baldwin Four-Cylinder Balanced Compound Prairie (2-6-2) Locomotive; Atchison, Topeka & Santa Fe.

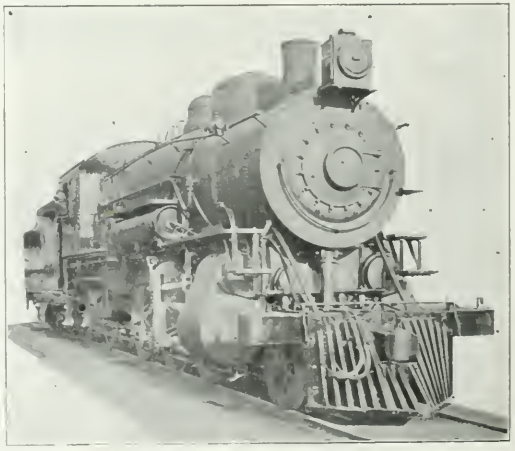
The pistons are all coupled to the second driving axle, and the inside or high pressure cylinders are inclined at an angle of 7 degrees, so that the main rods can clear the leading driving axle. The two cranks on the same side of the engine instead of being placed 180 degrees apart, are 173 degrees apart, this arrangement being necessary in order that the pistons may start their strokes at the same instant.

The Walschaerts valve gear is applied to these engines, the valve being driven through a rock shaft having both arms pointing downwards. The bearing for this rock shaft is mounted on a cross-tie, which is supported by knees bolted to the engine frames. It is also braced to the cylinder casting. The Rushton trailing truck is used, the journals being placed outside. The spring seat is in the form of a cast steel saddle, which is suspended directly on the swing links. The spring link seat back of the truck is bolted to an outside supplemental frame, which is secured to the main frame by means of steel castings.

The boiler is of the extended wagon top, radial stay type, the front ring of the barrel being coned. It has a sloping throat and back head. The inside diameter of the dome ring is 82 in.

The principal dimensions are as follows:

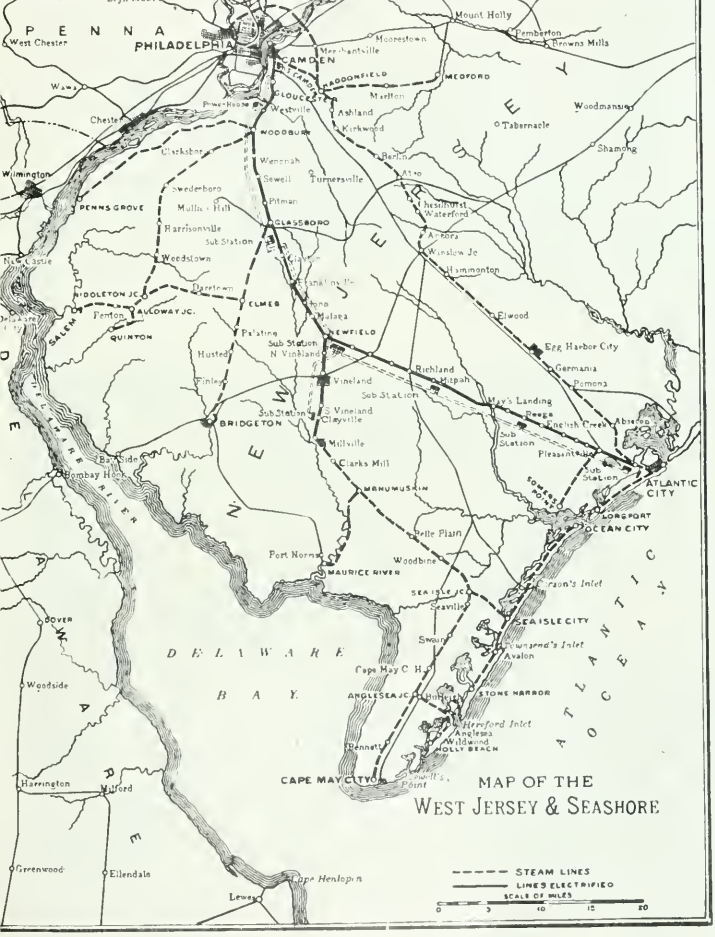
| | |
|---|---|
| Kind of fuel | Soft coal |
| Weight on drivers | 174,700 lbs. |
| Weight on front truck | 31,300 lbs. |
| Weight on trailing truck | 42,200 lbs. |
| Weight, total | 248,200 lbs. |
| Weight, engine and tender | 418,000 lbs. |



Front View of Four-Cylinder Balanced Compound; A. T. & S. F.

## Electrification of the West Jersey & Seashore.

The electrified parts of the West Jersey & Seashore division of e Pennsylvania run from Camden, N. J., via Newfield, to Atlantic ty, 65 miles, and from Newfield to Millville, 10 miles; these are own in solid lines on the accompanying map. The Penn-lvania has two roads connecting Camden with Atlantic City; it is e longer of these routes that has been electrified. This has been ne because on the longer route there is a large local traffic, which, is believed, can be handled better by electric traction than is possi-e with steam. The line was opened to through traffic under elec-fication on September 18, and local traffic was begun on October . The building of the terminals and inspection sheds, double acking, changes in existing tracks, grading, new bridges, changes telegraph lines and installation of a special telephone system, were rried out by the Pennsylvania's regular engineering and mainte-




West Jersey & Seashore Division of the Pennsylvania.

The line from Camden to Atlantic City is double tracked throughout, and has three tracks between Camden and Woodbury, 8 miles. From the Camden terminal to Newfield the road is laid with 100-lb. rails of the Pennsylvania Railroad standard section, and from Newfield to Atlantic City with 85-lb. rails of the A. S. C. E. section. The line from Newfield to Millville is a single-track road, and is laid with 100-lb. rails. The power house and sub-station equipment are designed to supply enough power to operate ultimately all the cars now provided, with express service to Atlantic City, consisting of three-car trains running on 15 minute headway in each direction at a speed, on straight level track, of 60 miles an hour; a local service of two-car trains between Camden and Millville at half-hour intervals, and single cars between Camden and Woodbury at 10-minute intervals. The present schedule consists of three-car express trains between Camden and Atlantic City on one-hour intervals, the running time being 90 minutes, and a local service of two, three and four-car trains run on a minimum interval of 15 minutes during the rush hours between Camden and Glassboro, 18 miles, every fourth train going on to Millville.

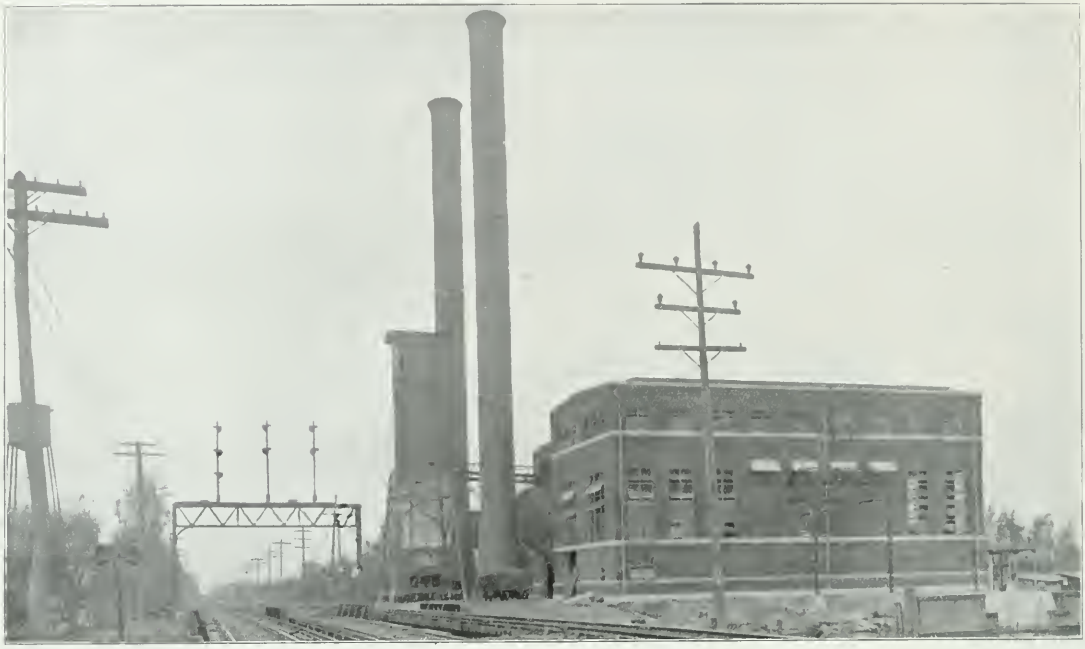
At Camden a new terminal has been built adjoining the ferry terminal. This work includes a number of stub end tracks with concrete platforms sheltered by steel umbrella sheds; three-quarters of a mile of new elevated double-track trestle, with stone piers and steel superstructure at street crossings, was built to connect this terminal with the existing lines at grade near Haddon avenue. From a point about two miles from Atlantic City a new right of way into the city was secured; after crossing the "Thoroughfare" on a new drawbridge, the tracks cross the Philadelphia & Reading on an elevated structure, consisting of nine concrete piers with steel superstructure, and enter the Atlantic City terminal on a descending grade. This terminal, of which a photograph is shown herewith, is new, and is like the one at Camden. It is south of the present steam road terminal.

The power house, interior and exterior views of which are shown in the accompanying photographs, is at Big Timber Creek, just north of Westville, six miles from the Camden terminal. This site was chosen on January 17, 1906, and work begun two days later. On July 1 two boilers and one turbine were generating power by which the first car was run. The foundations of the power house, boiler house and stacks are reinforced concrete in which are imbedded the tops of the concrete piles on which the structures rest. In the boiler house are 12 Stirling water tube boilers, each rated at 358 h.p., and fitted with superheaters. The steam is supplied at 175 lbs. pressure to three 2,000 k.w., 25-cycle, three-phase Curtis turbines which generate alternating current at 6,600 volts. This current is stepped up to 33,000 volts for transmission to the sub-stations, where it is reduced to 430 volts, and then converted through the rotary transformers into 650-volt direct current in the third rail for driving the motors. The other equipment of the power house includes two 75 k.w. 125-volt Curtis turbo-exciters and nine 700 k.w. 25-cycle air-blast transformers. The area of the power house is 17,059 sq. ft., which leaves room for a fourth turbine, when it shall be needed, to furnish additional power when heavier traffic is built up by the improved services. The foundation for this engine is already built. There are eight sub-stations, one at Westville, one at each of the terminals in South Camden, Clayville and Atlantic City, and four at intermediate stations. Each sub-station contains two rotary 750 k.w. converters, except those at Clayville and Mispah, which are of 500 k.w. capacity. The station at Atlantic City has room for two additional rotary converters of 1,000 k.w. capacity, and the other sub-stations each have room for one more 750-k.w. converter. Three air-cooled transformers are provided for use with each rotary converter. Each converter can be started, run up to full speed and be delivering power to the line within a minute. There is in each sub-station a hand crane which can handle any of the machinery in the building.

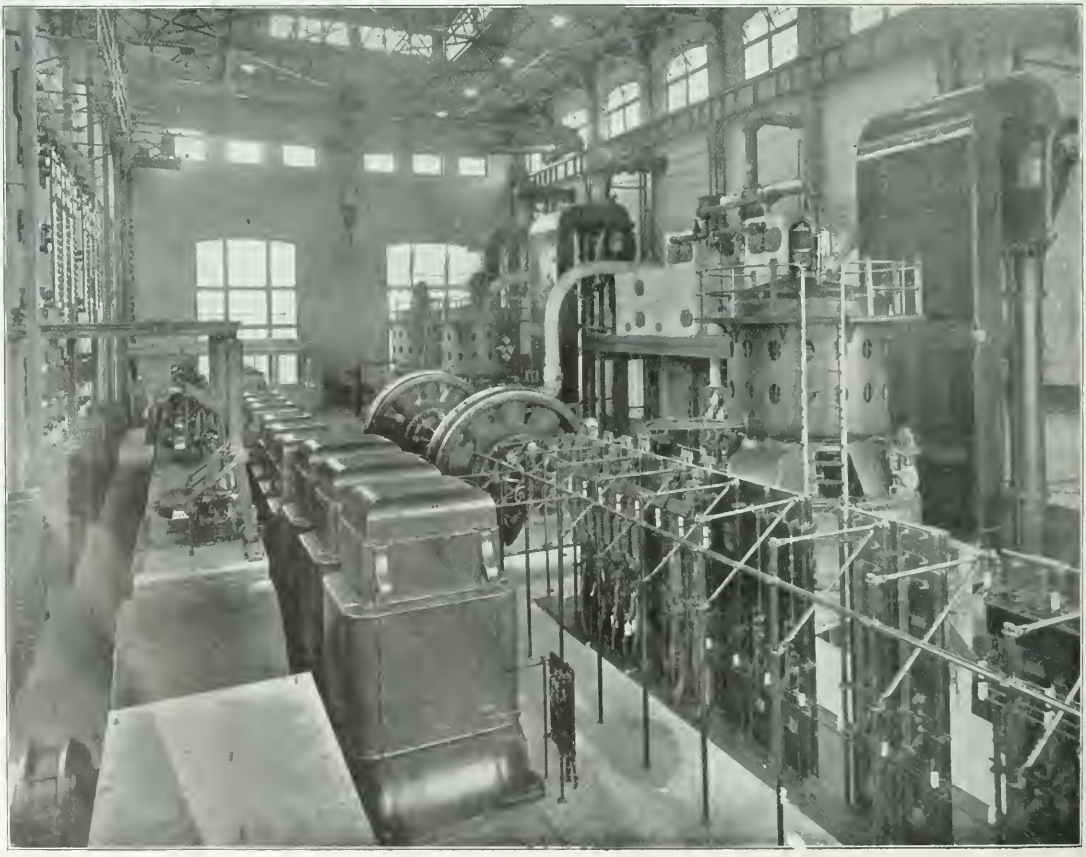
Inspection sheds have been built at the three terminals; the one at Atlantic City is illustrated herewith. The one at Camden

ance of way departments. The interlocking plants and automatic lock signals were installed by the Union Switch & Signal Company. The signal system was described in the *Railroad Gazette* of October

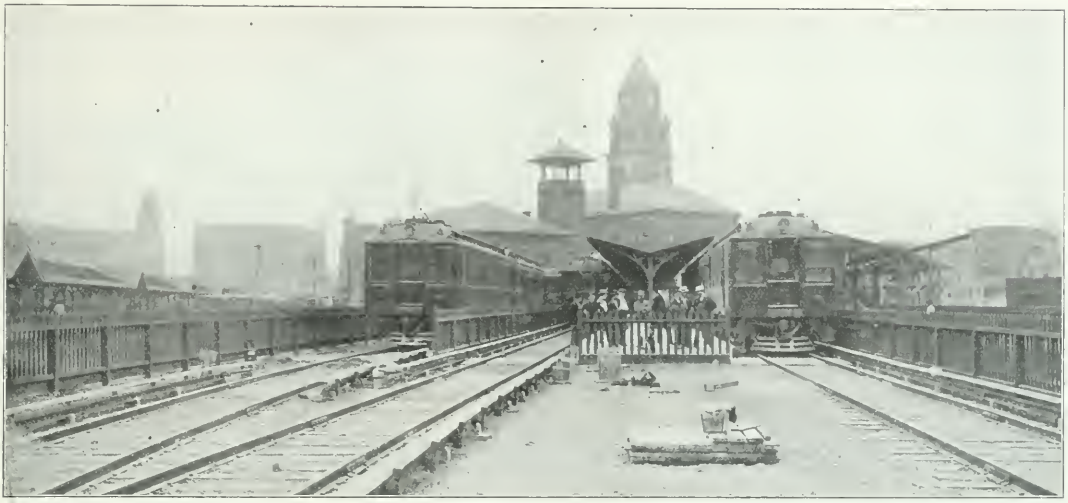
The new cars and trucks were designed by the motive power department of the road, and built by the American Car & Foundry Company, the J. G. Brill Company and the Wason Car Manufacturing Company. The entire contract for the building and equipment of the power house and sub-stations and the electrical equipment on the cars, was held by the General Electric Company, under the supervision of George Gibbs, Chief Engineer of Electric Traction. Stern & Silverman, of Philadelphia, were appointed by the General Electric Company as their general sub-contractors, and the Icofield Company, also of Philadelphia, acted as general engineers for the power house and sub-contractors for the piling and foundations.



Power House at Westville, New Jersey.

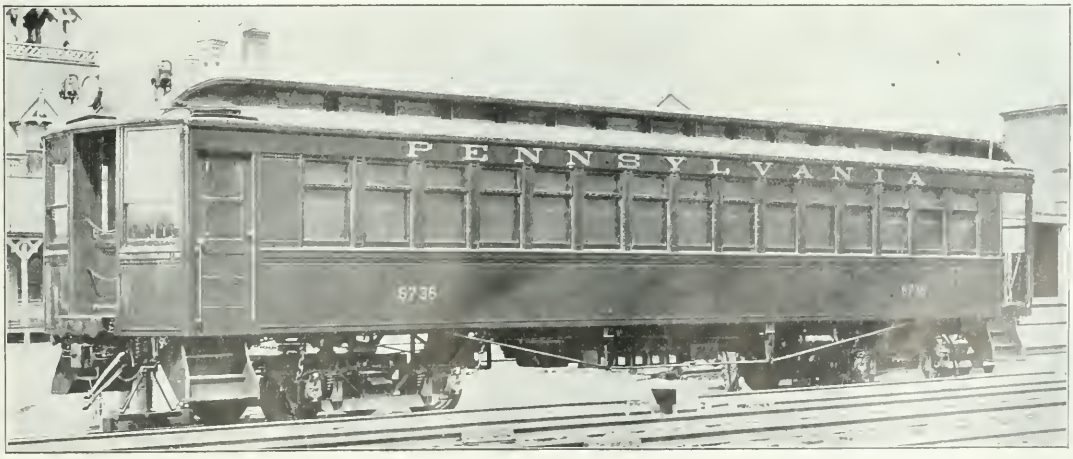


Interior of Power House; West Jersey and Seashore.



New Terminal at Atlantic City.

Baggage and Mail Motor Car; West Jersey & Seashore.




Passenger Motor Car; West Jersey & Seashore.

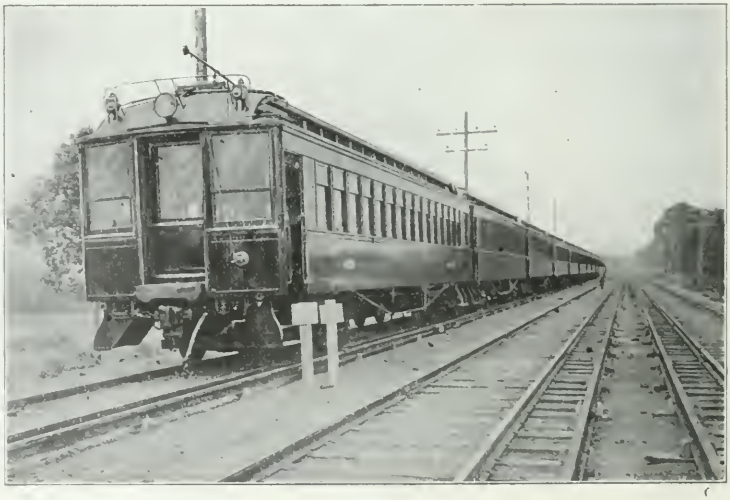
has three tracks and is 221 ft. long x 56 ft. wide, allowing room for nine cars as well as for office space, a store room and a small machine shop. Within the shed, overhead trolley instead of the third rail is used. There is a pit for each track, provided with steam heat, electric lights and compressed air outlets for cleaning. Over the center track is a hand crane on a runway extending into the machine shop. The building has a wooden frame covered with corrugated galvanized iron and there are steel rolling doors at the main entrance. Inside of the shed the track rail is carried on a stringer making the top of the rail 12 in. above the floor level; the bottom of the pit is 3 ft. 5 in. below the top of the rail. The other inspection sheds are of the same general arrangement but smaller.

The transmission line, 71 miles long, is double throughout. The cable consists of six No. 1 B. & S. hard drawn solid copper wires. The poles are chestnut, usually 45 ft. high

Car Inspection Shed at Atlantic City.

Crossing at Westville, Showing Jumpers and Cattle Guards; West Jersey & Seashore.

and 125 ft. apart. The top arm carries four insulators and the lower arm two insulators. The insulators are made in two parts and tested to 85,000 volts. The line is protected from lightning by a galvanized steel cable $\frac{7}{16}$ in. in diameter strung along the tops of the poles 4 ft. above the nearest charged wire and grounded at every fifth pole. The third rail is of the top contact type and is 100-lb. Pennsylvania Railroad standard cross section and composition, being thus interchangeable with the track rails. The insulated supports, which are 8 ft. apart, are reconstructed granite held in position by a metal centering cup fastened to the ends of long ties with lag screws. These insulators are 10 in. long and $5\frac{1}{2}$ in. broad at the base, the foot of the rail being $3\frac{1}{2}$ in. above the tie. The supports are shown clearly in the photograph of the line near South Westville. The third rail is 26 in. from the track rail and $3\frac{1}{2}$ in. higher; these dimensions are similar to those for the Long Island, the Interborough Rapid Transit in New York City, and the Pennsylvania's New York terminal, now under construction. The third rail is bonded with concealed ribbon bonds with solid copper terminals compressed into 1-in. drilled holes in the rails; there are two bonds for each joint. The jumpers used at



Track near South Westville, Showing Third Rail Support.

all grade crossings and at other places where a continuous third rail is impracticable, consist of cables laid in solid concrete and protected at the surface of the ground with terra cotta covers. They can be seen in the photograph of the Westville station. Where the tracks cross the "Thoroughfare" at Atlantic City the third rails on the draw are connected to the third rails on the approaches by sliding contact shoes, so that when the draw is closed the rail is continuously connected. Two submarine cables also connect the rails so that the opening of the draw does not interrupt the circuit. The submarine cables for the return circuit are bare.

The third rail is anchored at intervals by metal clamps secured to the under flange of the rail and engaging the insulator on either side. The third rails may be isolated from each other, but normally they are electrically connected midway between the substations to get the combined conductivity of both rails. There are also section insulators opposite each substation so that in case of accident on any part of the system only a short section would be dead. The right of way is fenced in and at all grade crossings the fence is brought into the rails as far as the metal guards which protect the crossings. At all stations and in the Atlantic City and Camden yards the third rail is protected by planks on top and on the outside, supported by ample posts 6 ft. apart. The boards are held together with angle straps, no part of which extends above or below the protecting plank. Wherever possible, the rail is kept between the tracks, and is therefore on the side of the track farthest from the station platform. Fences between the track prevent crossing. In order to prevent passengers or others on the platforms from touching the contact shoes on the platform side of the car, there is a protecting plank similar to the third rail protecting plank but carried on castings fastened to the ties. The branch line from Newfield south to Melville is a trolley line. The line wire poles are 100 ft. apart; where practicable, the transmission poles have been used to support the span wires. The trolley wire is 22 ft. from the tops of the track rails. The trolley is also used between Haddon avenue, Camden, and South Gloucester; tubular steel poles are used to support the cross wires on this stretch of track. On the Newfield-Melville line, lightning arresters are placed about 1,000 ft. apart.

All of the cars are motor cars, the equipment being the same for both types of cars. Photographs of each type are shown. For the present service 62 passenger cars and six combination baggage and mail cars have been built. The general design is that of the standard Pennsylvania Railroad coach. The general dimensions are as follows:

| | |
|---|---|
| Length over buffers | 55 ft. 5½ in. |
| Length over body and sills | 46 " 6 " |
| Truck centers | 33 " 0 " |
| Width over sheathing | 9 " 10 " |
| Width at eaves | 10 " 1¼ " |
| Height from top of rail to top of roof (car light) | 13 " 3²⁵/₃₂" |
| Total weight of car, fully equipped | 98,000 lbs. |

The passenger cars seat 58. The entire under side of the cars is protected by transit ¼ in. thick, and above the motor truck is a steel plate over asbestos fire felt. The cars are lighted and heated by electricity, the wires being carried in galvanized iron conduits along the roof. Both motor and trailing trucks are similar to those used on the Interborough Rapid Transit and the Long Island, except that the wheel base is somewhat longer. The truck bolster and truck center plates are steel castings machined to the proper dimensions. The side frames are wrought iron machined on four sides. The motor truck transoms are rolled steel channels and the trailer truck transoms are forged wrought iron. The side bearings are cast-steel provided with liners for adjustment of height and wear. The wheels of the motor truck are steel-tired with cast-steel spoke centers. They are 36 in. in diameter with M. C. B. standard tread. The hub of one wheel on each axle of the motor truck is extended and to this hub the forged steel gear is shrunk after the wheel has been pressed on the axle. The axles are of open hearth steel with journals 5 in. x 9 in. Schoen solid rolled steel wheels, 33 in. in diameter, are used on the trailer truck. The trailer truck axles have 4¼ in. x 8 in. journals. The brakes on both motor and trailer trucks are inside-hung with Davis brake-beams. The contact shoes are carried on wood beams supported from the face of the extended equalizer spring seats, allowing for adjustment in height. The motor and trailer trucks for 65 of the cars were built by the Baldwin Locomotive Works, and for the other three cars by the J. G. Brill Company. On each car are two 200 h.p. motors. The equipment is General Electric standard, the Sprague-General Electric Automatic Type M control being used. All the cables are run in grounded loricated conduits. The cars are equipped with hand brakes and with Westinghouse quick-service automatic air-brakes.

The effect of the railroad ticket tax in Germany is indicated by the passenger earnings of the Prussian and Hessian State Railroads in August, the first month of the taxes. During the first four months of the fiscal year ending with July their passenger earnings had increased no less than 9 per cent., reflecting the high degree of prosperity prevailing, which is as noticeable this year in Germany as in this country. In August the increase was a little less than 3½ per cent. As the imposition of the tax was known long beforehand, doubtless more than usual of the important summer pleasure travel was done before August, to save the increased cost, thus swelling June and July and reducing August earnings. The later months will show better the permanent effect of the tax.

## Poor's Statistics for 1905.

Advance sheets of *Poor's Manual* for 1906 contain the usual summary of statistics of the railroads of the United States for the fiscal years of the companies ending in 1905.

The total length of all railroads completed on December 31, 1905, is given as 217,341 miles, an increase for the year of 4,947 miles; for the previous year these figures were 212,249 miles completed December 31, 1904, an increase of 5,014 miles over 1903. Again, as in 1904, the heaviest construction of the year was in the Southwestern group of states in which 1,140 miles were built, divided as follows: Texas, 337; New Mexico, 154; Oklahoma, 153; Arkansas, 213; Indian Territory, 101; Colorado, 87; Missouri, 63; Kansas, 32. There were 1,716 miles built in this group in the previous year. North Dakota easily leads all separate states in amount of new mileage with 533 miles, Georgia is third with 257 miles, Illinois fourth with 216 miles, and Indiana sixth with 200 miles.

The following table gives the totals of the principal statistics for the two years:

| | 1905. | 1904. |
|---|---|---|
| Mileage of railroads | 212,624.18 | 211,074.39 |
| Second track, sidings, etc. | 88,707.57 | 82,863.03 |
| Total track | 301,331.75 | 293,937.42 |
| Steel rails in track | 290,529.24 | 282,229.35 |
| Iron rails in track | 10,802.51 | 11,708.07 |
| Locomotives, No. | 49,616 | 47,844 |
| Cars: Passenger | 30,444 | 29,205 |
| " Baggage, mail, etc. | 10,552 | 10,417 |
| " Freight | 1,757,105 | 1,691,427 |
| Total revenue cars | 1,798,434 | 1,731,049 |
| *Liabilities:* | $ | $ |
| Capital stock | 6,741,956,825 | 6,447,045,374 |
| Bonded debt* | 7,821,245,306 | 7,462,091,455 |
| Unfunded debt | 201,978,773 | 172,619,537 |
| Current accounts | 620,720,096 | 516,404,178 |
| Sinking and other funds | 182,853,229 | 203,962,204 |
| Total liabilities | 15,568,752,029 | 14,802,122,748 |
| Excess of assets | 650,821,816 | 620,750,567 |
| Total | 16,219,573,815 | 15,422,873,315 |
| *Assets:* | | |
| Cost of railroad and equipment | 12,143,997,551 | 11,664,191,134 |
| Other investments | 2,935,276,877 | 2,712,445,967 |
| Sundry assets | 367,454,847 | 408,808,136 |
| Current accounts | 772,841,570 | 637,328,078 |
| Total assets | 16,219,573,845 | 15,422,873,315 |
| | Miles. | Miles. |
| Miles of railroad operated | 215,506.92 | 211,835.21 |
| Rev. train mileage: | | |
| Passenger | 467,270,447 | 446,890,386 |
| Freight | 559,434,683 | 543,117,633 |
| Mixed | 26,715,494 | 28,069,524 |
| Total | 1,053,420,624 | 1,018,407,543 |
| Passengers carried | 745,446,641 | 719,173,676 |
| Passenger mileage | 23,906,420,668 | 22,108,481,473 |
| Tons freight moved | 1,435,321,748 | 1,295,527,441 |
| Freight mileage | 187,375,621,537 | 172,627,299,384 |
| | $ | $ |
| Traffic earnings—Passenger | 486,420,902 | 456,342,380 |
| Freight | 1,478,167,246 | 1,377,281,206 |
| Miscellaneous | 147,609,622 | 144,015,127 |
| Total | 2,112,197,770 | 1,977,638,713 |
| Net earnings | 685,464,488 | 639,240,027 |
| Other receipts | 80,927,659 | 81,357,891 |
| Total available revenue | 766,392,147 | 720,597,918 |
| *Payments:* | | |
| Interest on bonds | 247,155,897 | 242,992,755 |
| Other interest | 12,956,316 | 13,533,529 |
| Dividends on stock | 193,553,869 | 188,386,093 |
| Miscellaneous | 59,856,679 | 54,557,670 |
| Rentals—Interest | 31,716,773 | 32,807,145 |
| Dividends | 22,311,069 | 23,254,314 |
| Miscellaneous | 22,208,880 | 18,420,396 |
| Taxes | 54,553,620 | 54,325,806 |
| Total payments | 644,516,133 | 627,977,878 |
| Surplus | 121,876,014 | 92,620,020 |

*Including, in 1905 and 1904, real estate mortgages, equipment trust obligations, etc., previously included in item "Unfunded Debt."

Total traffic revenue (based on 215,507 miles increased 135 millions, or about 6.4 per cent., against an increase of 69 millions, or about 3 per cent., in 1904, and an increase of 188 millions, or about 10 per cent., in 1903. Freight earnings rose 101 millions, as against 29 millions in 1904, and 117 millions in 1903, and passenger earnings 30 millions, as against 26 millions in 1904, and 33 millions in 1903.

The following table shows the average miles operated, capital

per mile and bonded debt per mile of all steam railroads in the United States for the past five years:

| | Mileage worked. | Capital Stock per mile. | Bonded Debt per year. |
|---|---|---|---|
| 1901 | 195,887 | 30,521 | 30,811 |
| 1902 | 199,685 | 30,439 | 32,377 |
| 1903 | 206,876 | 30,719 | 32,495 |
| 1904 | 211,074 | 30,686 | 32,731 |
| 1905 | 212,624 | 31,708 | 34,875 |

Gross earnings per mile of road in operation in 1905 amounted to $9,643, and net earnings to $3,135, as compared with $9,248 and $2,989 per mile in 1904. The average ton mile rate received was 7.84 mills, as against 7.93 mills in 1904. Up to 1905 this average showed a steady increase since 1899, when rates touched the lowest point with a ton-mile rate of 7.26 mills. The year 1905 marks the first decrease since 1899 in the average rate received.

The average revenue per freight train mile was $2.63, against $2.53 in 1904, and $2.45 in 1903, indicating a steady growth in amount of traffic and operating efficiency. Earnings per freight train mile have steadily increased since 1894, when the average revenue was $1.47. Herein is clearly reflected the development of the modern large train load. The average receipts per passenger mile in 1905, 1904 and 1903 were respectively 2.028 cents, 2.058 cents, and 2.052 cents. The lowest point in the passenger mile rate was in 1898, when the average revenue was 1.994 cents per passenger per mile.

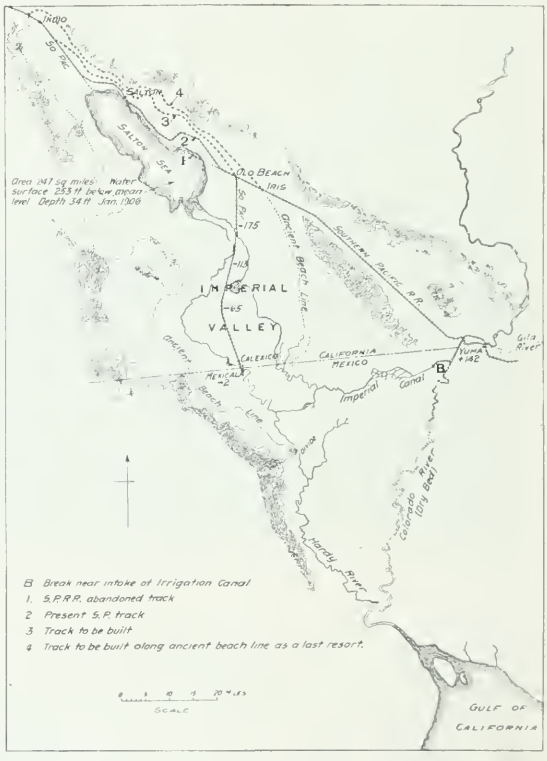
The average rate paid on the total bonded debt was 3.65 per cent. in 1905, 3.98 per cent. in 1904, and 4.13 per cent. in 1903, while the average dividend rate paid on the total share capital was 3.02 per cent. in 1905, as compared with 3.14 per cent. in 1904, and 3.00 per cent. in 1903. In 1897 only 1.49 per cent. rate was paid. The ratio of operating expenses to earnings in 1905 was 67.45, as against 67.68 in 1904.

## The Salton Sea Conquered.

The engineers of the Southern Pacific and of the California Development Co. have at last controlled the flow of the Colorado river into the great Salton Sink after working heroically for nearly two years. The Salton Sink is a large depression in southern California with a minimum elevation of 297 ft. below sea level. The main line of the Southern Pacific passes through Yuma, Ariz., and at Drylyn, 23 miles west of Yuma, it begins to descend into the valley of the Salton Sink. At Iris, shown on the accompanying plan, the line has an elevation of +71.6. It descends rapidly and for a distance of 62 miles is below sea level, the lowest point at Salton having an elevation of —265 ft. From Salton the line rises to Indio and from there begins to climb on a grade of 100 ft. to the mile to the summit at Beaumont, 50 miles further west. The Salton Sink was originally no doubt under the waters of the Gulf of California, but some volcanic upheaval cut off communication with the Pacific ocean and left this large area under water, which the heat of the sun during the course of many years gradually evaporated and created a salt desert. In the southern part of the valley thus formed, where the elevation is from —100 ft. to sea level, the silt from the surrounding mountains has been gradually washed down and has converted the ground into a fertile valley which needed only water to make it a garden spot.

In 1896 the California Development Co. was organized to build a system of canals for diverting part of the water of the Colorado river into a system of irrigating canals and thereby reclaiming for agricultural purposes many thousand acres in the so-called Imperial Valley, which lies to the south of the Salton Sink. A headgate was built in the north bank of the Colorado river eight miles below Yuma and water was turned into the main canal in March, 1902. In the summer of 1904 the head waters of this canal for a distance of about four miles below the gate became choked with silt carried down by the summer floods, and the volume of water flowing in the canal was greatly reduced. In order to provide for the large amount of water necessary to meet the demands during the winter the engineers of the company decided to dredge a temporary intake canal about four miles below the permanent gate and to construct temporary controlling works pending the dredging of the upper four miles which were choked up. In December, 1904, an unexpected flood damaged the temporary controlling works and this was followed by a series of floods which completely destroyed them. The canal opening was rapidly enlarged by the erosion of the rapidly flowing waters and soon the break in the bank of the Colorado river assumed such large proportions that the entire flow of the river was deflected into the main canal and over the surrounding country. The water found its way into the old bed of the Alamo river and into the New River. Both of these streams flow north into the Salton Sink and the water soon began to rise in that depression at the rate of two or three inches a day. By July, 1905, the water had reached the tracks of the Southern Pacific, and as it continued to rise short detours were built in the hope that the flow through the break might be controlled. The original line of the Southern Pacific is shown at 1 on the accompanying drawing. It soon became necessary to build an entirely new detour line about 40 miles long at an elevation of about 70 ft. above the old line, and 37 miles of the old line, which had been flooded, were abandoned.

In the meantime the Southern Pacific had taken over control of the California Development Co. in order to protect its property, and had jointly, with the engineers of that company and the United States Reclamation Service, begun a series of attempts at controlling the river which had broken from its bounds. The first attempt made was to throw a dam across the break, but this was washed out before it was completed. Later a jetty was built out from a small island opposite the break and it was attempted to deflect the flow of the water away from the break and through the channel on the other side of the island. This was not successful. Plans were then made for building a gate in the break large enough to pass the entire flow of the river, but as the situation became more and more dangerous, and as the gate could not be completed for some months at least, it was decided to make another attempt at closing the north channel by throwing a dam across between the bank and the small island above the break. This was washed out by the first flood. In December, 1905, work was begun on a large intake gate and the construction of an earth dam to hold back the water as the gate was gradually raised. This work has been going on all spring and summer. Six trains of dump cars have been employed day and night in hauling dirt for the dam and about




Map of the Imperial Valley and the Salton Sink.

1,000 men have been at work on the job. During the week ending Oct. 1 a heavy rain in Colorado increased the discharge of the river near Yuma from 9,000 in. to 15,000 in., but the new works stood the test of high water, which quickly receded. The river will now be forced to return to its old bed and all danger from a further rise of the water in the Salton Sink is probably past. The Southern Pacific, however, took no chances on the final success of the plan of the controlling works under way and had made all the surveys for another detour line on the —100 ft. contour. Had the water continued to rise and threaten the present line the new detour could have been built in time to prevent interruption of traffic.

Little actual damage was done in the cultivated section of the Imperial Valley, not more than 4 per cent. of the acreage under cultivation having been flooded. The water flowed through the main canals and the old river beds in the valley without flooding except in a few places. The principal damage was in the destruction of the Southern Pacific track. Now that the break has been repaired it will be possible to further enlarge the system of irrigating canals and develop the agricultural region of the Imperial Valley, which already has a population of nearly 10,000.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 20. FRIDAY, NOVEMBER 16, 1906.


The butting collision near Woodville, Indiana, last Monday morning, makes the fifth great railroad disaster since July 1; Salisbury and Grantham, England; Hamlet (N. C.), Atlantic City and Woodville, in America. Such a list, showing 157 persons killed and 111 injured, recalls the fact that the accident record for one year (or even for a much longer period) may show moderate losses of life and property, and yet afford no certain gage of progress or improvement in safety of railroad travel. It emphasizes the need of having a strictly scientific basis for all our efforts toward greater security against collisions and derailments. Another thing to keep in mind in case of such a collision as the most recent of this list, or that at Hamlet, is that the cause is not exceptional. Such an accident, of sufficient magnitude to attract general attention, may occur once in a year, perhaps; but others of the same kind occur every month. The last quarterly Government accident bulletin shows eight prominent collisions (not to mention the less costly ones) which were due to mistakes concerning orders or meeting points. We say this to refresh the memories of editors who seem to have forgotten it, and for the benefit of railroad officers who surely cannot have forgotten it, but whose action indicates to the public that they have. As to the details of the cause of the Woodville collision we are not fully informed, and the question is not important. The accounts indicate that the engineman of the freight misread a despatcher's order; or had received an incorrect order; or had failed to observe green signals on the engine of a preceding westbound passenger train; or had been deceived by absence of such signals on that train. All of these errors or faults occur frequently, and the fact that all efforts to prevent or cure them, except by the use of the block system, have been unsatisfactory, is known to everybody who takes the trouble to look into the matter.

The comparison of cost of steam locomotive and electric power which is the subject of a contribution printed in another column is interesting but it is not conclusive. From an involved calculation of train resistance and coal consumption the writer estimates the coal consumption of a steam locomotive at from 9 to 15 lbs. per effective horse-power per hour, and compares this with an estimated consumption of 3 lbs. per horse-power hour under electric operation. The locomotive tests made at St. Louis in 1904 and confirmed by other tests showed that the coal consumption of steam locomotives, simple and compound, freight and passenger, is from 2 to 5 lbs. per dynamometer horse-power per hour; these tests were made under all conditions of load and speed. Making all proper allowances for the superior conditions of the locomotives under test, intelligent firing, continuous operation and the great waste of coal in road service, a difference of more than 300 per cent. between the estimated and test results cannot be entirely accounted for. The principal error in the writer's estimate is in neglecting the important factor of the number of trains run and in calculating train resistance by weight alone. Had a similar estimate been made of some electric road already in operation the coal consumption per horse-power hour would have been much greater than 3 lbs. Comparisons, for whatever purpose, must be on the same basis to be of value.

Last week in these columns we pointed out the high efficiency of the locomotive as a steam power plant, an efficiency in point of steam consumption which compares favorably with most stationary plants operating under similarly wide variations of load. Locomotive designers are concerned only with improving the details to make the machine as a whole even more efficient, that is, to use all of its power in hauling trains with maximum economy. If the figure of coal consumption estimated by our correspondent, assuming it for the moment to be correct, could be divided into two parts, the coal consumed in useful work and the coal wasted, locomotive designers would disregard the second part and ponder only over the first. Without such a division, results obtained by accurate tests only can be used, and it is obviously unfair to charge up to the steam locomotive, fuel wasted by improperly handling it or by working it above or below its economical load. As much energy can be wasted by an electric locomotive as a steam locomotive. Our correspondent's arguments have not changed the position taken by the *Railroad Gazette* since the beginning of the discussion of electrified steam roads, which is best expressed by Mr. Aspinall, General Manager of the Lancashire & Yorkshire: "We did not enter into electric traction . . . to save money; we expected to make money."

The experiment of charging 50 cents a day for use of interchanged freight cars is now to be tried on a large scale. While cars are in a great majority of cases worth at the present time much more than 50 cents a day, the adoption of this rate at last week's

meeting in Chicago is a radical step. The rate now is 25 cents; four months ago it was 20 cents, and four years ago it averaged about 12 or 13 cents. It must always be remembered in dealing with this problem that, whatever the rate, it is attempting the impossible to make a uniform rate serve satisfactorily in exceedingly diverse conditions. To those acquainted with car service, the action taken will serve as one vivid indication of the recent great increase in volume of freight. Desperate diseases demand desperate remedies, and the unanimity among so many prominent railroads of the country in this matter indicates their tremendous need of cars. It is said that large roads owning 300,000 cars will refuse to join in this temporary arrangement, believing it to their interest to take no action until it can be taken through the regular machinery of the American Railway Association, which means retention of the present rate until next July. To thus have two rates in use everywhere will be a clerical annoyance, but not necessarily anything more serious. The philosophical spirit which cheerfully submits to losses and injustice is necessary to the success of any car interchange agreement, and it would be rash to predict that the necessary amount of this spirit will not be found. Nobody believes that unprincipled borrowers will be made honorable by doubling the cost of their borrowed cars, for if the rate were quadrupled it would still be cheap, compared with the profit to be made from use of the cars under present traffic conditions. The imposition on the car owner will, however, be materially lightened, and superintendents will have an intensified argument to use in getting cars moved and in stirring up consignees. This will cure a multitude of lesser evils, even if not the greater ones. The Chicago meeting did not do anything toward curing the diversion difficulty, but it did what was better, referred it to a competent committee of three—as strong a committee as could have been found. An agreement to penalize diversion has thus far failed because of its perplexities. It is the most troublesome part of a wholly troublesome business, and all eyes will be turned toward this committee for a plan of solution which can be generally agreed on.

## HEAVY LOCOMOTIVES AND THE RAILROADS OF THE FUTURE.

Breaking records in building heavy locomotives has recently become almost a mania. For more than two years the Mallet compound of the Baltimore & Ohio was the undisputed giant, but it was displaced by the locomotives of the same type for the Great Northern built last summer. These in turn give way to the Erie compounds to be turned out next spring. Almost simultaneously with the announcement of the contract for building the Erie locomotives comes the news that the Pennsylvania has designed a new class of consolidation freight locomotives which will be heavier by 20,000 lbs. than any other engines on that road of heavy motive power. The heaviest Prairie type locomotive yet built was delivered to the Atchison, Topeka & Santa Fe a few weeks ago.

This trend toward extra heavy locomotives is not the result of competition by the builders to hold the record for heavy engines. They would prefer to turn out smaller locomotives and more of them, for their shops are not as well adapted to the heavier work. The railroads are making the demands; the builders are simply carrying out the wishes of their customers. Nor is the demand from the railroads confined to a few or to any section of the country. Operating officers everywhere are trying to move the enormous amounts of freight offered and keep down the cost of transportation to the lowest limit. Locomotives and men are being overworked and the one solution seems to be bigger locomotives and bigger train loads. The saving in time and in wages by doubling the number of cars in a train is a strong incentive for using the heavier power. The economy of heavy train loads in most cases cannot be questioned; the results of the steady increase in train loading of the last ten years are convincing enough. Similar economies in reduced increments may reasonably be expected with further increases, and on that point there is justification for the extremists who advocate such radical advances in locomotive design and train operation.

What is going to be the result in other ways of using the heaviest types of locomotives now being turned out? Not a single railroad in the country has shops or roundhouses big enough to hold them. They cannot be turned on any turntable in existence. Many, if not most, of the bridges are overloaded when they run over them—perhaps not to an immediately dangerous point, but certainly beyond the assumed loads for which they were designed. When they exert their maximum power, the cars and draft attachments in the train are strained to the breaking point. In case of a wreck or derailment no wrecking equipment could put them on the track or clear them off the track possibly for days after the accident. The present track structure was not designed for carrying such loads; it is with difficulty that it can be made to stand up under much less severe conditions. Yards and terminal facilities are inadequate to care for the trains these heavy engines can and should haul.

These are some of the serious objections to the use of the biggest locomotives that exist to-day. How long will these conditions continue to exist as valid grounds for objection? If locomotives of great power such as the Erie has ordered, are to come into general use, enormous sums must be spent to bring up the other parts of the complicated machinery of transportation to the same standard. Like the heavy expenditures involved in electrification, which are not for electric equipment, but for other improvements which must be made along with the change, the cost of the improvements which will make possible economical operation of heavy locomotives must be charged against the saving in operating expense by their use.

It would be interesting, if it were possible, to plot the curve of saving in operating expenses due solely to the use of locomotives of increasing power and against it the cost of new engine terminals, track, bridges, yards and cars. The intersection of two such curves would show the point of maximum efficiency for the whole machine, which is what all the railroads are striving after. Has the motive power department in response to demands from the operating department overshot the mark and gone beyond the economical limit of size? Six or eight years ago this same question in a different form was asked on all sides when the 50-ton car was first introduced. It was possible to build such cars, but the question was, how about the wheels and the draft gear and the old light cars coupled in the same train? Where were 50-ton loads coming from on every trip? But who will say that their general introduction has not effected striking economies in operation? The points about which there was doubt straightened themselves out in time.

So with these heavy locomotives. They are a radical step in advance, and distancing the steady if somewhat slow progress in other departments. It is now the turn of the other fellow. If the track proves too weak it must be strengthened; the yards must be enlarged; adequate engine terminal facilities must be provided and every detail correspondingly improved. An apparent extreme of this kind now and then perhaps is a good thing; it makes for progress in all directions and forces others out of their self-satisfaction to show what they can do if they have to.

## THE FINANCES OF A GREAT TERMINAL.

The South Station at Boston, opened Jan. 1, 1899, and occupied and operated by the Boston & Albany and the New York, New Haven & Hartford, stands in the front rank of the great passenger terminals of the world and will long continue to hold one of the foremost places. The main station is 850 ft. long by 725 ft. broad and covers some 13 acres, with a train shed 602 ft. long and 570 ft. wide. The whole terminal property contains 35 acres with 15 miles of track, 4 miles of it under roof, and a total car capacity of 613 cars, 252 cars under roof. Besides loop tracks in its subway, the station has 28 regular tracks used each year by some 25,000,000 passengers. The daily train movements in and out of the station are indicated by the following table:

| | Week-day Trains. | | Sunday Trains. |
|---|---|---|---|
| Boston & Albany | 217 | | 79 |
| New York, New Haven & Hartford: | | | |
| Providence division | 281 | 99 | |
| Plymouth division | 223 | 66 | |
| Midland division | 80 | 28 | |
| | 593 | | 193 |
| Total regular trains | 810 | | 272 |
| Storage yard drafts | 420 | | 120 |
| Light engine movements | 370 | | 180 |
| Grand total daily movements to and from station | 1,600 | | 572 |

At a time when great terminal passenger stations in the large cities of the country are so costly yet imperative ventures of our prominent railroad companies; when the big terminal has, in fact, become a logical product of railroad maturity, it is of interest to know concrete facts in the fiscal operation of the South Station at Boston. Very few, if any, of the figures for the terminal have, we believe, ever before been published.

The returns for the fiscal year ended June 30 last, of the Boston

Terminal Company, through which the two proprietary railroads built and financed the South Station, give total revenue from the terminal for the year of $321,324. The more important entries follow, together with comparisons for the year preceding:

| | 1906 | 1905 |
|---|---|---|
| Parcel room | $27,495 | $24,837 |
| Baggage storage | 10,568 | 9,938 |
| Pay lavatories | 7,729 | 7,123 |
| Power, heat, light | 12,219 | 12,077 |
| Pintsch gas | 99,981 | 96,221 |
| Ice | 8,156 | 10,282 |
| Rental, offices and buildings | 60,734 | 60,705 |
| Rental, restaurant | 14,800 | 13,999 |
| Other concessions | 67,025 | 62,768 |
| Revenue, Atlantic Ave. Ext. bridge | 12,562 | 158 |

The total revenue for the terminal for the year 1905 was $299,191, which is $22,000 less than in 1906, or $10,000 less if we exclude the bridge revenue in the more recent year. The tendency toward increased revenue from practically all of the station concessions will be noticed as a suggestive feature.

Taking up next the terminal expenses, they appear under three heads: Maintenance of buildings and tracks, operation, and general expenses. Under the first head, which covers repairs merely, the prominent entries for the two years follow:

| | 1906 | 1905 |
|---|---|---|
| Surface tracks | $32,300 | $31,292 |
| Subway and tracks | 683 | 1,034 |
| Interlocking | 18,474 | 15,222 |
| Station building | 10,364 | 9,912 |
| Train shed | 5,338 | 8,136 |
| Power house | 15,283 | 13,969 |
| Gas plant | 12,914 | 14,429 |
| Ice plant | 1,083 | 1,176 |

The total for 1906 was $97,288, as compared with $99,747 in the previous year, indicating that this branch of expense remains about stationary in spite fo some increase of terminal business.

Under the much more important head of "Operation" the following entries appear:

| | 1906 | 1905 |
|---|---|---|
| Superintendence and service | $50,590 | $52,148 |
| Ticket and baggage agents | 106,024 | 104,419 |
| Cleaning station | 10,023 | 9,839 |
| Station expense | 15,847 | 15,685 |
| Power house | 56,700 | 60,718 |
| Gas plant | 28,717 | 29,355 |
| Interlocking | 25,021 | 25,030 |
| Loss and damage | 287 | 9,841 |
| Personal injuries | 11,288 | 8,902 |
| Ice plant | 6,788 | 7,597 |

The total outlay for operation in 1906 was $311,289, as compared with $323,540 in 1905. These returns become respectively $299,719 and $304,797, if we exclude the obviously variable return for loss, damage and personal injuries, suggesting a slight tendency, perhaps temporary, toward decreased operating expense. The general expense entries follow in full:

| | 1906 | 1905 |
|---|---|---|
| Salaries of general officers | $14,921 | $16,868 |
| General office expenses | 2,080 | 1,464 |
| Insurance | 350 | 387 |
| Legal expense | 1,643 | 1,104 |
| Stationery and printing | 3,008 | 2,596 |
| Total | $22,002 | $22,419 |

The summaries are:

| | 1906 | 1905 |
|---|---|---|
| Maintenance of tracks and buildings | $97,288 | $99,747 |
| Operating expenses | 311,289 | 323,540 |
| General expense | 22,002 | 22,419 |
| Total | $430,579 | $445,706 |
| Less revenue | 321,324 | 299,191 |
| Expense over revenue | $109,255 | $146,515 |

The Boston Terminal Company is capitalized at $500,000 of stock owned by the two proprietary railroad corporations—mere "holding" capital—and $14,000,000 3½ per cent. bonds. The charter of the company provides that in case of foreclosure, any deficiency shall be made up by the subscribers to the stock of the company, the lessees, which are the Boston & Albany, the New York, New Haven & Hartford as lessee of the Old Colony Railroad, the Old Colony, the Boston & Providence Railroad Corporation and the New England Railroad. This charter provision is, of course, equivalent to a guarantee of principal but not of interest on the bonds. To the deficit of $109,255 in the income account of the last fiscal year is to be added $490,000 fixed charge for interest on bonds and $8,625 taxes, raising the total charge above revenue for the year to $607,880, of which 25 per cent. ($151,969) was paid by the Boston & Albany and 75 per cent. ($455,911) by the New York, New Haven & Hartford. In the balance sheet of the Terminal Company, construction is entered under date of Aug. 31, 1906, at $15,015,628, and total payments by the two companies on account of expenses up to the same date $4,490,678, of which the Boston & Albany has paid $1,122,669 and the New York, New Haven & Hartford $3,368,008, or about $600,000 a year net loss on the terminal investment by the two roads, a little less than 4 per cent. on the cost of construction. At the present time bonds in the nature of those of the Boston Terminal Company could hardly be marketed on a much lower interest rate basis than 4 per cent., adding say $70,000 to the annual fixed charge; while, with the great rise in cost of material and labor during the last seven years, to cover the cost of construction several millions more bonds would be required, with corresponding fixed charge additions.

The realistic case of the South Station at Boston with its actual returns for operating cost and charges confirms, as a mere matter of figures and book-keeping, the common opinion as to the long-delayed return in dollars and cents on the vast investments in great railroad terminals. But the reasoning must not stop there. In this very example must be reckoned in the great though indeterminate factors which are in the nature of credits against the bookkeeping debits. Some of them are general, some specific and localized to Boston. Setting them forth interrogatively: What was the annual loss at which the two companies were running their former separate stations? What credits are to be entered for the value as real estate of the stations discontinued? How much larger would have been the losses had the companies been forced each to build a new station? What traffic gains have been scored by having one great station convenient for the public, especially in Boston's immense suburban business, and what vantages secured, or losses reduced, as against the acute rivalry of the street railways? What are the future possibilities of electric operation in the station subway, which was expressly designed for such a service? And, finally, does not the joint station stand in a more or less pacifying relation to the rivalry of the two proprietary lines in New York-Boston passenger traffic? But even if all such questions could be answered negatively the inexorable demand of public necessity and convenience in our great cities remains, to which the big passenger terminal is the necessary and only response.

## St. Louis & San Francisco.

After a period of rapid expansion the St. Louis & San Francisco this year shows an increase of only 38 miles in operated mileage. Its railroad lines, as shown in the map published at the time the annual report of the Chicago, Rock Island & Pacific was reviewed in these columns some weeks ago, center about the area bounded by Kansas City and St. Louis on the north, Central Kansas and the Panhandle of Texas on the west, the Red River on the south and the Mississippi River on the east. Some of its through lines overstep these boundaries; for instance, the Birmingham, Ala., line and the line from Denison through Ft. Worth to Brady, Texas. Along with the Rock Island its influence is just being extended southward through the new line of the Trinity & Brazos Valley, which is being opened to Houston and Galveston, and is to be extended farther by the Colorado Southern, New Orleans & Pacific, when it shall be built from Houston east to Baton Rouge and New Orleans. It also owns, as a northern connection, the Chicago & Eastern Illinois, bringing it from Thebes and St. Louis through the coal fields of Illinois to Chicago. The Evansville & Terre Haute and Evansville & Indianapolis, also controlled, tap the coal fields of western Indiana.

The problem of the St. Louis & San Francisco proper is to develop a profitable business on a large mileage of new lines in the new Southwest. Gross earnings in the past year were $32,000,000 against $30,000,000 in 1905, a gain of 7 per cent. Net earnings increased $11,500,000, or 8 per cent. The net income over all charges was equal to 4 per cent. each on first and second preferred stock and 5 per cent. on the $29,000,000 common stock, but following the present policy of the Rock Island group, instead of paying the full 4 per cent. on the two preferred stocks as in 1905, only 2 per cent. was paid on the $16,000,000 second preferred stock. The money is to be used instead in the improvement of the road. No dividends have ever been paid on the common stock.

There was an increase of $457,000 in the cost of maintenance of way which rose from $714 per mile in 1905 to $799 per mile. More than half of the increase was in the one item, repairs of roadway. Repairs and renewals of locomotives increased by $200,000, and maintenance of equipment, as a whole, by $272,000. The unit maintenance charges for equipment including renewals were $2,313 per locomotive against $2,142 in 1905, $780 per passenger car against $698 in 1905, and $50 per freight car against $50 in 1905.

The weakest point of operation of the road has been the large proportion which conducting transportation bears to gross earnings and total operating expenses. This was but little bettered during the past year. As against 57.9 per cent. in 1905, conducting transportation was a little more than 57.1 per cent. of the total operating expenses. Of the gross earnings 36.6 per cent. was paid on conducting transportation account against 37.4 per cent. in 1905.

There was an increase of 306,000,000 in the number of revenue ton miles and a decrease of 14,000,000 in the number of passengers

carried one mile. The train load is low, 214 tons last year as against 200 tons the year before and only 28 tons higher including company freight. If the extension to the Gulf results in any large amount of through traffic this figure will undoubtedly be increased. Commodity statistics are given showing increases and decreases both in tons and per cent. The general traffic of the road is being built up in almost all directions; the tonnage of agricultural products increased 12 per cent.; of animal products, 9 per cent.; of manufactures, 18 per cent.; of lumber, 14 per cent., and of miscellaneous commodities and merchandise, 15 per cent. Tonnage of mine products remained nearly stationary. In proportion to the whole, however, it fell from 42 to 39 per cent.

A 6½-mile extension of the Winkler branch in Phelps County, Mo., to iron ore deposits was finished August 1, 1906. Jointly with the Chicago, Rock Island & Pacific a large new freight terminal is being built in North St. Louis. This is being done by the Rock Island-Frisco Terminal Company, which is to operate the property. There has already been spent by the St. Louis & San Francisco $712,000 on this account. The new terminals have lately been put in operation. There have been 361 new manufacturing plants located on the lines during the year whose estimated cost is $9,000,000, and which will employ about 10,000 men.

The principal results of the last two years' operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 5,069 | 5,030 |
| Freight earnings | $21,955,975 | $20,111,455 |
| Passenger earnings | 7,908,644 | 7,647,378 |
| Gross earnings | 32,046,657 | 29,958,240 |
| Maint. way and structures | 4,049,094 | 3,592,174 |
| Maint. of equipment | 3,803,211 | 3,730,357 |
| Conducting transportation | 11,742,742 | 11,163,560 |
| Operating expenses | 20,545,533 | 19,297,017 |
| Net earnings | 11,501,123 | 10,661,223 |
| Net income | 2,309,136 | 1,024,128 |
| Dividends | 519,742 | 839,742 |
| Year's surplus | 1,789,394 | 184,386 |

Great Northern.

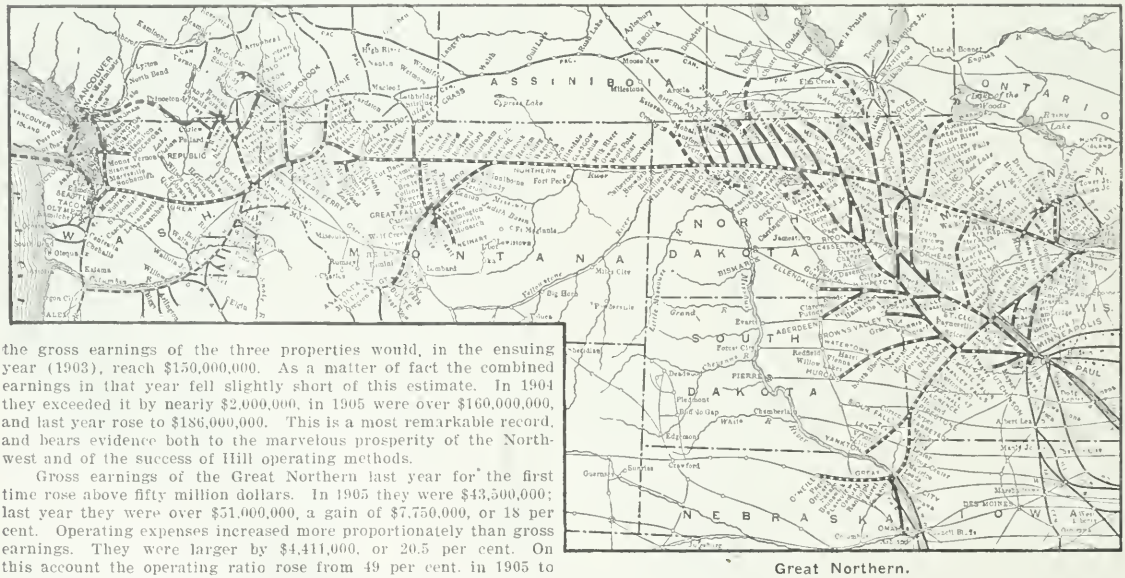
In reviewing the third, in many ways the most important, and certainly the most typical of the Hill railroads (the annual reports of the Northern Pacific and the Burlington, having been reviewed in previous weeks), it is worth while to call attention, as was done a year ago, to Mr. Hill's reported prophecy made in 1902, that the gross earnings of the three properties would, in the ensuing year (1903), reach $150,000,000. As a matter of fact the combined earnings in that year fell slightly short of this estimate. In 1904 they exceeded it by nearly $2,000,000, in 1905 were over $160,000,000, and last year rose to $186,000,000. This is a most remarkable record, and bears evidence both to the marvelous prosperity of the Northwest and of the success of Hill operating methods.

Gross earnings of the Great Northern last year for the first time rose above fifty million dollars. In 1905 they were $43,500,000; last year they were over $51,000,000, a gain of $7,750,000, or 18 per cent. Operating expenses increased more proportionately than gross earnings. They were larger by $4,411,000, or 20.5 per cent. On this account the operating ratio rose from 49 per cent. in 1905 to 50 per cent. last year. The Great Northern operating ratio has long been the marvel and the despair of other roads. It is never possible to analyze it at all carefully, because no detailed tables of operating expenses are given in the reports, a policy which has also been in force on the Northern Pacific and the Burlington since they have been Hill roads. It is, therefore, possible to work out only one of the unit maintenance figures, that for maintenance of way per mile. This was $973 in 1905 and $1,092 in 1906, an increase of $119, or 12 per cent. per mile. This seems by no means a large figure for a road whose revenue traffic density is 784,345 tons one mile per mile of road, although it must be remembered that the Great Northern has a large branch line mileage, occupation of its territory by feeders of the main stem being its characteristic form of development.

The clearest hint of the operating methods which are used to keep down expenses in proportion to earnings, is found in the average train load. This was 530 tons of revenue freight last year, a truly remarkable figure for a transcontinental line with a large amount of branch line agricultural territory. It was the Great Northern, of course, which set the example to all the other railroads of the country of scientific train loading, particularly by means of locomotive rating. The Hill policy has always been to wait for a load before sending out a train. This has been possible because so large a proportion of its traffic has been bulk grain and, on the lines at the head of Lake Superior, ore. The increase of last year's train load over the 1905 figure is small, but in the last two years there has been a total increase of 82 tons. The average number of cars in a train is 37, with 20 tons of revenue freight in each car. Thus strictly operating results are in great measure responsible for the low operating ratio of the road.

The showing of the past year in earnings is, of course, a remarkable one. It was pointed out in the review of the previous year's report that as both gross and net earnings were smaller in the year 1904 than in the year immediately preceding, all comparisons were uncommonly favorable for 1905. It is suggestive of the way new high records are now being made by railroad companies to observe that this uncommonly favorable comparison showed an increase of $3,500,000 in gross and $2,600,000 in net earnings for 1905. These look small in comparison with the gain of $7,750,000 in gross and $3,400,000 in net last year. Considering the freight traffic, the fact that the number of tons of revenue freight hauled one mile increased 896,386,043 units during the year, following an increase of 813,358,569 units during 1905, is evidence of a remarkable gain. Here in the last two years is, not a total ton mileage, but an *increase* of over one billion and a half ton-miles. Freight earnings increased $6,000,000, or 18 per cent. Passenger train earnings increased $1,688,000, or 17 per cent. The gain in passenger earnings can be, to some extent, attributed to the Portland Exposition.

The increase of $4,411,000 in operating expenses came more than half in conducting transportation, this increase being due directly, according to the report, to increased train service, the opening of new stations, increases in forces and the general high prices prevailing for all classes of labor and material. Conducting transportation cost increased 21 per cent. Maintenance of way increased $880,000, or 15 per cent., and maintenance of equipment a little over $1,000,000, or 27 per cent.




Great Northern.

The latest official map of the road, published herewith, shows such part of Mr. Hill's projects, north of the Canadian boundary, as have been officially announced. Of the two lines reaching north into Manitoba, the more eastern from a connection with a Great Northern branch on the International boundary at Neche, N. Dak., to Portage la Prairie, Man., 77 miles, is being built by the Midland Railway of Manitoba, and is about finished. The other line is similarly an extension northward of a Great Northern branch in North Dakota. This runs from St. John, N. Dak., to Brandon, Man., 70 miles, and is also about ready to be put in operation. It is being built by the Brandon, Saskatchewan & Hudson's Bay. A large

amount of branch line construction is under way in the United States, particularly in North Dakota. A 59-mile line, which is being built to connect a branch line from Aneta, N. Dak., to Devils Lake, is to form a short main line between St. John and the west, helping to relieve traffic congestion between Devil's Lake and Grand Forks. An important line is being built from Armington, Mont., south to Laurel, 200 miles. This is to form a connection between the Great Northern and the Montana Central roads on the north and the Northern Pacific and the Burlington on the south, besides opening up territory in central Montana. It will furnish the long desired direct connection between the Burlington and the Great Northern, and may be taken as an evidence that the interchange of traffic in Montana has been found to be highly profitable.

The capital stock of the road, which is all preferred, was increased by $25,000,000 during the year. Most of this has already been issued, as it was offered to shareholders at a price which made it distinctly profitable to take up. Besides this general policy of giving rights, the particular reason why Great Northern stock sells at something over 300 lies in the recent consummation of the famous "ore deal" with the United States Steel Corporation, under which, beginning in 1907 with a minimum annual payment for royalty and freight of $1,237,500, the stockholders will receive increasing sums each year, which will amount to a payment of at least $16,417,500 in the year 1917. It seems probable that these profits from lands which were obtained largely in land grants will be turned over to the stockholders, not directly in dividends on their stock but indirectly through a subsidiary company. This is particularly likely in view of the provision of the new Rate Law which forbids ownership of mines by railroads after 1908.

The following table sums up the last two years' operating results:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 5,906 | 5,723 |
| Freight earnings | $29,044,732 | $33,013,729 |
| Passenger earnings | 9,460,659 | 8,000,467 |
| Gross earnings | 51,276,280 | 43,526,088 |
| Maint. way and structures | 6,453,240 | 5,571,189 |
| Maint. of equipment | 4,820,650 | 3,749,131 |
| Conducting transportation | 12,676,737 | 10,463,218 |
| Operating expenses | 25,852,923 | 21,441,927 |
| Net earnings | 24,423,357 | 22,084,161 |

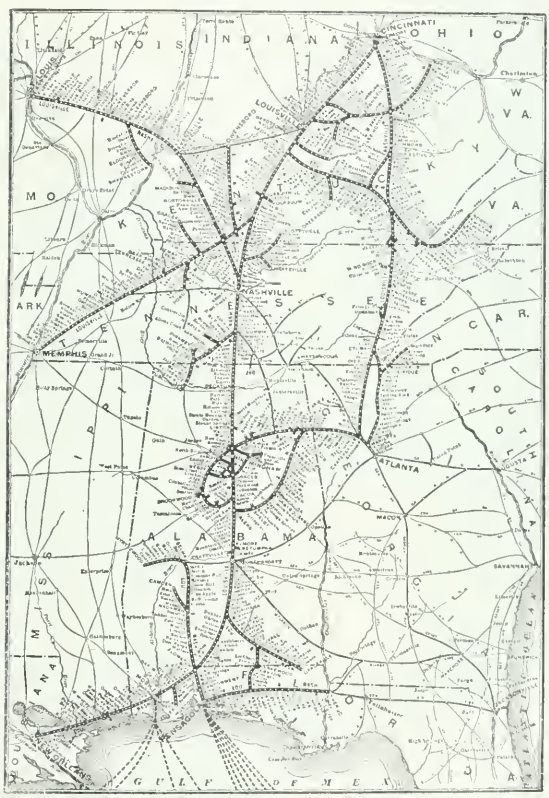
## Louisville & Nashville.

The Louisville & Nashville connects St. Louis and Cincinnati on the north with Nashville, Atlanta, Birmingham, Montgomery, Pensacola, Mobile and New Orleans. It has a line to the Mississippi river at Memphis. Over the Nashville, Chattanooga & St. Louis, which it controls, it reaches Chattanooga and Atlanta. On the north, through ownership of half the controlling capital stock of the Chicago, Indianapolis & Louisville (Monon) it reaches Chicago. It is itself controlled by the Atlantic Coast Line. Included under the three heads, lines owned and operated, lines operated separately, but controlled, owned jointly or leased, and lines owned but operated by other companies, the Louisville & Nashville has 6,842 miles of line. Of this, 4,131 miles are included in the traffic figures of the report.

The company has acquired a through line from Cincinnati to Atlanta, of which the several parts are the Knoxville, Lafayette & Jellico taken over December 22, 1904, and the Atlanta, Knoxville & Northern acquired February 11, 1905. These two roads, extending from the Kentucky-Tennessee state line near Jellico, Tenn., to Marietta, Ga., together with trackage rights owned by the Atlanta, Knoxville & Northern from Marietta to Atlanta, make up the through line, all of which has been operated as part of the Louisville & Nashville system since January 1, 1905. This is being improved as a through freight route. Grades in both directions between Knoxville and Etowah, Tenn., have been reduced to 0.65 per cent. compensated for curvature, and a new line with the same ruling grades has been built between Etowah, Tenn., and Cartersville, Ga. A trackage contract has been made for running rights over the Western & Atlantic and that part of the new low-grade line between Knoxville and Atlanta opened for traffic. The reduction of grades north of Knoxville, Tenn., between Corbin and Saxton, Ky., has not yet been finished. The cost of the construction work on this new line is being financed by an issue of $50,000,000 4 per cent. Atlanta, Knoxville & Cincinnati division 50-year bonds covered by a mortgage executed April 1, 1905. This mortgage covers terminals in Cincinnati, Knoxville and Atlanta, the bridge across the Ohio river formerly known as the Newport & Cincinnati Bridge and the line of railroad from Cincinnati to Atlanta with certain branches. To June 30, 1905, there had been issued $14,543,000 of these bonds to reimburse the Louisville & Nashville; in the last fiscal year an additional $4,612,000 was issued. Of this total in its possession the company sold during the fiscal year 1906 $10,000,000, for which it received $9,750,000. The high prices at which these 4 per cent. bonds with underlying liens were sold is an evidence of the strong financial standing of the company. This is notable, in view of the fact that in 1902, when control of the road had been bought in the open market by a band of speculators, the road was turned over to the Atlantic Coast Line at a price which at that time seemed unreasonably high. It was; but the last few years have proved that it was in reality a very profitable purchase.

The characteristic feature of Louisville & Nashville policy since that time has been the expenditure of large amounts out of earnings for improvements, not in special appropriations, but directly in the operating accounts. Gross earnings last year were $43,000,000, larger by $4,500,000 than in 1905, yet net earnings were less than $50,000 larger and net income was smaller by nearly $500,000 than in the earlier year. The cause lies in the large size of the operating expenses, and is summed up by saying that although the road was amply maintained in 1905, the operating ratio increased from 68.77 per cent. in that year to 71.92 per cent. in 1906. The extent to which earnings have been turned back into the property is indicated by the fact that while gross earnings have increased from $35,500,000 in 1903 to $43,000,000 in 1906, net earnings have increased in that time by less than $600,000.

Last year this policy was carried to an even greater extreme than before. Maintenance of way and structures increased 15 per cent., maintenance of equipment 23 per cent., and conducting transportation 16 per cent. There are two items under the head of maintenance of way and structures which ordinarily are deducted from a railroad's net income. These are extraordinary expenses and improvements. In 1905 there was charged in this account for these betterments $1,574,428; last year these figures increased to $1,785,196. Similarly, under maintenance of equipment $1,202,863 in 1905 and $1,166,157 in 1906 was spent for improvements. Straight maintenance of way cost $1,150 per mile, against $1,079 in 1905; including betterments, the figures were $1,583 in 1906 and $1,490 in 1905. Maintainance of equipment cost $1,142 per locomotive, against $2,819 in 1905, an exceptionally large increase. This increase of 50.6 per cent. in locomotive repairs is due, according to the report, to heavy repairs required on the larger number of engines, including 21 old locomotives taken over with the Atlanta, Knoxville & Northern, as well as to light and heavy repairs deferred during removal from the old to the new shops at South Louisville, a period which was marked by a phenomenal increase in traffic and consequent added strain on motive power. Maintenance of passenger cars cost $1,039 per car in 1906, against $788 in 1905, and per freight car $73, against $70 in 1905. These are all exceedingly liberal figures, particularly for a road in southern territory. The increase in cost of




Louisville & Nashville.

conducting transportation is fairly evenly distributed among the different items, being particularly in those including wage payments. It is remarkable to see that it cost the road $200,000 last year for stock killed on the right of way.

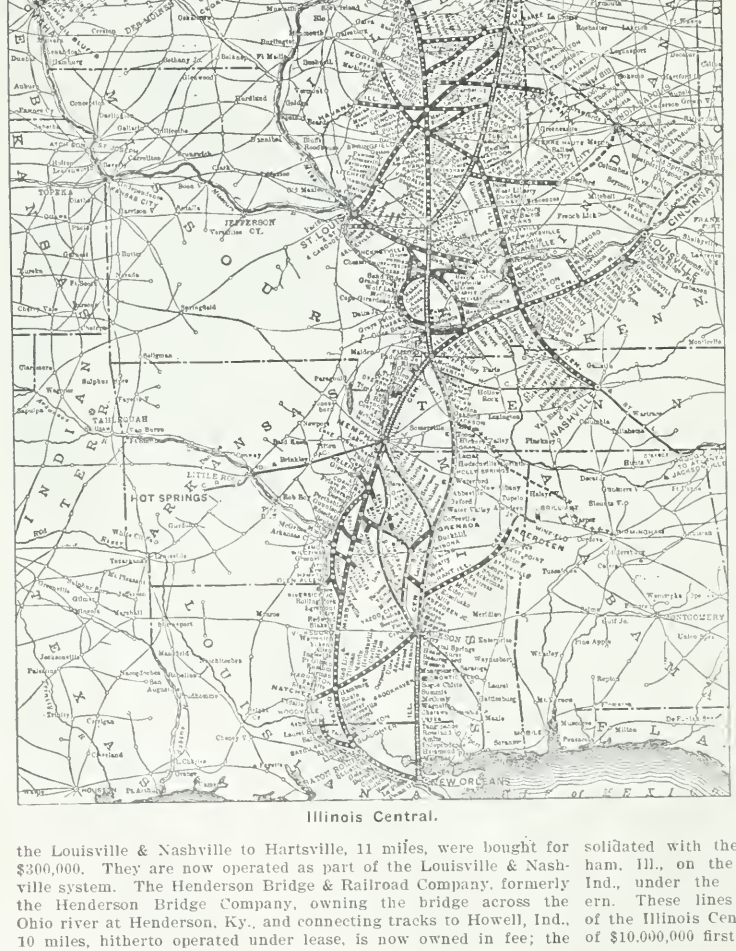
The general increase in operating expenses is given in the report as due to larger cost of labor and material, rebuilding of the Union Station at Louisville destroyed by fire, heavy repairs made on equipment in use during the St. Louis Fair, yellow fever for five months on the southern divisions and an unusual number of destructive accidents.

The Louisville & Nashville's train load is not high, being 231 tons, against 230 tons in 1905. The average revenue per ton mile was 0.803 cents, as against 0.791 cents in 1905. There was an increase of 12 per cent. in the number of miles run by revenue freight trains, a decrease of 3 per cent. in the number of loaded cars in each train, and a decrease of 10 per cent. in the number of empty cars in each train.

During the year the Chesapeake & Nashville, running from Gallatin, Tenn., to Scottsville, Ky., 36 miles, and the Middle & East Tennessee Central, extending from Hartsville Junction, Tenn., on the Louisville & Nashville to Hartsville, 11 miles, were bought for $300,000. They are now operated as part of the Louisville & Nashville system. The Henderson Bridge & Railroad Company, formerly the Henderson Bridge Company, owning the bridge across the Ohio river at Henderson, Ky., and connecting tracks to Howell, Ind., 10 miles, hitherto operated under lease, is now owned in fee; the Yellow River Railroad, running from Florala, Ala., to Crest View, Fla., 26 miles, hitherto controlled, but operated separately, was conveyed to the L. & N. on June 30, 1906.

A summary of the last two years' operations is given in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 4,131 | 3,826 |
| Freight earnings | $31,556,207 | $27,732,625 |
| Passenger earnings | 8,985,216 | 8,619,650 |
| Gross earnings | 45,008,996 | 38,517,071 |
| Maint. way and structures | 6,537,697 | 5,702,533 |
| Maint. of equipment | 7,791,862 | 6,316,098 |
| Conducting transportation | 15,939,420 | 13,509,780 |
| Operating expenses | 30,933,164 | 26,490,021 |
| Net earnings | 12,075,533 | 12,027,050 |
| Net income | 6,348,375 | 6,827,040 |
| Year's surplus | 2,748,375 | 3,227,040 |




Illinois Central.

At this time, when the dominance of E. H. Harriman in the Illinois Central has been clearly shown, it is of especial interest to consider what sort of a railroad the new member of the Harriman group is. It is no news to readers of the *Railroad Gazette* that it is a splendid property, particularly in its financial strength. Like the Great Northern, whose report is reviewed in another column, the Illinois Central last year for the first time passed the fifty million dollar mark in earnings. Gross earnings were $51,600,000 as against $49,500,000 in 1905. Against this increase of $2,100,000, operating expenses increased a little more than half, $1,200,000, leaving net earnings larger by not quite $1,000,000, or 5 per cent. more than in 1905. The net income for the year was $10,800,000, and was large enough, following the prosperity of previous years, to decide the management to begin the payment of 7 per cent. as a regular annual dividend, this amount having been paid for a year or two in the shape of 6 per cent. regular and 1 per cent. extra dividends. Even after this payment there was an appropriation for betterments amounting to $4,100,000 as against $1,680,000 in the previous year, an increase of $2,480,000, or 147 per cent. The income account thus summarized is good evidence of the company's financial power.

Freight earnings increased $2,900,000 and passenger earnings decreased $725,000, the change in each case being about 6 per cent. No table of commodities carried is given, so that it is not possible to tell where the gains in freight traffic were made. The decrease in passenger earnings was, of course, due to comparison with a year which included several months of the St. Louis Exposition. There was spent on maintenance of way $1,550 per mile as against $1,394 in 1905. Maintenance of equipment cost $1,944 per locomotive against $2,211 in 1905, $819 per passenger car against $761 in 1905, and $67 per freight car against $69 in 1905. The largest item of increase under conducting transportation is in station expenses; freight train expenses and telegraph expenses show the next largest increases.

The train load shows an increase of 11 per cent. from 319 tons to 353 tons. Including company freight there was an increase of 12 per cent. from 367 tons to 411 tons. The tons of revenue freight carried one mile increased 12 per cent. against an increase of 6 per cent. in freight receipts. The average rate received per ton-mile was 0.556 cents against 0.587 cents in 1905, a decrease of 5 per cent. On the other hand, and showing the greater efficiency with which the road was operated, receipts per freight train mile increased from $1.87 to $1.96, also a gain of 5 per cent.

The Indianapolis Southern, a projected railroad from Indianapolis southwest to a connection with the Effingham branch of the Illinois Central, was bought in the previous fiscal year. On June 30, 1906, it was consolidated with the Illinois Central branch extending from Effingham, Ill., on the Chicago-Cairo main line west to Switz City, Ind., under the name of the St. Louis, Indianapolis & Eastern. These lines are to be known as the Effingham district of the Illinois Central. The new company has authorized an issue of $10,000,000 first mortgage 5 per cent. bonds, of which $1,000,000

## Illinois Central.

is reserved for purchase of equipment. The Illinois Central owns all of the outstanding bonds, amounting to a little over $7,000,000. The proceeds are to be used for finishing the line from Switz City to Indianapolis. On the western part of the line from Switz City to Effingham (the old Effingham branch) the Illinois Central is to make improvements, reduction of grades, ballasting, etc., estimated to cost over $1,000,000. Another important acquisition during the year was that part of the Tennessee Central from Hopkinsville, Ky., southeast to Nashville, Tenn., 85 miles. The Illinois Central has an option running until June 1, 1908, to purchase this property. Included in this option is the joint ownership with the Southern Railway, which has taken over the western part of the Tennessee Central, of the Nashville Terminal Railroad. Operation of the road from Hopkinsville to Nashville was begun on December 1, 1905.

In order to secure entrance into Birmingham, Ala., trackage agreements have been made with the Mobile & Ohio for use of track between Jackson, Tenn., and Corinth, Miss., 55 miles, with the Southern Railway and Northern Alabama for use of the latter company's tracks between Haleyville, Ala., and Jasper, 40 miles, and with the Kansas City, Memphis & Birmingham (St. Louis & San Francisco) between Jasper, Ala., and Birmingham, 41 miles. Over the intervening distances, namely, from a point near Jackson, Miss., to connection with the Mobile & Ohio, three miles, and from Corinth, Miss., to Haleyville, Ala., 80 miles, lines are to be built by the Illinois Central under separate charters at an estimated cost of $4,380,000. Land has been secured in Birmingham for a freight terminal estimated to cost $1,120,000. The amount expended to June 30, 1906, on the Birmingham line has been $1,271,785. The route of the new line is shown on the accompanying map.

Aside from its splendid credit, the principal advantages which the Illinois Central will bring to the Harriman system are a connection from Omaha to Chicago, bringing the Union Pacific into Chicago, and the best line from Chicago to the Gulf at New Orleans, bringing the Southern Pacific also into Chicago. What effect the Harriman control of the road will have on the trackage privileges which have been granted to the Colorado Southern, New Orleans & Pacific, a Rock Island road, from Baton Rouge, La., to New Orleans, bringing that projected competitor of the Harriman line into the principal Gulf port is not yet clear. This privilege, which could in no way injure the Illinois Central, was given as a more or less direct result of the trackage rights over the Frisco into Birmingham.

A summary of the last two years' operations is given in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 4,424 | 4,374 |
| Freight earnings | $34,673,124 | $32,607,922 |
| Passenger earnings | 10,004,041 | 10,729,825 |
| Gross earnings | 51,636,405 | 49,508,650 |
| Maint. way and structures | 6,855,173 | 6,095,096 |
| Maint. of equipment | 7,059,028 | 7,804,810 |
| Conducting transportation | 18,568,575 | 18,102,052 |
| Operating expenses | 34,302,477 | 33,084,258 |
| Net earnings | 17,333,928 | 16,424,392 |
| Net income | 10,862,339 | 10,135,842 |
| Betterments and improvements | 4,164,739 | 1,683,886 |

## NEW PUBLICATIONS.

*Things That are Usually Wrong.* By John E. Sweet. New York: Hill Publishing Co. 5½ in. by 7¾ in.; 32 pages; 50 illustrations. Price, 50 cents.

In the preface the author says that the book is small but that it is his hope that most of the readers will wish there were more of it. It is safe to say that the hope will be realized. In the text itself attention is drawn to a number of items in machine design that are usually wrong because the designers have followed precedent blindly without stopping to think whether or not they were doing the best that could be done. If one were to read between the lines, a fine sermon would be found on the necessity of careful thought in the designing of even the most trivial details of machine work. The preface also says that "should those who buy the book be disappointed they can console themselves with the fact that it did not cost much." As a repair shop foreman who should follow the book's suggestion about counterboring cylinders would save more than his own salary to the company in a year, the book is clearly a good investment and will pay for itself. To quote further: "It is not to be expected that the other old fellows are going to change their patterns or practice, even if convinced that they are wrong. It is only those who think of the best way who are likely to do it; and those who think that the 'best is bad enough.'"

*Cost of Locomotive Operation.* By George R. Henderson, M. E. New York: 1906. The Railroad Gazette. Cloth; 6 in. x 9 in.; 192 pages. Price, $2.50.

This is a reprint in book form of a series of articles which appeared in the *Railroad Gazette* during 1905. The locomotive is considered as a power plant, and the author, who has had long experience in the motive power department, takes up in detail each of the items which go to make up the cost of delivering power at the drawbar to haul trains. One-third of the operating expenses of a railroad are included under this general head, yet there is little definite information as to how this cost, which annually amounts to $450,000,000, is divided and what effect physical influences have on each item. No attempt has been made to determine absolute figures of cost that could be used without qualification, but the effects of different circumstances on the cost of transportation are discussed at length and a study made of the methods of reducing this to the lowest limit. The chapters are arranged in three general groups: supplies, maintenance and service, and include fuel, water, lubricants, waste, tools, miscellaneous, general repairs, running repairs, renewals, engineers, firemen, hostling and turning, cleaning fires, wiping, inspecting, firing-up and coaling. The book is a critical analysis of the locomotive and its operations, and is of value alike to the designer, the runner and the man in charge of its maintenance and repair.

*General Specifications for Steel Railroad Bridges and Viaducts.* By Theodore Cooper. Revised Edition, 1906. New York: Engineering News Publishing Co. Pamphlet, paper cover; 7 in. x 9½ in. Price, 50 cents.

Cooper's bridge specifications were first published nearly 25 years ago. They have formed the basis of many similar publications issued since, and need no introduction to bridge engineers the world over. This is the tenth revision, made to meet the requirements of increasing loads and improvements in material and methods of construction. The load diagrams are given from E 30 to E 50. While the specifications are general in their requirements, they are especially intended to cover ordinary railroad bridge spans resting on two supports only. An appendix gives tables of moments, end shears and floor-beam reactions, weights of recent heavy locomotives and relative costs of bridges built for different classes of loading.

*Manual of Field Engineering.* By H. C. Ives and H. E. Hilts. New York: 1906. John Wiley & Son. Leather, Pocket Size, 136 pages. Price, $1.50.

This is an outline of the methods to be employed in solving the fundamental problems of surveying and geodesy, and was prepared for the use of students in the civil engineering course at the University of Pennsylvania. An appendix gives instructions for making the adjustments of the engineer's transit and level. The book is illustrated with numerous diagrams and forms for recording notes of field observations.

*Elements of Gas Engine Design.* By Sanford A. Moss. New York: D. Van Nostrand Co., 1906. No. 121 Science Series. Price, 50 cents.

The author of this little book assumes that the reader is familiar with the general features of the gas engine and its operation. He presents in condensed form only the fundamental principles with which a designer of gas engines should be familiar, and no attempt is made to go far into mathematical or constructional details of different types of engines.

# CONTRIBUTIONS

## Consistency of Proposed New Signal Indications.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have heard the system of signalling recommended by the Railway Signal Association Committee (*Railroad Gazette*, October 26, page 368) attacked from various standpoints, and have been put to it at times to defend the system. The principal point of attack seems to be "Consistency."

While consistency may in some cases be synonymous with narrow-mindedness, yet I believe it is good, other things being equal, and it is especially good in signalling, where the engineman should meet as little confusion as possible from indications given him.

Now, the conclusion I arrive at is, that the system is absolutely consistent. The indications at and approaching interlockings most severely criticised are shown in the sketch, A to 1. *A*, 3, 2, and 1, represents everything normal approaching an interlocking plant. Here No. 2 was attacked, because both arms show caution. This is consistent, for at the interlocking there is a possible medium speed route, and it should have its distant indication as well as the high. In its meaning this is the same as the present arrangement, shown at *D* 2.

It has been asked why *A* 3 should not also have the lower arm at clear, since the lower arm at *A* 2 does not indicate stop. The reason is that there is no medium speed route, as such, between 3 and 1; therefore, there should be no clear medium speed indication.

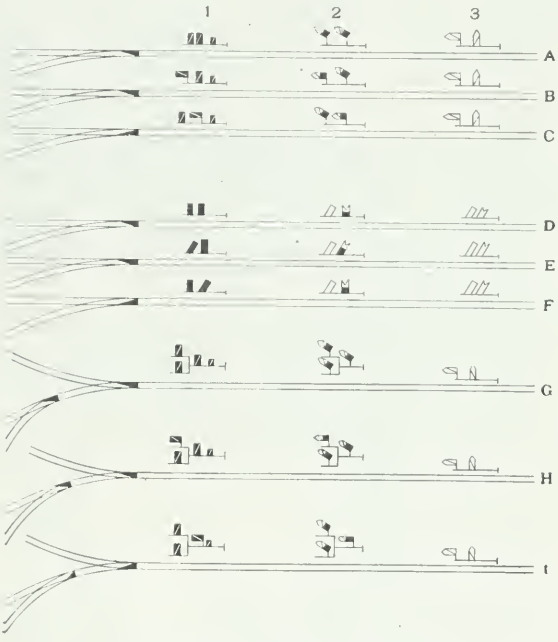
The same applies to *B*, which shows the high speed route clear through the interlocking. In the present case this corresponds to *E*, which shows the main line clear through the interlocking. But B shows more; it shows that although there is a possible medium speed route, it is blocked.

Now consider *C* and *F*. In *C* the medium speed route is clear, and in F the diverging route is clear, but note the difference. At *C* 2 a caution high speed signal is displayed, showing that the high speed route is blocked; but there is a clear medium speed signal displayed, showing that a train may proceed, not "prepared to stop

at the next home signal, but for two blocks at medium speed. The chances are that an engineman getting indication *F* 2 would apply the brakes; whereas, getting *C* 2 he would merely shut off steam. You will have to refer to Mr. Peabody's article on "Cost of Stopping Trains Compared with Cost of Maintaining Interlocking Plants"* to see how much the saving per year capitalized would amount to, but I think it would pay to use *C* 2.

One more point. In the last analysis, why use the different arrangements of lights as between block and interlocking signals? Are not all high interlocking signals to have three arms and consequently three lights? [No; the dwarf is dim and does not count.—EDITOR.]

You remarked, editorially, two weeks ago, that one defect in the new system was lack of provision for a layout having two or more equally high speed diverging routes. This is true and may prove a serious defect. To follow the committee's theory we must use the same arm for both routes if both are equally safe for the highest speed. Enginemen have been known to get lost, even under the present system of route signaling, as witness the case of a Santa Fe train taking the M., K. & T. tracks at Forth Worth recently. Merely as a suggestion, I have shown a possible solution of the




Old and New Signal Indications.

*A, B, C.—Railway Signal Association Committee Recommendations.*
*D, E, F.—Present practice, two-position.*
*G, H, I.—For two high-speed routes.*

difficulty in *G, H* and *I*, which, I think, needs no further explanation except that the right hand signal governs the right hand route, etc. The idea is not entirely original, but was suggested by Mr. Henry Johnson's letter in the *Railroad Gazette*,† and, I believe, is English practice. As to lights in vertical and oblique lines, this arrangement theoretically may not be entirely consistent, but as it would be used only approaching interlockings, this might be tolerable.

This scheme involves the eternal question of bracket posts, but that is beside the point. W. H. A.

## Steam Locomotive and Electric Locomotive Power.

New York, Nov. 12, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of the widespread errors current among engineers is the belief that the steam locomotive is an economical engine. This error forms the basis of the many various estimates of the relative cost of steam locomotive and electric operation recently published. Various test runs with steam locomotives are recorded which give a coal consumption of between 2 lbs. and $2\frac{1}{2}$ lbs. per indicated horse-power-hour. These results have been used in a recent estimate as the actual coal consumption of steam locomotives in service. More conservative estimates place the coal consumption per horse-power-hour in service at from 4 to 7 lbs. By comparing the total coal consumption of the locomotives of several railroads with the useful work done by them, measured at the rim of the drivers, the average coal consumption is found to be between 9 and 15 lbs. per horse-power-hour. The variation is partly due to differences in the quality of the coal. By useful work at the rim of the drivers is here meant the work used to haul the locomotive and the train. The work needed to haul one ton of locomotive or train is assumed to be equal. The work credited to the locomotive is therefore that developed at the drawbar, which can be measured by a dynamometer car, plus this work multiplied by the ratio of weight of locomotive to weight behind the locomotive. A large preponderance of authority can be quoted against the above estimate of coal consumption.

A close inspection of the tests which form the basis for such an estimate shows, however, that they do not give the coal consumption of an average locomotive with an average engineer and fireman under commercial conditions per useful horse-power-hour developed at the rim of the drivers. Careful tests under commercial conditions are few and they support the views here advocated. Among these may be quoted a series of tests made by Bion J. Arnold on the New York Central between Grand Central Station and White Plains. In these tests the power was measured by a dynamometer car behind the locomotive. The length of the runs was 24.75 miles. There was an average of 18 stops in this distance. All the coal used by the engine during the day was charged up. The only power counted was that developed at the drawbar in hauling the revenue trains. One of the purposes was to find the coal consumption per useful horse-power furnished by the locomotive. This was found to be 15.6 lbs. per horse-power-hour. The weight of the locomotive and tender was 107 tons; the average weight of the cars in the trains was 174 tons, and the average speed was 24 miles an hour. The useful power developed at the rim of the drivers has to haul the locomotive and the cars; it is, at moderate speeds, approximately in proportion to the weight hauled. Allowing for this the coal consumed per useful horse-power developed at the drivers is $15.6 \cdot \frac{174}{281} = 9.66$ lbs. This includes the coal used in firing up, during laying over and during switching. It does not give the average coal consumption per horse-power-hour on a whole system, but refers to the local passenger trains on a short line and to one particular locomotive. Since the coal consumption per horse-power-hour is largely dependant on the care used in firing, on the skill of the fireman and the engineer, and on the train speed the result here found does not give a reliable indication of the amount of coal used per horse-power-hour on the whole system, and when the engineers and firemen are not watched. The conditions of the tests were, however, as closely as possible like those of commercial service. The tests were made October 23 to 25, 1901, and are described in detail in Trans. Am. I. E. E., 1902.

It has been often attempted to measure the coal consumption of locomotives per useful horse-power-hour by means of indicator cards. This method gives directly the coal used per indicated horse-power-hour. The useful work done by the locomotive is then often guessed at by assuming its mechanical efficiency as about the same as that of stationary engines. There is no better way, known to the writer, to determine this mechanical efficiency than to measure by means of a dynamometer car the work done behind the locomotive and to estimate the work done in hauling the locomotive itself. For this latter work the most reasonable assumption is to take, for moderate speeds, the resistance per ton of locomotive the same as per ton of train. If the work of hauling the locomotive is estimated in this way it is found that the average mechanical efficiency of the locomotive, with the partial loads of commercial service, is about 40 to 60 per cent. Locomotive indicator cards, though valuable for judging the efficiency of the boilers, are therefore of little value for finding the useful work done by the locomotive. The low mechanical efficiency of steam locomotives is well established by such comparisons. Tests by means of indicator cards together with erroneous guesses of the mechanical efficiency of steam locomotives form the basis of the current opinions on their coal consumption per useful horse-power-hour.

A direct method of finding the average coal consumption per horse-power-hour of useful work on a railroad is to compare the amount of coal used per year by the locomotives with the work done by them estimated from the train resistance per ton determined by dynamometer car or other tests, and from the number of ton-miles of freight, cars and locomotives. Train resistances per ton vary considerably with the kind of equipment, especially the method of lubrication, with the number of cars per train, the average weight of the cars and of their load and the train speed. European tests can therefore not be used unless confirmed by other evidence. From a consideration of many formulæ giving the results of American tests the writer estimates the train resist-

*Railroad Gazette*, Oct. 13, 1905.
†Oct. 27, 1905, p. 387; see also Nov. 10, 1905, p. 434.

ance of freight trains at the present speeds to average not over 7 lbs. per ton. The train resistance of the passenger trains of the railroads here considered is estimated for the average schedule speed of about 30 miles per hour at not over 11 lbs. per ton. The train resistances here assumed form the basis of the whole calculation of the work done by the locomotives; a few words in their defence are therefore proper.

Train resistances have been determined by three methods. The latest and most reliable is by means of dynamometer cars measuring the drawbar pull of the locomotive. Two older methods use either indicator cards combined with an estimate of the mechanical efficiency of the locomotive or gravity tests, consisting in observing the speeds of a train running without power on a known grade and calculating from them and the grade the total train resistance. The mechanical efficiency of the locomotive is a much disputed subject. It is the useful work done by the locomotive divided by the work done by the steam on the pistons. The work done by the steam is given by the indicator cards, that in hauling the train by the drawbar pull, that in hauling the locomotive is variously estimated, often at twice the amount needed in hauling an equal weight of train. The definition of the mechanical efficiency of the locomotive is incomplete without a statement of the method of estimating the work done in hauling the locomotive. The mechanical efficiency of the locomotive, like that of any other engine, is quite different at full load and partial load. In actual service the locomotive works most of the time at partial load; its mechanical efficiency, however defined, if defined at all, is generally estimated for full load. Train resistances calculated from indicator cards are, therefore, of little value unless confirmed by other evidence.

The gravity tests give the resistance for trains under the compression caused by the head resistance. This is shown by comparative tests to be greater than the resistance of a train under tension. The latter is the usual condition. All old experimenters are for trains consisting of light cars, and they were generally made by defective methods. They are therefore of little value.

The Burlington brake tests made in 1886 by means of a dynamometer car are the oldest I shall mention. I quote the conclusions derived from them by Mr. A. M. Wellington from his *Economic Theory of Railway Location*.

"The normal tangent freight train resistance is often, and perhaps usually, as low as 4 lbs. per ton, up to speeds as high as 25 miles per hour, running down in cases to 3 lbs. and even less; and, on the other hand, rising in cases as high as 6 or 8 lbs. per ton when the cars are in bad order or against a head or sidewind, or at winter temperatures, these latter figures being a fair working maximum for freight service."

The tests were made with trains weighing behind the tender from 571 to 615 tons of 2,000 lbs. The Westinghouse train consisted of 25 box cars weighing 301 tons:

| | |
|---|---|
| 25 box cars weighing | 301.0 tons. |
| 12 loads of 20 tons | 240.3 " |
| Dynamometer car with 15 persons | 16.5 " |
| Way car with 10 persons | 13.6 " |
| Total | 571.4 tons. |

There were three trains. The Westinghouse train consisted of old cars in excellent running order, with well-worn journals and wheel treads. The average train resistance with speeds of 16 to 25 miles per hour was 4.32 lbs. per ton. The American train was made up of entirely new heavy cars, which had only run some 300 to 500 miles since leaving the shop, and consequently had bearings and wheel treads still comparatively rough, and not fairly representing the average conditions of practice. The mean resistance of three tests was 8.50 lbs. per ton. The train weighed 615 tons. The Eames train, weighing 571 tons, consisting of poorly built, light cars in inferior condition, showed an average resistance of 6.84 lbs. per ton. Each of the three trains had 27 cars, weighing together more than their load.

Mr. A. C. Dennis reports, in December, 1902, the results of runs of 3,000 miles with dynamometer cars and heavy freight trains. He found the average resistance in winter and summer practically the same. He gives the resistance of empty cars as 9 lbs. per ton, that of cars carrying a load of twice their weight as 4.7 lbs. per ton; that of the load alone at 2.6 lbs. per ton. The load of the average train is about equal to the weight of the cars. The resistance of such a train would be according to Mr. Dennis $\frac{2.6+9}{2} = 5.8$ lbs. per ton.

The *Railroad Gazette*, April, 1899, reports tests with empty and loaded coal cars. They show 5.17 lbs. per ton resistance for loaded and 9.17 lbs. for empty cars. This substantially agrees with the results obtained by Mr. Dennis.

Experiments made in 1885 in Germany on the Breslau Schmolz line with a dynamometer car give substantially the same results. The cars used had a rigid wheel base of 16 to 23 ft. Some had fixed and some radial axles. At 21.8 miles per hour the average resistance was 4.14 lbs. per net ton with fixed axles and 4.08 lbs. with radial axles.

These tests make the average freight train resistance 4 to 6 lbs. per ton on a tangent. Allowing for the resistance caused by occasional curves and for the waste of power by the use of brakes 7 lbs. per ton appears to be a liberal estimate for the average freight train resistance on the lines hereafter considered. For passenger trains the data are not so satisfactory.

The Baldwin Locomotive Works gives a formula widely used but based on indicator card tests. The wide experience of this company has probably led to an approximately correct estimate of the mechanical efficiency of locomotives. A too low estimate of the train resistance would mean an underestimate of the work done by their engines; this is therefore improbable. The formula is $R = 3 + \frac{V^2}{6}$, where R is the resistance in pounds per net ton and V is the speed in miles per hour. This gives 9 lbs. per ton as the resistance for an average running speed of 36 miles per hour. Numerous experiments with dynamometer cars have been made in France and England. Mr. Barbier gives a formula as the result of experiments with passenger trains at 36 to 69 miles per hour. Translated to English measures it is $R = 3.2 + 2.5\ V\ \frac{(V+6.08)}{1000}$. This formula gives for 36 miles per hour 7 lbs. per ton.

Mr. J. A. F. Aspinall gives the result of his experiments with English rolling stock in a formula $R = 2.5 + \frac{V^{\frac{5}{3}}}{50.8 + 0.0278\ L}$

V is the speed in miles per hour, L is the length of the train in feet. Taking L = 300 ft. we obtain for 36 miles per hour R = 9.1 lbs. per ton. These foreign experiments agree fairly well with the results of the Baldwin Locomotive Works' formula.

Assuming the resistance on a level tangent, at the average passenger train speeds, at 9 lbs. per ton and adding 2 lbs. for curve resistance and power lost by the use of brakes the work done by the locomotives is probably liberally estimated.

There are some local passenger trains on suburban lines with frequent stops, where the train resistance, inclusive of the loss due to the use of brakes, is nearly twice as large. There are also some fast through trains where the train resistance is about 14 lbs. per ton. These trains represent, however, a small per cent. of the total mileage of passenger trains, and have therefore little influence on the average. More numerous reliable American tests with dynamometer cars are needed to prove the accuracy of the estimates here made; the quoted tests, however, prove in the opinion of the writer their approximate truth. With these train resistances per ton and the total ton-miles per year calculated from data in the annual reports to the stockholders the total work done by the locomotives of whole railroad systems can be calculated.

Following this method with the Lake Shore & Michigan Southern in the year 1905 we find the coal consumption from the annual report to be 1,690,000 tons. For calculating the work of the locotives we find:

| | |
|---|---|
| Tons of freight hauled 1 mile | 5,383,000,000 |
| Car miles of freight and work cars | 314,000,000 |
| Passenger car miles | 47,645,000 |
| Passenger engine miles | 7,588,000 |
| Freight and work engine miles | 11,685,000 |
| Switching engine miles | 6,468,000 |

Taking for the average weight of a passenger car 40 tons, of a freight car 15 tons, of a freight locomotive and tender 130 tons, of a passenger locomotive and tender 90 tons, and of a switching engine 80 tons, we obtain the number of horse-power-years to be credited to the locomotives as follows:

| For hauling: | H. P. years. |
|---|---|
| Freight $\frac{5,383,000,000 \times 7 \times 5{,}280}{1,980,000 \times 8{,}760}$ | 11,472 |
| Freight and work cars $\frac{314,000,000 \times 15 \times 36{,}960}{17,345,000,000}$ | 10,993 |
| Passenger cars $\frac{47,645,000 \times 40 \times 11 \times 5{,}280}{17,345,000,000}$ | 6,382 |
| Passenger engines $\frac{7,588,000 \times 90 \times 11 \times 5{,}280}{17,345,000,000}$ | 2,387 |
| Fr't and work eng $\frac{11,685,000 \times 130 \times 36{,}960}{17,345,000,000}$ | 2,774 |
| Switching trains $\frac{6,468,000 \times 420 \times 36{,}960}{3 \times 17,345,000,000}$ | 1,929 |
| Total horse power years | 36,300 |

The switching mileage given in railroad reports is generally estimated at 6 to 8 miles per hour. This is done to credit the switching engines with an amount of work about equal to that done by other engines. The average weight of a switching train is here

estimated at 420 tons, and the actual switching mileage is estimated to be ⅓ of the nominal reported mileage.

The railroad owns 739 locomotives; the amount of work done per locomotive is therefore 49 h.p.-years. The coal used per horse-power-hour is evidently $\frac{1\,690,000 \times 2000}{36,300 \times 8760} = 10.63$ lbs. This is the average actual coal consumption per horse-power-hour on the whole Lake Shore system. This result is in the nature of things only approximate, but it is believed to be closer to the truth than any result that can be obtained from a few test runs. It is not vitiated by some of the inevitable errors of test runs, however accurate the observations. It gives the average results, with average firemen and engineers and average locomotives, under the average conditions of the actual traffic. It is possible that there are errors in the annual report; these reports, however, compare the results of different years and large errors would, therefore, be inevitably discovered. The weight of the cars and locomotives and of the average train resistance has been liberally estimated, and the writer believes that the amount of coal used per h.p.-hour is underestimated.

The Lehigh Valley gives, in its annual report of 1905, 519 tons as the average amount of freight carried by a freight train. The average number of cars per train is 36.45, their weight approximately 14 tons each, or a total of 510 tons. The weight of engine and tender is 130 tons. This gives 1,159 tons as the average weight of a freight train. The work per train-mile is: $\frac{11.59 \times 7 \times 5,280}{1,980,000} =$ 21.63 h.p.-hours.

The average coal consumption per freight engine-mile is given as 208.4 lbs. The coal used per h.p.-hour is, therefore $\frac{208.4}{21.63} = 9.64$ lbs. About one-half the freight of this road is coal carried down grade. On up-grades helpers are used; there is, therefore, more than one engine-mile per train-mile. The amount of work done per freight engine-mile is, therefore, probably overestimated, and the coal consumption per h.p.-hour is underestimated. This is confirmed by the results obtained for other railroads. The passenger trains have, on an average, 5.2 cars weighing $5.2 \times 40 = 208$ tons. The passenger engine and tender adds 80 tons, making the average weight of a passenger train 288 tons. The work per train-mile is $\frac{288 \times 11 \times 5,280}{1,980,000} = 8.45$ h.p.-h. The coal used per passenger locomotive-mile is 103.9 lbs. The coal used per h.p.-hour is, therefore, $\frac{103.9}{8.45} = 12.3$ lbs. The switching work, which is the least economical, is here not included, and would have to be considered in obtaining the average coal consumption per h.p.-hour on the whole system.

The Chicago & Alton, in its annual report for the year ending June 30, 1906, gives:

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|---|---|
| Average freight per freight train | 418 tons. |
| Average number cars pr freight train, 30.37, weighing | 425 " |
| Engine and tender, estimated | 120 " |
| Estimated average weight of freight trains | 963 " |

The coal used per freight engine-mile is given as 201.55 lbs. The work of the freight locomotive per mile is, therefore, $\frac{963 \times 7 \times 5\,280}{1,980,000} = 18$ h.p.-hours. The coal used per h.p.-hour is, therefore, $\frac{201.55}{18} = 11.2$ lbs. The report gives the average number of cars per passenger train as 5.25.

| | |
|---|---|
| Their estimated weight is | 210 tons. |
| Engine and tender | 80 " |
| Weight of passenger train | 290 tons. |

Work done per mile $\frac{290 \times 11 \times 5.280}{1,980,000} = 8.5$ h. p. h.

Coal used per mile is 109.43 lbs.

Coal per h. p. h. $\frac{109.43}{8.5} = 12.86$ lbs.

This road publishes also the necessary data for calculating the total work done by the locomotives. If calculated as above it is found to be 9,913 h.p.-years. The coal used per h.p.-hour is found to be 14.73 lbs. This coal costs only $1.15 per ton, and is inferior to the coal used farther east. To do this work the road owns 250 locomotives, each producing an average of 40 h.p.-years. Their value is about $250 per h.p.-year of work produced.

The Erie gives, in its report for the year ending June 30, 1905, the necessary data for obtaining the following results. Coal consumption of freight locomotives, 10 lbs. per h.p.-hour; of passenger locomotives, 14 lbs. per h.p.-hour; of all locomotives, 14.23 lbs. per h.p.-hour.

The railroads here considered were selected at random, mainly because of the completeness of their reports. This investigation, therefore, justifies the statement that the average coal consumption of American steam locomotives is approximately between 10 and 15 lbs. per useful h.p.-hour developed at the rim of the drivers.

With electric locomotives, assuming alternate current operation similar to that adopted on the New York, New Haven & Hartford, with steam turbine power stations of at least 5,000 h.p., one electrical horse-power at the station can be produced in ordinary commercial service with an average consumption of 2 lbs. of coal per hour With an efficiency of ⅔ from the station to the rim of the drivers this means 3 lbs. of coal per h.p.-h. measured at the rim of the drivers as against 3 to 5 times as much with steam locomotives.

It is of interest to find the cost of steam locomotive power per horse-power-year. The Lake Shore gives the cost per locomotive-miles 32.07 cents. The number of locomotive-miles is 25,741,500. This gives $8,256,000 as the total cost of 36,300 h.p.-y., or $227.50 per h.p.-year. This does not include interest and taxes on the cost of the plant.

With electric locomotives, we have the cost at the power stations that of transmission, and that on the locomotives. With stations of 5,000 or more h.p. capacity and a minimum load factor of ⅝, with coal at $1.60 per net ton, one electrical horse-power at station will cost approximately $36 per year. With an efficiency of ⅔ from the station to the rim of the drivers the current for one horse-power-year at the drivers costs $54 at the station. This includes 5 per cent. for interest and taxes on the cost of the power stations.

The cost of transmission varies greatly with the amount of power consumed per mile of track. Assuming alternate current operation with 15,000 volts in the contact conductor, the cost of the transmission plant for a trunk line with maximum train speeds of 80 miles an hour is approximately $5,500 per mile of track. This cost is the same whatever the number and size of the daily trains, provided the distance of the stations is inversely proportional to the square root of the amount of power used per mile of track. Allowing 8 per cent. for interest, taxes and maintenance of the transmission plant, the yearly cost of the power transmission becomes $440 per mile of track.

On a double-track line, with 40 trains per day, the average power consumption per mile of track is about 16 horse-power at the rim of the drivers. This makes the cost of the power transmission $27.50 per h.p.-year. On some lines the traffic will be twice as large, making the cost of transmission per h.p.-year one-half as much. On single track lines the maximum train speeds are much smaller, and an overhead construction similar to that of interurban lines costing about $2,500 per mile of track, can be adopted. Taking 10 per cent. for interest, taxes and maintenance the yearly cost of the power transmission per mile of track becomes $250.

On some single-track lines the power used per mile of track does not exceed 6 h.p. costing for transmission $41.67 per h.p.-year. The cost of the electric current delivered at the locomotive varies therefore from $68 to $96 per h.p.-year. This assumes power produced in steam turbine stations using good coal costing $1.60 per ton, with the average power consumption varying between 6 and 32 h.p. at the rim of the drivers, per mile of track. In some locations cheap water powers will reduce this cost from $43 to $71 per h.p.-year.

The costs incurred on the electric locomotive are not exactly known. They amount to about $75 per h.p.-year. The total cost per h.p.-year developed at the rim of the drivers is therefore approximately $143 to $171, with power derived from steam turbine stations, and it may be only $118 to $146 with a cheap water power. This compares with about $225 for steam locomotive power. Interest and taxes on the cost of the plant required with steam locomotives and on the cost of the electric locomotives have been omitted. These will be about the same for the two cases.

It is generally conceded that electric operation has many advantages much more important than its cheapness. They can, however, not be as accurately estimated, and they are too large a subject to include within the limits of this paper.

JOSEPH MAYER,
Consulting Engineer, Mem. Am. Soc. C. E.

## The Federal Employers' Liability Law.

Leading railroads may unite in an effort to overthrow in the courts, on the ground of unconstitutionality, the law passed by the last Congress known as the "employers' liability act," although it is confined to railroads.* The plan of the railroads has become known to the government and the Attorney-General will probably ask leave to intervene in the first case brought under the law to support the constitutionality of the act.

Garrard B. Winston, of Winston, Payne & Strawn, attorneys for the Chicago & Alton, the Michigan Central and other roads, has prepared a statement in which he says:

"At common law no recovery could be had by one employee for negligence of a fellow servant, and contributory negligence on the part of an employee was also a defense to a suit against the em-

*Railroad Gazette, June 29, 1906.

oyer. From time to time, commencing as early as 1862, legis-
tures of the various states have enacted laws prescribing the
ghts, liabilities and duties of servant and master. At this day
ch state has a complete system of laws and decisions on relations
master and servant. By the act of its last session Congress
rogates the common law doctrine, and the federal government
ntrols all litigation arising between carriers engaged in commerce
tween the several states and their employees, for personal in-
ries to the latter, and all state laws and the decisions construing
e same are, to that extent, nullified. Not only nullified, but Con-
ess goes far beyond the trend of state legislation.

"Contributory negligence is no longer a defense. The doctrine
comparative negligence, long since repudiated by the courts, is
surrected by force of the statute. The freedom of the carrier
contract with its employees is denied. The amount recoverable
unlimited. A mere recital of these innovations upon the law
recognized by the great majority of states is sufficient to show
e importance to all common carriers as to whether or not such
law is valid.

"By the use of the words 'cars, engines, appliances, machinery,
ack, roadbed, ways, or works' Congress extended the provisions
the law over all instrumentalities of companies conducting com-
erce. The general and sweeping terms, 'every common carrier,'
ny of its agents,' 'any of its officers, agents, or employees,' 'all
strumentalities,' establish the proposition that there was but one
ea in the mind of Congress, namely, that as to commerce there
all be no states. Debates in Congress on this act also show con-
usively that such was the object sought to be accomplished. Yet
e Judicial department has been declaring for 100 years that the
ower to regulate commerce wholly within a state was a power
hich the states never surrendered to the federal government, and,
Congress well knew, much of the commerce of common car-
ers is carried on wholly within the individual states."

"The act in question," concludes Mr. Winston, "is unconstitu-
onal on the single ground that Congress has undertaken therein
invade the rights of the states."

## Fifty Cents a Day for Freight Cars.

The meeting which was held in Chicago, Nov. 9, to hasten the
doption of an increased rate of pay for the use of interchanged
eight cars appears to have been a shining success. Something like
nr-fifths of the prominent roads of the country were represented
d 40 or more companies, operating more than 100,000 miles of
ad and owning a million freight cars, indicated their willingness
sign the agreement which was adopted. This agreement, the
Car Hire Agreement"—so designated to distinguish it from the
greement which is now in force, under the auspices of the Amer-
an Railway Association—is distinctly supplemental to the Per Diem
ules Agreement, and is, of course, entirely independent of the Amer-
an Railway Association, although it has been adopted and will be
rried out entirely in harmony with the action of the association.
he agreement is in substance as follows:

It is mutually agreed, jointly and severally, by and between the several
ilroad companies subscribing and parties hereto, that on and after Dec. 1,
906, settlement among themselves for the use of freight cars of the said sub-
ribing companies will be made at the rate of 50 cents per car per day, with-
t penalty for delay, and that each subscribing company will account and
y for the use of said cars to each of the other subscribing companies ac-
rdingly.

It is further understood that this agreement in no wise affects the pro-
visions of the Per Diem Rules Agreement, except as to the rate for the use of
freight cars and the penalty for delay, between the parties to this agreement.

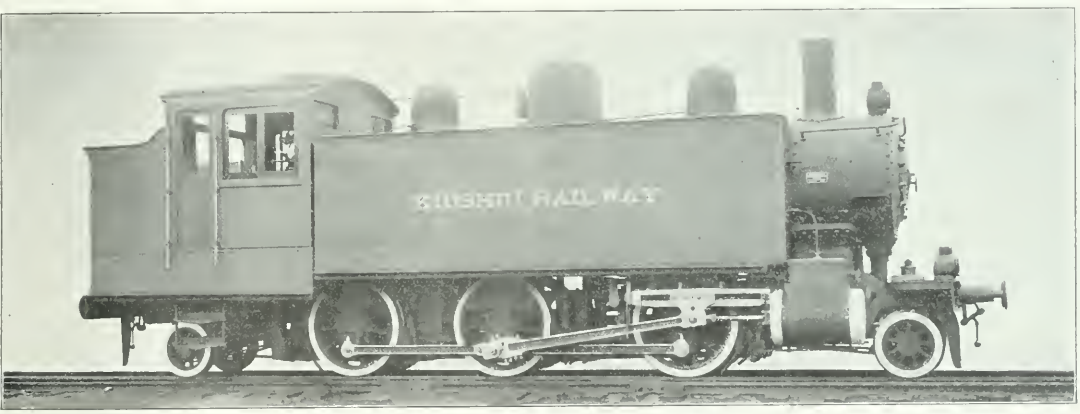
All disputes arising under this agreement shall be settled by a special committee appointed for the purpose, to be known as the Car Hire Committee.

This agreement shall terminate on July 1, 1907, unless it shall be extended, modified or dissolved, by the vote of the majority of the signers thereto, owning two-thirds of the cars represented, such action to be taken at a meeting of said signers, called by the Car Hire Committee on 10 days' previous notice.

The meeting was presided over by Mr. E. W. McKenna, Second Vice-President of the Chicago, Milwaukee & St. Paul, and the Secretary was Mr. W. F. Allen, Secretary of the American Railway Association. The Car Hire Committee will consist of Arthur Hale (B. & O.), chairman of the Car Service Committee of the American Railway Association; Julius Kruttschnitt, of the Southern Pacific, and F. A. Delano, of the Wabash. The meeting could not agree on any definite action looking to the cure of diversion abuses, but this committee will take up the question and try to formulate a rule.

## Double End Tank Locomotive for the Kiushiu Railway, Japan.

This locomotive is one of 24 double-end tank locomotives recently built for the Kiushiu Railway (Japan) at the Schenectady Works of the American Locomotive Company. They are intended for heavy passenger and fast freight service and have a large tank capacity for engines of their size. Their tractive power is 20,260 lbs. The general dimensions are as follows:




Double End Tank Locomotive Built by the American Locomotive Company for the Kiushiu Railway, Japan.

| | |
|---|---|
| Total weight, in working order | 132,000 lbs. |
| Weight on drivers | 92,000 lbs. |
| Diameter of drivers | 48 in. |
| Driving wheel base | 13 ft. 6 in. |
| Total wheel base | 29 ft. 2 in. |
| Cylinders | 17 in. x 22 in. |
| Working steam pressure | 180 lbs. |
| Diameter of boiler | 54 in. |
| Number of tubes | 166 |
| Length of tubes | 12 ft. 6 in. |
| Diameter of tubes | 2 in. |
| Total heating surface | 1,180 sq. ft. |
| Firebox, material—door sheet, crown and sides | Copper |
| " material—tube sheet | steel |
| Firebox, length | 86 in. |
| Firebox, width | 29½ " |
| Grate area | 17.7 sq. ft. |
| Tank capacity | 2,500 Imp. gals. |
| Coal capacity | 4½ tons. |

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.55$$

$$\frac{\text{Tractive effort x diam. of drivers}}{\text{Total heating surface}} = 825$$

$$\frac{\text{Total heating surface}}{\text{Grate area}} = 66.7$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 0.085$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 78$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 112$$

Volume of two cylinders = 5.8 cu. ft.

$$\frac{\text{Grate area}}{\text{Cylinder volume}} = 3.06$$

## Accident Bulletin, No. 20.

The Interstate Commerce Commission has issued Accident Bulletin No. 20, giving the record of railroad accidents in the United States during the three months ending June 30, 1906, and yearly tables for the 12 months ending with June. The number of persons killed in train accidents in the quarter reported was 194, and of injured 3,031. The total number of casualties from train accidents and other causes was 16,937 (933 killed and 16,004 injured). These accidents are classified in the following table. These reports deal only with (*a*) passengers and (*b*) employees on duty:

TABLE No. 1.—*Casualties to Persons—April, May and June, 1906.*

| | Passengers. | | Employees. | | Tot'l persons reported. | |
|---|---|---|---|---|---|---|
| | Kil'd. | Inj'd. | Kil'd. | Inj'd. | Kil'd. | Inj'd. |
| Collisions | 11 | 839 | 76 | 826 | 87 | 1,665 |
| Derailments | 16 | 558 | 73 | 476 | 89 | 1,034 |
| Miscellaneous train accidents | .. | 20 | 18 | 312 | 18 | 332 |
| Total train accidents | 27 | 1,417 | 167 | 1,614 | 194 | 3,031 |
| Coupling or uncoupling | .. | ..... | 68 | 813 | 68 | 813 |
| Other work about trains, etc. | .. | ..... | 72 | 3,790 | 72 | 3,790 |
| In contact with overhead bridges, structures at side of track, etc. | 4 | 12 | 35 | 372 | 39 | 384 |
| Falling from cars or engines or while getting on or off | 37 | 472 | 164 | 2,598 | 201 | 3,070 |
| Other causes | 13 | 577 | 346 | 4,339 | 359 | 4,916 |
| Total, other than train accidents | 54 | 1,061 | 685 | 11,912 | 739 | 12,973 |
| Total, all classes | 81 | 2,478 | 852 | 13,526 | 933 | 16,004 |

The total number of persons here recorded as killed (933) is less than in the last preceding quarter, but it is more than in the corresponding quarter of 1905. The same is true of the number of employees killed in coupling accidents. In considering train accidents alone, however, there is a gratifying diminution both in passengers killed and employees killed, compared with either of the two earlier quarters mentioned. These comparisons, tabulated, are:

| | Quarterly Bulletins— | | |
|---|---|---|---|
| | No. 20. | No. 19. | No. 16. |
| 1. Passengers killed in train accidents | 27 | 62 | 41 |
| 2. Employees killed in train accidents | 167 | 212 | 221 |
| 3. Employees killed, coupling | 68 | 84 | 49 |
| 4. Total passengers and employees killed | 933 | 1,124 | 886 |

In the first of these items the totals have been swelled by great disasters in nearly every quarter for two years. In Bulletin 16 there are two well remembered derailments, killing 34 passengers, and in Bulletin 19 one collision, killing 34 passengers and employees. In the present bulletin this feature is not so bad, yet there is one disastrous butting collision of passenger trains that killed 10 passengers and employees, and one derailment killing 9 passengers.

The total number of collisions and derailments was 3,103, as follows:

TABLE No. 2.—*Collisions and Derailments.*

| | No. | Loss. | Persons—Killed. | Injured. |
|---|---|---|---|---|
| Collisions: Rear | 340 | $324,929 | 31 | 537 |
| " Butting | 170 | 224,196 | 17 | 520 |
| " Trains separating | 168 | 61,454 | .. | 97 |
| " Miscellaneous | 910 | 352,512 | 39 | 511 |
| Total collisions | 1,588 | $963,091 | 87 | 1,665 |
| Derailments due to: Defects of roadway, etc. | 291 | $236,351 | 9 | 321 |
| Defects of equipment | 664 | 581,428 | 9 | 152 |
| Negligence of trainmen, signalmen, etc | 87 | 105,148 | 14 | 152 |
| Unforeseen obstruction of track, etc. | 62 | 98,546 | 14 | 78 |
| Malicious obstruction of track, etc. | 17 | 19,602 | 1 | 17 |
| Miscellaneous causes | 394 | 371,758 | 42 | 314 |
| Total derailments | 1,515 | $1,410,833 | 89 | 1,034 |
| Total, collisions and derailments. | 3,103 | $2,373,924 | 176 | 2,699 |

The following table, No. 2*a*, is a list of train accidents in which the damage is reported at $10,000 or over, and other notable cases:

TABLE 2*a*. *Causes of Thirty Prominent Train Accidents (Class A).*

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

COLLISIONS.

| No. | Class. | Kind of train. | Killed. | Injured. | Damage to engines, cars, & roadway | Reference to record. | Cause. |
|---|---|---|---|---|---|---|---|
| 1 | R. | F. & F. | 0 | 0 | $700 | 2 | Approached station too fast; misjudged distance. |
| 2 | R. | F. & F. | 1 | 4 | 2,187 | 21 | Too high speed in fog; engineman did not see flagman; engineman, who was killed, had been on duty 17½ hours. |
| 3 | B. | P. & P. | 0 | 38 | 2,500 | 49 | Operator omitted two words in writing a meeting order. |
| 4 | B. | P. & P. | 10 | 38 | 4,000 | 22 | Pilot misinterpreted despatcher's order. See note in text below. |
| 5 | B. | F. & F. | 1 | 5 | 4,000 | 27 | Operator failed to deliver order. See note in text below. |
| 6 | R. | P. & F. | 0 | 1 | 4,436 | 51 | Engineman, 27 years' experience, ran past automatic signal indicating stop. |
| 7 | R. | P. & F. | 1 | 21 | 4,800 | 23 | Clear block signal given to passenger train while an empty engine was in block section. See note in text below. |
| 8 | R. | F. & F. | 0 | 2 | 6,200 | 50 | Engineman ran past automatic signal indicating stop; brakeman riding on engine discharged for not seeing signal and taking measures to stop train. |
| 9 | B. | P. & F. | 0 | 23 | 7,000 | 47 | Operator, 3 months' experience, failed to deliver despatcher's order. |
| 10 | B. | P. & P. | 1 | 10 | 10,377 | 48 | Men in charge of southbound train overlooked meeting point. |
| 11 | B. | F. & F. | 1 | 4 | 10,082 | 53 | Conductor, engineman and whole crew (on duty 16 hours) overlooked meeting orders; orders delivered to them only 30 minutes before. |
| 12 | B. | F. & F. | 0 | 1 | 12,000 | 28 | Conductor and engineman, eastbound, misread orders. |
| 13 | B. | P. & P. | 0 | 5 | 12,050 | 45 | Northbound encroached on time of southbound. |
| 14 | B. | P. & F. | 0 | 30 | 14,579 | 57 | Signalman failed to put block signal in position after passage of work train. See note in text below. |
| | | Total..... | 15 | 187 | $101,011 | | |
| | | | | | | | DERAILMENTS. |
| 1 | D. | P. | 1 | 8 | $1,255 | 11 | Two cars of a passenger train having been detached at junction ran back down grade and were derailed at a curve; brake connections defective; one bolt missing; one hook so weak that it straightened out; brakeman set hand-brakes, but these defects thwarted his work. |
| 2 | D. | F. | 0 | 0 | 2,800 | 59 | Ran off derail switch; air brakes inoperative; brake-pipe cocks had been maliciously closed in three places; conductor had not properly tested air brakes. |
| 3 | D. | F. | 0 | 0 | 5,110 | 17 | Air brakes failed on steep grade; brake-pipe found closed near engine; cause not explained; engineman disobeyed rule to stop at head of grade. |
| 4 | D. | F. | 1 | 1 | 6,500 | 58 | Air brakes failed on 3.4 per cent. grade; brakes not tested after detaching helping engine; conductor and engineman discharged; conductor's service as such, three months'; engineman's as such, two months. |
| †5 | D. | P. | 9 | 18 | 6,710 | 40 | Unexplained; speed, 12 miles an hour, switch at point of derailment found broken may have been the cause. |
| 6 | D. | P. | 0 | 4 | 7,825 | 14 | Overhead bridge burned and fell on track. |
| 7 | D. | P. | 0 | 0 | 8,000 | 38 | Rail maliciously misplaced, presumably by dissatisfied track laborers. |
| 8 | D. | F. | 0 | 0 | 10,000 | 67 | Loose wheel. |
| 9 | D. | P. | 0 | 2 | 10,000 | 43 | Unexplained; speed, 50 to 60 miles an hour on 1 per cent. descending grade; derailment occurred on bridge; track in good condition. |
| 10 | D. | P. | 1 | 35 | 11,000 | 63 | Misplaced switch; left misplaced by men of freight train over an hour before. See note in text below. |
| 11 | D. | P. | 0 | 21 | 12,509 | 64 | Excessive speed on track not well ballasted. |
| 12 | D. | F. | 0 | 0 | 13,400 | 32 | Steel dump car with top-heavy load; speed, 30 miles an hour. |
| 13 | D. | F. | 2 | 2 | 16,000 | 12 | Runaway; air brakes ineffective; conjectured that angle cock had been closed purposely or accidentally by a tramp. |
| 14 | D. | F. | 0 | 3 | 18,600 | 33 | Runaway, on 3 per cent. grade. See note in text below. |
| 15 | D. | P. | 0 | 0 | 21,700 | 72 | Open draw. See note in text below. |
| 16 | D. | P. | 0 | 2 | 27,900 | 4 | Ran into wreck of freight trains. (Collision No. 1.) |
| | | Total..... | 14 | 96 | $179,300 | | |
| | | Grand total. | 29 | 283 | $280,911 | | |

Collision No. 4* occurred about 11 p. m., and was between two passenger trains running on a single-track branch line, in consequence of an obstruction on the double-track main line, which was their usual route. Being on an unusual route, the enginemen were guided by "pilot men," and the pilot man, being the only person on the train fully acquainted with the road, was chiefly responsible for seeing that the movement of the train was made in conformity to the rules. The pilot of the west-bound train was mainly at fault. He had received a dispatcher's order to run to a signal tower designated "S T," which was at the end of the double-track section of the branch, and at this tower he was to receive further orders, or, in the absence of such orders, to wait there. When he arrived at "S T" the telegraph operator at the tower delivered to him a message in regard to reducing speed over a piece of new track which he was to traverse, and he carelessly took it for granted that this message was the dispatcher's order which he was expecting, and he proceeded with his train (on the single-track line). As soon as he read the order and found that it did not give him any right to proceed, he stopped the train and sent the fireman back to consult the conductor. The conductor, however, on receiving the order to run to "S T" had misread it, taking it for an order to run to "S J," which was the name of a tower some distance beyond. The conductor therefore sent back word by the fireman that his order was the same as that which had been given to the pilotman, and that it gave the train the right of road to "S J." On this the pilot assumed that he himself had been mistaken in reading his order, and proceeded, though with a doubt in his mind. Before he had settled the doubt, however, the east-bound train was met, and the wreck occurred. The report says that the dispatcher's order was plainly written, and that there was no reason for mistaking the "T" for a "J." The conductor and the pilot were both experienced men. The

*Clover Creek Junction, May 4.
†Louisville, May 28

conductor had been on duty about three hours. The engineman had been on duty all day, about fourteen hours, except that in the middle of the day his train was laid up about five hours at the terminus of its run.

In the case of collision No. 5 the operator who failed to deliver a meeting order and thereby caused a collision had at the time three other orders for delivery to the same train. The rules require that the operator report to the dispatcher the numbers of orders to be delivered to a given train, and also that he deliver to the conductor of the train a clearance card on which the numbers of the orders are entered. Concerning one of the four orders there was some discussion between the dispatcher and the operator, and the operator definitely stated that he had that order; but he neglected to enter it on the clearance card. The rules also require that meeting orders shall be sent to the operator at the station where the trains are to meet, but in this case the dispatcher, being unable to get a response from the operator at the meeting point, neglected to carry out the rule.

Collision No. 7 appears to have been due to carelessness in the management of permissive block signaling. The passenger train was given a clear block signal when the block was occupied by an empty engine which had preceded the passenger train. This engine was running on a caution card on account of the presence of still another engine in the block ahead of it. It appears that the signalman at the outgoing end of the block had not been advised, or denied having been advised, of the entrance of the second engine, and he authorized the giving of a clear signal to the passenger train before the block was clear.

Collision No. 14 was due to confusion at a block-signal tower where trains pass from a two-track line to a three-track line. A work train passed to the northermost track of the three-track line and stopped. The next following train, a fast passenger train, was due in about fifteen minutes, and it should have been run on to the middle track of the three-track line; but the signalman neglected to return the signal to the stop position after the passage of the work train, and the fast train when it came on therefore received a clear signal for the northernmost track, the one occupied by the work train. It appears that there was no track circuit or other arrangement to insure the movement of the signal from the clear to the stop position after the passage of the work train. It was the duty of the flagman of the work train, according to the rules, to go back with a flag so as to be ready to stop the passenger train, but it appears that he depended on the signalman in the cabin to provide this protection—though without looking at the signal to see whether or not the signalman had actually done so.

Derailment No. 10 was a disaster to a fast passenger train which ran through a misplaced switch that could be seen by the engineman only a few seconds before he reached it—that is to say, about 500 ft. away. The switch had been left in the wrong position by a brakeman of a freight train something over one hour before. The station agent is censured by the superintendent for not noticing that the switch had been left in the wrong position. There was no distant signal connected with the switch. The negligent brakeman had been in the service about two years. The conductor of the freight train had been in the service seventeen years, but his record was quite faulty.

Derailment No. 14 was primarily due to the runaway of a heavy train on a 3 per cent. grade, though the damage is believed to have been immediately due to the breaking of a wheel; but the whole trouble could undoubtedly have been prevented if the conductor of the train had made proper use of the air brakes. The train consisted of 37 cars of ore, 27 of them being steel cars carrying 50 tons each, and 10 of them wooden cars carrying 25 tons each. Shortly after beginning the descent of the grade the speed became uncontrollable. It is believed that a tramp rode on one of the cars and that he, without knowing what he was doing, moved the handle of an angle cock so as to close the train line air pipe near the engine. The increase in the speed occurred so rapidly that all of the three men on the front of the train jumped off; but the train reached a safety siding before the speed got above 35 miles an hour, and therefore it should have been stopped without serious damage. Marks on the ties showed, however, that one of the cars had been off the track for nearly a mile, and this car had the broken wheel. The broken wheel knocked the switch rails out of place, causing the derailment of the following cars. Before the broken car jumped the track the conductor had detached the caboose from the train, after closing the angle cocks in the air pipe both of the caboose and of the last freight car. If, instead of doing this, he had applied the air brakes, in all probability he would have been able to stop the train or greatly to check its speed.

Derailment No. 15* was caused by the carelessness of the attendant at a drawbridge, who opened the draw for the passage of a vessel when the passenger train was approaching and after the engine of the train had passed the stop signal. This signal was about one-third mile away from the bridge, and it appears that the bridge tender set it in the stop position immediately *after* the engine had passed it. The signal being so far away from the bridge, and there being no lock to prevent the attendant from moving the draw after the train had passed the signal, there was time to move the draw a few feet after the signal had been set and before the train reached the draw span. Though the train ran upon the partly opened draw and the engine sank in the river, all of the occupants of the train escaped without serious injury.

YEARLY TABLES.

This bulletin completes the publication of the accident records under the law of March 3, 1901, for five years, and the double column table (A) gives the aggregates for the year ending June 30, 1906, of the items which are given in Table No. 1 of the quarterly returns. The total number of casualties shown in Table A is 70,934 (4,225 killed and 66,709 injured). The totals of these yearly tables are not comparable with those given in the Commission's Annual Statistical Reports, as the monthly reports deal only with accidents to passengers and to employees while on duty.

TABLE A.—*Summary of Casualties to Persons, Year ending June 30, 1906.**

| | Persons carried under agreement, etc. | | | | Total. | | Trainmen. | | Trainmen in yards. | | Yard trainmen (switching crews). | | Other employees. | | Total employees. | | Total all persons. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Passengers. (*a* and *b1*). | | (*b*, *b1*, *b2*). | | (*a*, *b* and *bb*). | | | | | | | | | | | | | |
| | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. |
| Collisions | 89 | 3,596 | 31 | 409 | 120 | 4,005 | 331 | 2,348 | 53 | 669 | 43 | 429 | 57 | 463 | 484 | 3,909 | 604 | 7,914 |
| Derailments | 48 | 2,341 | 12 | 315 | 60 | 2,656 | 220 | 1,385 | 17 | 209 | 27 | 232 | 49 | 280 | 313 | 2,116 | 373 | 4,772 |
| Miscellaneous train accidents.† | 0 | 86 | 2 | 31 | 2 | 117 | 61 | 1,036 | 5 | 215 | 10 | 103 | 6 | 104 | 82 | 1,458 | 84 | 1,575 |
| Total train accidents | 137 | 6,023 | 45 | 755 | 182 | 6,778 | 612 | 4,769 | 75 | 1,093 | 80 | 764 | 112 | 857 | 879 | 7,483 | 1,061 | 14,261 |
| Coupling or uncoupling | ... | ... | ... | ... | ... | ... | 101 | 1,060 | 65 | 695 | 130 | 1,646 | 15 | 102 | 311 | 3,503 | 311 | 3,503 |
| Other work about trains or at switches | ... | ... | ... | ... | ... | ... | 75 | 7,303 | 42 | 2,871 | 55 | 2,735 | 96 | 2,945 | 268 | 15,854 | 268 | 15,854 |
| In contact with overhead bridges, etc. | 7 | 30 | 1 | 16 | 8 | 46 | 80 | 753 | 27 | 280 | 16 | 402 | 9 | 62 | 132 | 1,497 | 140 | 1,543 |
| Falling from cars or engines, or while getting on or off | 140 | 1,962 | 4 | 65 | 144 | 2,027 | 295 | 4,436 | 98 | 2,252 | 175 | 3,156 | 145 | 1,469 | 713 | 11,253 | 857 | 13,280 |
| Other causes | 66 | 2,118 | 18 | 216 | 84 | 2,334 | 197 | 591 | 93 | 394 | 119 | 363 | 1,095 | 14,586 | 1,504 | 15,934 | 1,588 | 18,268 |
| Total, other than train accidents. | 213 | 4,110 | 23 | 297 | 236 | 4,407 | 748 | 14,143 | 325 | 6,492 | 495 | 8,302 | 1,360 | 19,104 | 2,928 | 48,041 | 3,164 | 52,448 |
| Total, all classes | 350 | 10,133 | 68 | 1,052 | 418 | 11,185 | 1,360 | 18,912 | 400 | 7,585 | 575 | 9,066 | 1,472 | 19,961 | 3,807 | 55,524 | 4,225 | 66,709 |

*The passengers have been divided into three classes: Class *a* includes all ordinary passengers; Class *b* includes passengers traveling on freight trains; Class *bb* includes persons who are customarily carried on trains under special arrangements, such as postal clerks, and express messengers, employes on Pullman cars, newsboys, live stock tenders, and men in charge of freight.

†Including locomotive boiler explosions.

TABLE B. *Casualties for Three Years; Years ending June 30.*

| | 1906. | | 1905. | | 1904. | |
|---|---|---|---|---|---|---|
| | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. |
| Passengers: In train accidents | 182 | 6,778 | 350 | 6,498 | 270 | 4,345 |
| Other causes | 236 | 4,407 | 187 | 3,542 | 150 | 3,132 |
| Total passengers | 418 | 11,185 | 537 | 10,040 | 420 | 8,077 |
| Employees: In train accidents | 879 | 7,483 | 798 | 7,052 | 844 | 6,990 |
| In coupling accidents | 311 | 3,503 | 243 | 3,110 | 278 | 3,444 |
| Overhead obstructions, etc. | 132 | 1,497 | 92 | 1,185 | 116 | 1,210 |
| Falling from cars, etc. | 713 | 11,253 | 633 | 9,237 | 709 | 9,371 |
| Other causes | 1,772 | 31,788 | 1,495 | 24,842 | 1,429 | 22,254 |
| Total employees | 3,807 | 55,524 | 3,261 | 45,426 | 3,367 | 43,266 |
| Total, passgrs.-employees | 4,225 | 66,709 | 3,798 | 55,466 | 3,787 | 51,343 |

TABLE C.—*Collisions and Derailments for Two Years Ending June 30.*

| | 1906. | | | 1905. | | |
|---|---|---|---|---|---|---|
| | | Persons— | | | Persons— | |
| | No. | Killed. | Injured. | No. | Killed. | Injured. |
| Collisions: Rear | 1,722 | 169 | 2,427 | 1,493 | 152 | 2,085 |
| " Butting | 866 | 251 | 2,733 | 707 | 304 | 2,453 |
| " Trains separating | 901 | 9 | 375 | 972 | 11 | 369 |
| " Miscellaneous | 3,705 | 175 | 2,379 | 3,052 | 141 | 2,204 |
| Total collisions | 7,194 | 604 | 7,914 | 6,224 | 608 | 7,111 |
| Derailments due to: | | | | | | |
| Defects of roadway, etc. | 1,287 | 38 | 1,608 | 1,007 | 50 | 1,446 |
| Defects of equipment | 2,811 | 42 | 802 | 2,605 | 40 | 798 |
| Negligence, train or signal men, etc. | 391 | 54 | 494 | 341 | 40 | 418 |
| Unforeseen obstruction of track, etc | 300 | 76 | 456 | 332 | 177 | 646 |
| Malicious obstruction of track, etc.. | 65 | 16 | 94 | 76 | 34 | 196 |
| Miscellaneous causes | 1,407 | 147 | 1,318 | 1,010 | 115 | 1,334 |
| Total derailments | 6,261 | 373 | 4,772 | 5,371 | 456 | 4,838 |
| Total collisions and derailmts | 13,455 | 977 | 12,686 | 11,595 | 1,064 | 11,949 |

Damage to cars, engines and roadway: for 1906, collisions $5,319,758; derailments $5,339,431, total $10,659,189. For 1905, collisions $4,849,054, derailments $4,862,602, total $9,711,656.

*Marion, N. J., June 2.

## Drawbridge Floors and Locks.

In view of the recent drawbridge disaster and the discussion, in connection therewith, of bridge floors and the interlocking of bridges with the signals, the following notes concerning drawbridges in and near New York City may be found of interest.

The drawbridges of the Central of New Jersey have floors of 12-ft. ties for each track, laid 14 in. apart, center to center; and have outside guard timbers 5 in. x 8 in. laid 13 in. from the outside of the running rail on both sides of each track. Inside steel guard rails—of the same size as the running rails but a half-inch lower in consequence of not being set on tieplates—are laid the whole length of the bridge, the distance between these and the running rails being 8 in. between heads. At the approach end of the bridge the inside guard rails are bent so as to come to a point in the center of the track, the radius of the curve being 344 ft. An old No. 6 frog point, beveled for 1 ft., is used at the end, which is 40 ft. outside of the end of the draw. Miter joints are provided at the ends of draws and expansion joints, farther out, when necessary, to prevent creeping.

The most important drawbridge on this road near New York is that in the main line across Newark bay, where vessel movements are very frequent throughout the day and where there are two separate Scherzer lift bridges, each giving an 85-ft. opening. These bridges were described in the *Railroad Gazette* of Feb. 26, 1904.

These bridges, when down, are fastened at the end by hooks, and the hooks, as well as the locks in the rails of the track, are controlled by the interlocking in the signal cabin, which is electro-pneumatic. At these bridges the signal cabin is at the level of the tracks and is supported on brackets far enough to one side to give a view, in each direction, along the tracks, outside of the bridge trestles. The gasolene engines, which move the bridge, are in a house 25 ft. above the tracks, but the movement of the engines is controlled by the signal man below; and when he has closed the bridge and given clear signals for a train to proceed, the bridge engineer is powerless to move the bridge.

When a vessel is seen approaching, the first act of the signal man is to set "navigation signals" to indicate to the approaching vessel which of the two draws is to be opened for it. (This, however, does not give the vessel any authority to pass the bridge—this signal is given by the lifting of the draw, and the presence of the draw across the channel is the daylight "stop" signal.) The next move of the signal man is to set the signals against trains, though this is not dependent on the setting of the navigation signals. He then opens the derailing switches on the approach. Then he unlocks the facing-point locks in the tracks at the ends of the draw, and the bulkhead lock. Next he withdraws the hooks which fasten the outer end of the draw span and then releases the engine in the upper tower. Having done all this he signals the bridge engineer to raise the draw.

The drawbridges of the Delaware, Lackawanna & Western have no inside guard rails, but the rails of the track are locked down at the ends of the draw with a lock which, in principle, is like the common facing-point lock used on interlocked switches. A typical bridge of this company is that over the Passaic river at Newark, N. J., though it differs from most drawbridges in having tracks on two decks, the upper and the lower. The main tracks are on the upper level; and the lower level, which was the grade of the road before the recent elevation of the tracks, is occupied by a freight-yard track. This bridge consists of a single swing span 221 ft. long. The ties of the floor are 16 in. apart, center to center, and the outside guard timbers are 5 in. x 8 in. The rails of the track at the end of the draw which are lifted are 15 ft. long and extend beyond the end of the draw 1 ft. The miter joints at the ends are $7\frac{1}{2}$ in. long. The rail shoes, holding the movable rails in place, constitute a trough 3 in. high, being made of angles 3 in. x $3\frac{1}{2}$ in. The outer side of this trough flares out at the top, the angle iron being bent to a radius of 6 in.

The wedges at the ends of the bridge and the cranks which lift the rails are connected by gearing to a longitudinal shaft and are worked simultaneously by means of the engine which turns the bridge.

The interlocking of the bridge track with the signals which govern the passage of trains over the bridge, is entirely separate from the apparatus here described and, as already intimated, consists of a plunger which enters a hole in a tierod. The plunger must be in place in the rod before the signal man can move the levers by which he clears the signals to permit the passage of trains; and, on the other hand, he must have set the signals in both directions at "stop" before he can withdraw the plunger preparatory to opening the bridge.

The standard bridge floor of the New York Central is made of yellow pine ties 8 in. wide and 10 in. deep laid 12 in. apart, center to center, and of sufficient length to extend 6 ft. out from the center of the outside track, or 3 ft. 4 in. outside of the outside rail. The longitudinal guard timbers fixed on the outer ends of the ties are 8 in. wide and of a depth equal to the height of the rail. They are notched 1 in. down between the ties. They are bolted to every third tie and are chamfered one-half inch on the upper edges. On double track bridges there is a similar timber in the middle, covering the butt joints between the ties at that point. On four track deck bridges there is a guard timber at the inside of each of the outer tracks, and on through bridges these guards are provided for all the tracks.

In each track there are inside guards (steel rails), the space between these and the running rails being 8 in. between heads. The inside guard rails are bent so as to come to a point in the center of the track not less than 50 ft. beyond the bridge on the approach side. On deck bridges on four-track lines the inside guard rails are omitted on the two inner tracks.

The locking of drawbridges on the New York Central provides for interlocking between the rails of the tracks, in position, and the signals. The following is a description of the locking devices of the four-track swing drawbridge over the Harlem river at 135th street, New York City, five miles north of the Grand Central Station.

The device for raising the ends of the bridge is such that the bridge will be properly centered in raising the ends. The lift rails at the ends of the draw are mitred.

The road here is equipped with the controlled manual block system and the bridge is interlocked and protected by a mechanical interlocking plant having two machines, one at either end of the draw. These are interconnected by mechanical connections extending over the draw span.

The usual home and distant signals are provided with derails placed 300 ft. from the end of the draw span. The signals are bolt-locked with the derails so that the signals cannot be cleared unless the derails are properly set.

The lift rails at the ends of the draw have a switch point lock for each lift rail point, so that the levers in the tower cannot be moved to clear the signals unless all the rails are lowered into their proper position. In addition, the lever controlling the draw unlocking device, making possible the raising of the lift rails, is controlled by a lever in the interlocking machines, thus placing the control of the unlocking of the bridge in the hands of the signalmen operating the signals.

On the closing of the draw it is locked in position by the bridge tender through the operation of the steam locking devices. The bridge rails are simultaneously lowered into position. The signalmen in the towers at the ends of the draw lock the bridge lock lever in the engine room and then work the lever to lock the lift rails in their lowered position. The working of this interlocking lever locks the previously operated lock lever, in addition to the bridge lock, so that the lever cannot be moved. On the locking of the lift rails in position, the derails are closed, and the home and distant signals may then be cleared.

In addition to the regular home and distant signals, there is a "smash" signal on the approach side of the draw for each track. These signals are placed on the home signal post, about 10 ft. above the top of the rail, and project over the nearest rail so that the arm will be hit by a train passing the signal when it indicates "stop." If a smash signal is broken, it furnishes positive evidence that the home signal has been over run.

New interlocking is to be installed at this bridge, in connection with the electric automatic signals to be put in use when the line is equipped for electric propulsion of trains. This will be of the electric type, with home and distant signals motor-operated and controlled by track circuit, as well as by the levers of the interlocking machine. The derails and locks on the draw will be operated by motor-operated switch movements which have automatic locking devices to insure correspondence of the movement with the position of the controlling lever.

In addition to the locking of the starting lever of the bridge and also the lift rails, a circuit controller will be placed on each lift rail point, to break the circuit controlling the home signal. If the rails are not in place for the passage of trains, the circuit breaker will prevent the clearing of the signal, even though the interlocking connections might be maliciously tampered with and the home signal lever to be improperly reversed.

The management of the Bavarian State Railroads has called the attention of its subordinates who exercise authority over employees and laborers to the overbearing and insulting manner of exercising their authority which some of them, and especially those in the lower ranks, too often indulge in. The management desires the intercourse between those in authority and their subordinates to be conducted always in a friendly manner, even when strict orders and reproofs are necessary. Firmness and strict discipline should be exercised, but without unnecessarily wounding the feelings of the men, who should always be made to feel that they have the good will of the management.

## Anthracite Coal Storage.

The problem of storing anthracite coal through the dull season is an important one with the coal mining and carrying companies. The rush orders during the fall and winter tax the mines beyond their capacities and the falling off during the summer reverses conditions so that only the storage of enormous quantities of coal permits the continuous operation of the mines from one end of the year to the other. When trade is dull the coal goes to the piles, and when a rush of orders comes the piles are drawn upon to meet the demands. The location of a storage plant is governed by cost of the site, conformation of the ground for the trackage necessary to the switching and disposal of cars, accessibility of the mines, and tidewater and railroad shipping facilities.

Coal Storage Plant of the Lehigh Valley at Ransom, Pennsylvania.

Foot of Trimmer, Ransom Coal Storage Plant.

The Dodge system of storing anthracite usually consists of two stationary trimmers, which are conveyers supported by shear trusses, for piling the coal, and a conveyor working in a tunnel between the trimmings for transferring the coal back from the piles to the cars. A series of such groups constitutes the plant of the Philadelphia & Reading at Abrams, Pa., shown in the accompanying photograph. This plant has a capacity of 500,000 tons. A modification of this system has recently been installed by the Lehigh Valley at Ransom, Pa., in which a single trimmer does all the work. The lower end is supported on a truck traveling on a track of 10-ft. gage, and the upper end on a mono-rail runway which is carried on a structure supported by 16 steel columns 83 ft. high. The columns are built up of sections of $\frac{1}{2}$-in. boiler iron and are 30 in. in diameter in the middle, tapering to 24 in. at the bottom and 26 in. at the top; they are filled with concrete. The columns are mounted on ball-and-socket joints and are stayed from the tops by $1\frac{1}{4}$-in. steel cables on each side, those on the trimmer side being a few inches below the lower side of the trimmer to give it clearance. The runway is 902 ft. long and the storage floor is 1,244 ft. long. The floor has a slope of 2 per cent. to give proper drainage. The trimmer weighs 66 tons, and its span from the center of the runway to the center line of the track is 186 ft. The lower end is pivoted on a steel pin 4 in. in diameter, and the upper end is also suspended in such a way as to allow considerable flexibility, so that one end may gain as much as 20 ft. over the other in its trans-

Coal Storage Plant of the Philadelphia & Reading at Abrams, Pennsylvania.

verse movement across the floor of the yard. The motive power for this movement is furnished by a 50 h.p. motor, which can be seen in the photograph of the lower end of the trimmer. This takes its current from a third rail mounted on the side of the trestle in which are the receiving bins. The flight conveyor carried on the trimmer is operated by a 90 h.p. motor mounted at the upper end. For reloading there are two tunnels, a longitudinal one under the trimmer runway and a transverse tunnel from the middle of the runway on the side away from the trimmer. There are two reloaders, one on the trimmer side and one on the other, which move along longitudinal tracks and carry coal on conveyors from the edge of the pile to the longitudinal tunnel in which flight conveyors, one from each end of the yard, carry the coal to the center. Here it is discharged into chutes leading to a bucket conveyor running in the transverse tunnel by which the coal is carried to the edge of the pile and then elevated to the screen tower over the reloading tracks. The two sets of shaking screens have a capacity of 300 tons per hour; this process is so rapid that it is economical to store all sizes of coal indiscriminately instead of making separate piles of different sizes. The power house for supplying electricity for all this machinery can be seen at the right of the photograph taken of the plant when the installation was partially completed. The Dodge Coal Storage Company estimates that the cost of installing their standard system is $1 per ton of storage capacity, and the cost of handling the coal both ways from 4 to 6 cents per ton, but it is believed that in the Ransom plant described above these figures will be reduced.

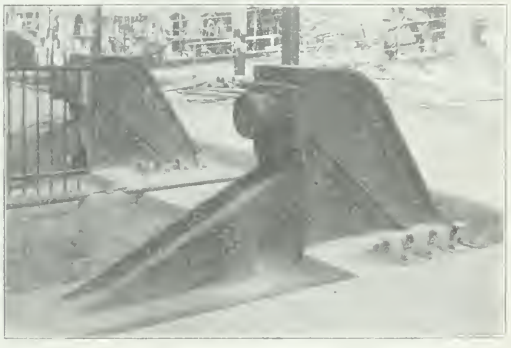
### New Bumping Post in the Lackawanna's Hoboken Terminal.

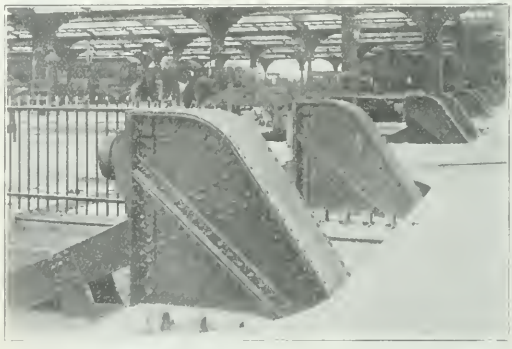
In the reconstruction of the Delaware, Lackawanna & Western passenger terminal at Hoboken a new bumping post has been used, which is illustrated herewith by photographs and drawings. It is built entirely of structural steel shapes and rests on a concrete bed to which it is securely anchored by 20 1¼-in. bolts. The bottom ties are 15-in. 55-lb. channels about 15 ft. 6 in. long bedded in concrete laid over the foundation. These provide a stable base, and the upright bracket which carries the rubber bumper block is strongly reinforced with stiffening angles in the direction of the resultant forces under impact. These bumping posts have not as yet been subjected to actual emergency tests, although they have been in place for some time, but it is believed that they will prove unquestionably efficient.

### Disastrous Collision near Woodville, Indiana.

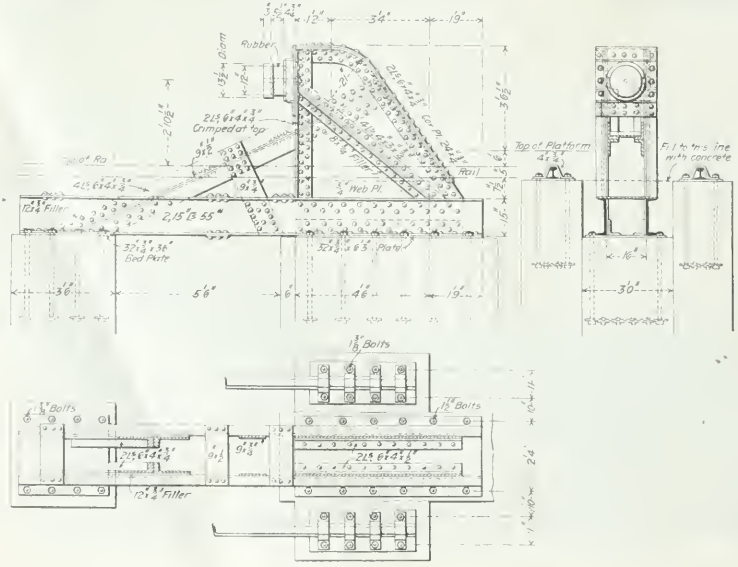
On the morning of November 12 in a butting collision between a westbound passenger train and an eastbound freight train, near Woodville, Ind., on the Baltimore & Ohio, about 50 miles east of Chicago, 47 passengers were killed in the wreck or were burnt to death, and 38 were injured. The wreck took fire at once and the bodies of 45 of the passengers were consumed or were burned beyond recognition. The passenger train was the second section of a regular train, and was occupied by 165 immigrants—Russians, Servians and Poles. The engines, six passenger cars and a dozen freight cars were completely wrecked, and a part of the wreck fell down a bank. Many of the injured passengers were saved from death by fire only by the desperate efforts of the trainmen and the uninjured passengers.

The freight train had received an order to wait at Babcock for the passenger train, but, according to the reports, the engineman believed or assumed that there was only one section of the passenger train, when there were two. He therefore started out after the passage of the first section, and soon met the second train, on a curve, running at full speed. Reports are confused as to whether the engineman had received an erroneous order or had misread a correct order, or was running by time table rules and was deceived by the absence of signals on the first section of the passenger train.





Front and Rear Views of Steel Bumping Post in Hoboken Terminal of the Delaware, Lackawanna & Western.




Steel Bumping Post; Hoboken Terminal, Delaware, Lackawanna & Western.

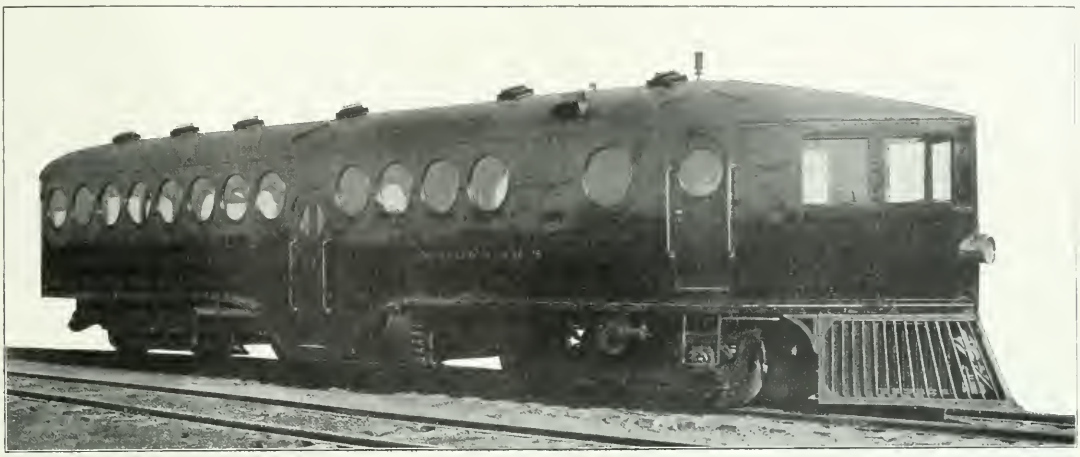
### Foreign Railroad Notes.

The Russian authorities have raised the railroad rates on flour and millstuffs 10 per cent. In 1903 the rates on flour were made the same as the grain rates, and this re-establishes a difference. The mills in the west of Russia have called for this change, which helps them to grind for the home and export market. Flour shipments to Finland and to Pacific ports are made at the old rates.

The new Minister of Public Works has issued some new rules affecting the employees of the Prussian State Railroads. Employees who are in debt must not in future be employed where they handle money, nor in storehouses. Generally, employees who have proved unfit for the places they occupy must be transferred after examination to places for which they are fit. Frequent changes are to be avoided, bearing in mind that in important positions practical and experienced employees are indispensable. In making transfers, the convenience of the employees must be regarded and ex[illegible] notice given them.

### Union Pacific Motor Car No. 8.

The accompanying photographs of the latest motor car built by the Union Pacific show that in general it is similar to motor car No. 7, illustrated in the *Railroad Gazette* of June 15, 1906. The round windows, which were also a feature of the previous car, have two advantages—they have rubber gasket seats, making them dust and waterproof, and also their use allows stronger construction in the body of the car than when rectangular windows are used. Each side of the car, in fact, consists of two plate girders, resting at the outer ends on the body bolsters and on the inner ends on needle beams at each side of the entrance door. The engine, which has six 10-in. x 12-in. cylinders, can develop 230 h.p. and is much the same as that of car No. 7, except that steel gears are used instead of bronze. The engine drives direct on the axle on the high speed, but it is best to start the engine on a low speed



Union Pacific Motor Car No. 8.

Interior View, Looking from Front of Car; Union Pacific Motor Car No. 8.

through the gears. The car weighs 61,000 lbs. as compared with 58,000 lbs. for No. 7, but it is stated that the weight of subsequent cars can be easily reduced to 55,000 lbs.

## Unit Costs of Railroad Building.*

III. BALLAST.

The first two articles of this series gave costs per mile for completed lines in the eastern states and in the southwest. The following data gives the quantities and cost of broken stone ballast per mile for a single-track, double-track and four-track line in the East.

The total cost of one cubic yard of ballast in track is 75.4 cents, made up of the following items:

| | |
|---|---|
| 1 cu. yd. ballast at Rockland Lake | $0.5750 |
| Floatage from Rockland Lake | .0862 |
| Distribution by train | .0346 |
| Labor, putting in track | .0582 |
| Total | $0.7540 |

This does not include the cost of preparing the track for the ballast, forking over the old ballast and removing the dirt, lifting the track, removing the ties and placing new ties, ready to spread ballast which is handled with Roger cars and ballast plow.

In reballasting a track, there is, of course, a considerable portion of the original ballast which will be used over again, and the cost of forking over the old ballast, lifting the track, removing and replacing ties ready for the new ballast is from 18 to 22 cents per tie, which, assuming the cost as 20 cents per tie, will amount to $562.20 per mile of single-track. A standard cross section provides for the following amounts of ballast per mile:

| | |
|---|---|
| Single track | 2,323 cu. yds. |
| Double track | 4,910 " " |
| Four track | 10,085 " " |

The following figures, showing the cost per mile, using the above costs of ballast and adding thereto the labor item of $563.20 per mile of track for preparing track for ballasting, will approximate closely to the actual cost of ballast now in track. It is understood, however, that the full cross section was not put in at one time, but has been done at various times and that in many places there is more stone than required. Assuming the cross section to be standard, the cost is as follows:

| | Cu. yds., per mile. | Cost at $0.754 per cu.yd. | Add for labor. | Total per mile. | Per cu. yd. |
|---|---|---|---|---|---|
| Single track | 2,323 | $1,751.54 | * $563.20 | $2,314.74 | $0.9964 |
| Double track | 4,910 | 3,702.14 | 1,126.40 | 4,828.54 | .9813 |
| Four track | 10,085 | 7,604.90 | 2,252.80 | 9,856.89 | .9774 |

To ballast a new track according to standard cross section about 15 cents per cubic yard should be added to the cost of ballast ($0.754) to cover cost of lifting track, tamping, surfacing, etc., making a cost per cubic yard of $0.904. Using this price, we obtain the following costs:

| | Cu. yds. per mile. | Cost, per cu. yd. | Cost per mile. |
|---|---|---|---|
| Single track | 2,323 | $0.904 | $2,099.99 |
| Double track | 4,910 | .904 | 4,438.64 |
| Four track | 10,085 | .904 | 9,116.84 |

The above figures are applicable to tracks carrying the heaviest traffic.

*Previous articles in this series appeared in the *Railroad Gazette*, Sept. 7 and Oct. 26, 1906.

## The Beginnings of Unit Statistics.

BY WILLIAM MAHL.*

The history of "statistical units" for which you ask is a subject of particular interest to me. It has engaged my time and thought from the spring of 1860, when I entered the railroad service, to the present day. In the early days of railroad management, when the locomotives and cars of a company did not get off its own rails, and when the expenses were much more simple in their character than in later days, there existed a desire to know something of the cost of the work done, particularly with reference to the "cost of carrying passengers and freight." This desire was in a large measure due to the fact that the managing officers of the railroads in those days either were the engineers under whose charge the roads were built, or had by reason of their education as civil engineers been selected to manage them. The desire for inquiries in regard to cost, natural to minds trained in engineering, prompted inquiries into the relative cost of passenger and of freight service in the early '60s. The annual report of the Louisville & Frankfort and Lexington & Frankfort Railroad Companies (both now part of the Louisville & Nashville), of which Col. Samuel Gill, a graduate of West Point, was Superintendent, for the year ending June 30, 1865, contained the following closing paragraph:

"Allow me to refer you for a very full detail of the year's operations to the various statistical and other tables of the General Ticket and Freight Agent, and of Mr. Mahl, Chief Clerk in the Mechanical and Road Departments. Through Mr. Mahl's assistance we have more thoroughly systematized our accounts, and have distributed, under the head of Freight and Passengers, all expense accounts. We are thus enabled to arrive at the cost of carrying per mile a passenger and ton of freight. The circumstances under which the road has been operated for the last year lessen the value somewhat of the tables, but if continued for a series of years, they will become valuable in arranging your tariff of Freight and Passengers, and in determining the relative economy of operation of these and other roads."

Standard Four-Track Ballasting.

It was my good fortune to be associated with Col. Gill for 16 years, and during that period the annual reports of those companies contained units and interesting data on cost under the then existing conditions. Some of the conditions have since passed away, but for such as still exist the units then observed are in use to-day.

The financial panic of 1873, which extended over a period of

*William Mahl, as is well-known to most readers of the *Railroad Gazette*, is Comptroller of the Southern Pacific, Union Pacific, Oregon Railroad & Navigation Company, Oregon Short Line, Leavenworth, Kansas & Western, and Chicago & Alton—a total of some 12,600 miles of railroads. He was born in Germany in 1843, and began railroad work in 1860, as an apprentice in the Louisville & Nashville shops. Here he was successively draftsman and chief clerk of the mechanical department. In June, 1864, he turned to the department which he was to distinguish, becoming Auditor, and later, Purchasing Agent of the Louisville, Cincinnati & Lexington, now part of the Louisville & Nashville. Thence he went to Texas in 1872 as Auditor and Purchasing Agent of the Texas Pacific. The road was hard hit by the financial panic of 1873, and Mr. Mahl became also the financial agent of the company. In 1874 he returned to his old post on the Louisville, Cincinnati & Lexington, and in 1880 was made General Superintendent of that road. In 1882 he became associated with Collis P. Huntington, and, up to the time of Mr. Huntington's death in 1900, occupied various administrative, financial and accounting positions on the roads which he controlled: The Chesapeake & Ohio; Elizabethtown, Lexington & Big Sandy; Scioto Valley; Kentucky Central; Chesapeake, Ohio & Southwestern; Louisville, New Orleans & Texas; Southern Pacific Company; Mexican International, and Guatemala Central. In 1891, Mr. Mahl became Comptroller of the Southern Pacific and since that time of the other roads mentioned. As head of the accounting department of the Harriman Lines, he has had no small share in bringing about the wonderful results achieved during the past ten years. More than this, by his admirable system of reports, which have made the annual statements of the Union Pacific and Southern Pacific models for all other roads, he has broadened and raised the science and art of railroad accounting. His success in his profession is only equalled by his delightful personality as a man.

six years, enforced economies over the entire country and caused further inquiries into the cost of transportation, and the discussion of units on which these costs should be based or ascertained. The most prominent writer of that period on this subject was Mr. Albert Fink, Vice-President and General Manager of the Louisville & Nashville. The results of his investigations and deductions are published in the 1875 annual reports of that company. Mr. Fink's statement of cost, however, included interest on capital invested, and was, I believe, primarily prepared to meet the then existing clamor for lower rates. The entire subject, however, was dealt with thoroughly by Mr. Fink and his publications bearing on this matter are a part of the railroad classics of this country.

This question of cost and units was also dealt with during that period in an annual report of the Plant System, of which Mr. H. S. Haines was Vice-President, but not to the extent on which it was dealt with by Mr. Fink.

About the year 1878 I became much interested in a scheme of units put into effect by Col. T. M. R. Talcott, then Vice-President and General Manager of the Richmond & Danville. I had formed Col. Talcott's acquaintance about 10 years before, and a common interest in these questions had kept us in touch with each other. I was particularly impressed with Col. Talcott's grouping of the operating expenses under headings which express the controlling factor of the expenses. These groupings are as follows:

FIXED EXPENSES.—Unit—Per mile of main track. Expenses for administration and for maintenance of roadway and structures, which are in the main fixed, such as the general staff, the maintenance of the roadbed, buildings and expenses for maintenance which are in the main affected by the elements and natural decay, and not by the volume of traffic handled.

TERMINAL EXPENSES. Unit Per ton of freight and per passenger carried. Expenses for switching, station and terminal service, and all expenses incident to the receiving and delivery of freight and passengers, direct or accessorial.

TRAIN MILEAGE EXPENSES.—Unit Per locomotive mile in traffic service. Expenses of trainmen, enginemen, casualties and all expenses incident to the running of locomotives.

CAR MILEAGE EXPENSES. Unit—Per car mile run in traffic service. Expenses incident to the maintenance and running of cars.

GROSS TONNAGE EXPENSES.—Unit—Per gross ton moved. Cost of fuel and water for locomotives, renewal of rails, frogs, switches and all other expenses for maintenance of way which are affected by the weight passing over the rails.

The allotment of the expenses between passenger and freight service was to me of secondary importance only. The cost per ton-mile or per passenger mile expresses only the net result of the expenditures under one or the other grouping, rising or falling with the increase or decrease in such expenditures along such lines of allotment between passenger or freight service as may be in effect for the time.

A careful study of Col. Talcott's principle of grouping convinced me that it was a most excellent arrangement for the control of expenses, and I adopted them and continued to use them wherever I was intrusted with the supervision of earnings and expenses directly or indirectly. It was of signal service to me during the 20 years I was with the late Mr. C. P. Huntington, where my duties were principally to "see what had become of the earnings," as he used to express it.

The direct application of these units, as well as allotment to passenger and freight service, was put into effect on the following properties in the fiscal years indicated: Louisville, Cincinnati & Lexington Railway, 1879, 1880 and 1881; Mr. Huntington's Newport News & Mississippi Valley lines, 1887; Mr. Huntington's Mexican International Railroad, 1896.

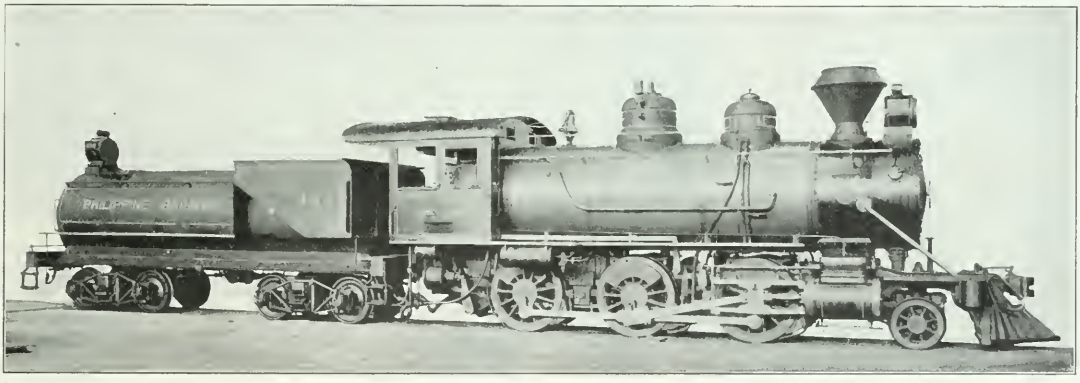
The expenses of the Southern Pacific Company's lines were dealt with similarly up to the year of Mr. Huntington's death, in August, 1900, but with my transfer to other fields of work my inquiries into these matters ceased.

I have written to you on this subject altogether from the standpoint of the officer immediately responsible or charged with the supervision of the expenses, i.e., the cost of service. The units for the general and for the financial public needs are simpler and have been amply provided for in the classification prescribed for the annual reports to the Interstate Commerce Commission. The system of units suggested by Col. Talbott will take care of itself, as will the units of cost per passenger and per ton per mile, as the expenses are controlled by those responsible for them.

It has been no little pleasure to me that interest should at this time be again manifested in a subject which was discussed nearly a generation ago by men of whom the greater part have since passed away. Then it was prompted by economies forced on railroad managers. Now it seems to be prompted by a demand for generally established and accepted units, by which the expenses of railroads, which have now reached enormous sums, can be measured so as to be readily grasped by those who are responsible for them.

## Mogul Locomotives for the Philippine Railway.

J. G. White & Co., New York, have recently received from the Baldwin Locomotive Works and shipped for the use of the Philippine Railway now being built by them on the islands of Panay, Negros and Cebu, four mogul (2-6-0) locomotives which are to be used for mixed passenger and freight service. They are built for 3-ft. 6-in. gage and have cylinders 17 in. in diameter by 24 in. stroke, with driving wheels 50 in. in diameter. The leading truck wheels are 28 in. in diameter, steel tired, and carry a load of 14,000 lbs.



Mogul (2-6-0) Locomotive Built for the Philippine Railway by the Baldwin Locomotive Works.

The weight on drivers, engine empty, is 84,000 lbs., and the total weight in working order is 102,000 lbs. The tractive force is about 21,000 lbs., giving a ratio of adhesion of about 4.

The boiler is of the straight top radial stayed type with a barrel 62 in. in diameter and a firebox 96 in. long x 30 in. wide. There are 220 tubes 2 in. in diameter and 10 ft. 6 in. long, which, with the firebox surface, gives a total heating surface of 1,322 sq. ft. The ratio of heating surface to grate area is about 69.

The grate and stack are arranged to burn native lignite coal, which is found in large quantities in the Philippine Islands. A sample of coal taken from the Caridad mine, on the island of Cebu, gave the following proportions: Fixed carbon, 54 per cent.; volatile matter, 35 per cent.; moisture, 9 per cent.; ash, 2 per cent. The stack used for this fuel is a modification of the old diamond stack, which has been used successfully with the lignites west of the Missouri river. The Philippine lignite, however, is of a superior grade, with a large proportion of fixed carbon. Ordinarily, lignites possess less than 50 per cent. of fixed carbon, and this coal might almost be classed as low grade of bituminous. The stacks are similar to the design illustrated in the *Railroad Gazette*, January 20, 1905. An efficient spark arrester is necessary because of the numerous villages en route, composed of native huts having highly inflammable nipa roofs.

The valves are of the Richardson balanced type and are operated by the regular Stephenson link motion. The cab is of steel, but is lined on the sides and roof, and has ventilators in front, sides and roof, as well as a liberal arrangement of doors and windows to adapt it to the warmer climate.

The tender is of the Vanderbilt cylindrical type and has a water capacity of 4,000 gallons; the coal space will carry about eight tons of coal. The frame is made of steel and is carried on chilled cast-iron wheels 33 in. in diameter, the axles being of hammered steel.

The engine and tender are fitted with Westinghouse air-brakes

and with M. C. B. automatic couplers 34 in. from top of rail to center of coupler. The engine and tender are arranged to work on curves of from 15 to 20 deg.

It is estimated that the engines will be able to haul a gross load of 450 to 550 tons up a straight grade of 1½ per cent.

## The Zambesi River Bridge.

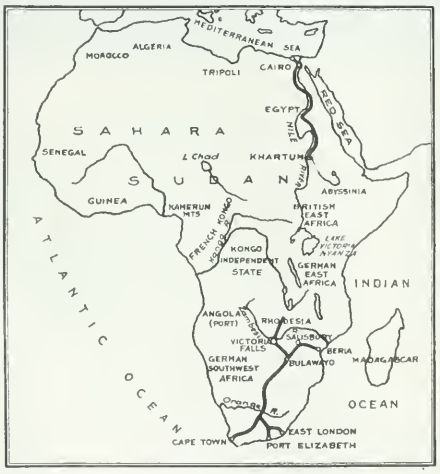
A brief description of the bridge over the Zambesi river at Victoria Falls was published in the *Railroad Gazette* of June 16, 1905. This bridge has now been opened and adds another link to the much discussed Cape-to-Cairo Railway. The structure is interesting, not only as an engineering achievement but also for its location, standing as it does in the heart of what was a few years ago an unknown land. The Zambesi river, after flowing quietly for 750 or 800 miles over the high granite table lands of Central Africa, reaches Victoria Falls, discovered by Livingston in 1885, in latitude 17 deg. 55 min. south and longitude 25 deg. 50 min. east. Here the river forms the boundary between the northwestern and the southern provinces of Rhodesia that make up a portion of the territory ceded to the British South Africa Company.

Above the falls, as shown on the map, the river forms a large lake more than a mile and a quarter broad but narrowing to a trifle more than a mile at the falls, where the water drops about 420 ft. into a confined gulf that extends the whole length of the falls but is not more than 295 ft. wide. Directly in front of the falls is a perpendicular bank, so that the water is in greater turmoil than is usual at the foot of a falls, and the mist is so dense that the water seems to disappear into a bottomless abyss. The outlet of this gulf is a deep gorge about 325 ft. wide at the eastern end of the falls, and through this narrow fissure the water tumbles on towards the Indian ocean, raising a cloud of mist that is said to mount to a height of nearly 1,200 ft., or fully 750 ft. above the top of the banks. This cloud of mist is so high and dense that it can at times be seen 40 miles away. The mist falls again in the form of rain and moistens the ground down to the viaduct, which is about 2,000 ft. below the falls. This produces a luxuriant local vegetation that sets out the banks in striking contrast to the barren soil of the surrounding country. The gorge, with an average depth of 425 ft., stretches on toward the Indian ocean for about 45 miles. At some points it is not more than 165 ft. wide, and it is very crooked.

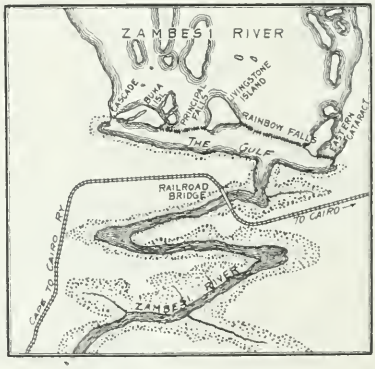
The Victoria Falls of the Zambesi are in every respect the largest in the world; they are 50 per cent. longer than Niagara, which is less than 4,000 ft. long, and they are two and a half times as high. About 2,000 ft. below the falls the Rhodesia Railway recently built across the gorge a steel bridge as a link in the Cape-to-Cairo Railway. Across this bridge rail connection is made direct to the rich copper mines of Broken Hills, 365 miles north of this point and 1,730 miles from the Cape. On the north, rail connection has been made with Khartum, 1,335 miles, whence the route will be by way of the Nile and Lakes Albert Nyanza and Tanganyaka. The bridge just built is, as shown in the accompanying drawing, a parabolic arch with hinged skew backs at the abutments and with both vertical and diagonal braces to carry the upper chord. The arch has a clear span of 500 ft. and a rise of 90 ft., or one in five and a half. The center span is connected to the banks by two shore spans of 87.5 ft. and 62.5 ft. on the south and north sides respectively, so that the total length of the viaduct is 650 ft. The depth of the arch span at the center is 15 ft. The width of the bridge is 53½ ft. and the top of rails are 100 ft. above the water. The structure is designed to carry two tracks, but only one has yet been laid. The abutments are concrete, set 295 ft. above the river in basaltic rock. The total weight of metal in the viaduct is about 1,650 gross tons. In many respects this bridge resembles that of the Grand Trunk at Niagara Falls; the span of the latter is, however, about 50 ft. longer. The photographs show views of the structure when partly built and when ready for the rails. The erection of such a bridge in such a place was naturally a task requiring great skill and care. Work was carried on from both sides at once. To sustain these two half spans without falsework, while being erected and up to the

Erection of Zambesi River Bridge.

Side Elevation and Cross Section, Zambesi River Bridge.




Cape-to-Cairo Railway.




Victoria Falls of the Zambesi River.

moment of the closing of the arch, they were held by steel cables, firmly anchored in solid rock. At the time of the closing of the arch the stress on these cables for each half span was about 800 tons; so the greatest precautions had to be taken to insure the solidity of this temporary anchorage, which was removed as soon as the two ends were brought together. This method of simultaneous construction from both banks necessitated carrying all the parts for the northern half of the span across the gorge. This preliminary and delicate work was done on a cable stretched across the gorge in the plane of the viaduct itself, and extending from steel towers erected on either bank set 870 ft. apart. An electric telpher, weighing five tons and of ten tons capacity, was run on this cable and used to carry the structural material across. This cable was also used for carrying over everything needed in the building

Zambesi River Bridge; Completed Span.

of the extension of the road to the north, so that this section might be opened as soon as the viaduct was finished. The 2,000 tons of bridge material, and accessories, were all brought from England.

## Mr. Hill on Railroad Expansion and Reciprocity With Canada.

Mr. James J. Hill, President of the Great Northern, delivered an address at the annual dinner of the Merchants' Club of Chicago, November 10, on the subject, "Canada and Reciprocity." He also said some things regarding the present congestion of traffic and the serious transportation problems of the future foreshadowed by the present situation that were not in his prepared address and in the course of which he expressed himself in strong terms regarding the present trend toward government restriction of railroad management. The text of these remarks was an editorial which had appeared in the *Chicago Tribune*, showing the relative increase in 10 years in the country's railroad mileage, number of cars and locomotives, and the ton-miles of freight traffic, based on the reports of the Interstate Commerce Commission. The editorial quotes Mr. Hill as saying:

"I have noticed that from 1895 to 1905—ten years—the growth in ton-mileage was 110 per cent. The growth in the mileage of railroads to handle that traffic was 20 per cent. There's where you stand to-day—you can see it in that brief comparison. There's where the whole country stands. The traffic of the country is congested beyond imagination. The commerce of the country is paralyzed, and, continued, it means slow death.

"More cars? Yes, we need more cars, but we need also cars of greater capacity, heavier trains, and more miles of railroad to haul them over. In ten years the railroads of the country expanded 20 per cent. for the handling of a business that increased 110 per cent. Suppose you are able in the near future to increase that expansion 50 per cent.? That will still leave 40 per cent. a year of the business without any facilities for taking care of it.

"It is estimated that from 115,000 to 120,000 miles of track must be built at once to take care of this immense business. But to build that amount will cost as much as the civil war cost, at least. It will cost from $4,000,000,000 to $5,000,000,000. A thousand millions of dollars a year for five years will scarcely suffice. Why, there is not money enough nor rails enough in all the world to do this thing. And if the rails were piled up ready for the undertaking, and if the money were in bank to-day, it would be impossible to get the labor with which to do it.

"I tell you there is no question since the civil war of half the consequence of this one. Why, you can't go out and contract with any railroad in this country to move 500 cars of freight from here to New York in 30 days. And the railroad could not deliver if it should contract to do it.

"The great cry is that there are not cars enough. The trouble is that you can't put cars on the track and get half the movement out of them that you could 10 years ago. Statistics show that freight cars running from 12 to 15 miles an hour average a movement of 25 miles in 24 hours. Think of it, only two hours a day in operation. Is there any business in the world that can sustain itself when its equipment is in use only one-twelfth of the time?

"There is not money enough available to bring relief to this situation under the conditions existing. You may be able to see a way out, but I can't. Are men going to invest their money in railroads as long as railroads are considered outlaws? The fact is, the railroad has not been getting justice in this country. Why, in the recent campaign we beheld the spectacle of two great political parties preaching the doctrine of the operation of the railroads by the Government. The Federal Government is to run the main lines—they're the only ones that make any money nowadays—and the private investors can have the branch lines, there being no profit in them. Is that the way to get men to put more money into the country's railroads? Is this the way to get more railroad mileage so that the country's freight can be moved? It is time to call a halt in this treatment of the railroad. Why, I challenge you to point out a road that has not failed at some point in its career. Most of them have been organized, have had their capital wiped out, and have gone into the hands of receivers. It's been a fad, and a costly fad, to build railroads."

### CANADA AND RECIPROCITY.

Mr. Hill's address on Canadian commerce and reciprocity, in which he advocated the establishment of reciprocal trade relations with that government as soon as possible, was in large part as follows:

"By the middle of the present century this country will have a population of more than 200,000,000. . . . There is no more important work for the general government than the early construction of a canal from St. Louis to New Orleans, with a depth of at least 15 ft. There is a crying need for such a canal now, and, bearing in mind what has been said about the general widespread want of railroad transportation, the sooner the work is commenced the better for the country. . . .

"Let us drop political theories and all the prejudices and preconceptions trailing after them, and look at this situation as a plain business problem. North of us lies a country of enormous possibilities for development, inhabited by between 5,000,000 and 6,000,000 people. It has 19,000 miles of railroads, with several other great projects actually under way. It has a foreign trade of only a little short of $500,000,000 a year. Its capital invested in manufactures is over $400,000,000, and the value of the annual product is $480,000,000. Its people have deposited in their savings banks $82,000,000.

"It has achieved this growth without outside aid, exactly as the United States has grown, by virtue of its inheritance of fertile land, rich mines, and noble forests, and by the industry and integrity of its people. And it is only at the beginning of its development. Its unworked resources are immense. There is land enough in Canada, if thoroughly tilled, to feed every mouth in Europe. There are more than 250,000 square miles in each of two northwest provinces, and there are 250,000,000 acres of timbered lands in the Dominion. This is a neighbor to be taken note of.

"We come now to the plain question, amazingly simple when severed from politics, why this country and our own should not be commercially as one. We have seen what the great central valley of this country is to the nation. Fancy it possible to have that most precious national possession in some way duplicated. How the national imagination would exult in the addition to our business and in the new prosperity to come from the new heritage.

"Yet that is substantially what unhampered trade relations with Canada would mean. The certain fate and fortune of this adjoining country, so similar in physical characteristics, so identical in language, customs, and usages of trade, is to be developed by a series of common agencies working in uniformity. It may require years; you or others may reap the harvest of gain. But there is an integrity, as it may be called, a oneness and a plan in American material development as indivisible as the surface of the land reaching as far north as the limit of human settlement. The same natural conditions that fixed Chicago here and fostered its amazing growth are at work, in other ways, to dictate American commercial unity. It may be postponed to the certain loss of both parties. It cannot be ultimately defeated. . . .

"Hold political considerations aside, consult the interest of the whole community, and determine this matter of business by business principles. The conclusive argument for reciprocity with Canada always has been and must be the experience of the several American states. Had it not been prohibited by the constitution, each state of the union would speedily have levied a duty on all commerce crossing its boundary. Even with the enlightenment of our own past behind us it is most probable that if this prohibition were removed, not many years would pass without some such restrictive legislation by certain of the states. Yet all acknowledge at this moment that one great factor in the development of the United States and its wonderful progress has been the commercial elimination of state lines. Unrestricted trade between the states has favored all of them.

"Now, whether this argument does or does not apply to our relations with European countries, different in history, in trade customs, and in material circumstances, it does apply to our northern neighbor, so nearly allied to us in natural conditions and in mode of growth. Canada is merely a portion of our

own western country, cut off from us by the accident of original occupation and subsequent diplomatic agreement. . . . The Dominion will, in any event and under any system, be opened up and highly developed. With its vacant spaces occupied and all its industries humming at the demand of new population, why should not its business and ours be transacted by agencies that work with the highest efficiency and at the lowest cost?

"Already demand and supply have forced a relaxation of tariff rivalries, which permits the wheat of Canada to be brought into the United States, milled in bond, and the flour exported without payment of duty. Wherein could any farmer suffer by the completer opening of a market already thus extended, since the price of this grain in any event is fixed by the surplus for export and the quotations of foreign markets? In 10 or 15 years, according to present indications, the United States will need every bushel of its wheat product at home. Would it then be disadvantageous for us to share in the products of the fields of Manitoba, Alberta, and Saskatchewan?

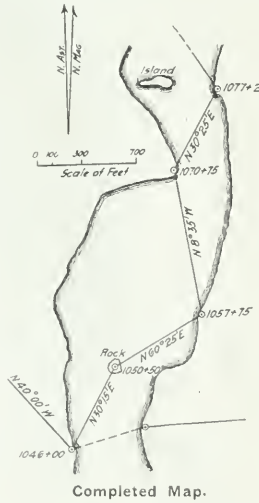
"Canada has already one transcontinental railroad system. Others will soon be added. It has a system of waterways which is justly its pride. On this it has spent nearly $100,000,000. The St. Lawrence system of canals furnishes 43 miles of artificial channel to reinforce river and lake. The Welland Canal completes the chain. The most ambitious project, and one in which every lake city has a stake, is the proposed canal from Lake Huron to the St. Lawrence River direct. Engineers have examined the scheme and pronounced it feasible. This ship canal would extend from Georgian Bay by way of Lake Nipissing and the Mattawa and Ottawa rivers, reducing the distance from Georgian Bay to Montreal to 430 miles. This is nearly 300 miles less than the present route by way of Lake Erie and the St. Lawrence River. . . .

"Canada no longer comes as a suppliant. There has been increasing irritation toward our attitude, and already the fact that our average tariff on dutiable articles coming from the Dominion to us is 49.83 per cent., while that levied by Canada on dutiable goods coming from the United States is 24.83 per cent., causes comment and suggests reprisals. The beginning of all reform or progress in public policies in a republic is the creation of an intelligent public opinion. To this work the friends of reciprocity in the United States should address themselves. Already the people of New England are clamoring for a more generous trade relation. Along the whole tier of States adjoining the Canadian boundary, covering precisely the territory where reciprocity would be most bitterly opposed if this country had aught to fear, it is in popular favor. The lack now is of intelligent leadership, of a strong centre of agitation, of a community powerful enough to make itself heard and felt."

## Traversing Lakes and Rivers With the Stadia.

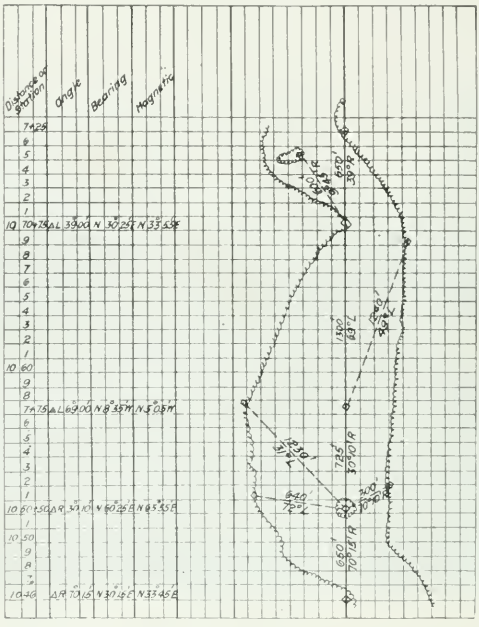
BY J. A. MACDONALD, C. E.

In our work on the surveys for the National Transcontinental Railway, the eastern end of the Grand Trunk Pacific, there has been a great deal of stadia work to do, mostly in the transversing of lakes. In the country through which the road goes few white men have ever trod, since it lies over a 100 miles north of the Canadian Pacific, in the wilds of northern Ontario, an unexplored territory. In this country no geographer has ever taken notes, so that besides mapping the route of the projected railroad a map of the country adjacent had also to be made. This made the topography work extensive. The country is a continual chain of lakes, which, however, is an advantage in that portages are usually short, and as all packing and moving of camp effects and provisions has to be done by human packers the existence of frequent bodies of water makes it possible to use canoes most of the time and saves much carrying on men's shoulders. Few of the portages through the country are more than a mile long, and many of them much less. These portages are usually between small lakes, not more than six or eight miles long, and some less than a mile long.



Completed Map.

In passing through this country with the survey we usually followed up those lakes which we passed to their heads, making a traverse with the stadia. This work could be done very rapidly, often making eight or ten miles a day. In this way the lakes, rivers, etc., could be mapped as well as the adjacent country for many miles on each side of the line. Also, in tying on to the next party we often used the stadia, by traversing up a lake and following its outlet to the next lake, and so on until we struck the other party's line. In this stadia work an ordinary 14-ft. leveling rod was used. By taking half the distance between the stadia hairs, that is, the distance between the middle hair and the one adjacent, it was possible to read 2,800 ft. at one shot. In some cases by placing the rod on a high stump of a tree and measuring from the top of the rod downwards on the stump, we took sights 4,500 ft. distant. By a little ingenuity, and using a bright target, it is possible to take very long sights. I have seen sights over a mile taken on the water, though 4,500 ft. was the longest sight taken by the writer. In all cases we read the rod from the top, using half the stadia hair, except for short distances of from 300 to 700 ft., when the whole distance between the stadia hairs was used. For a target we used, in most cases, a field book, bound in brown leather. Sometimes to brighten it, the rodman wrapped a white handkerchief around the book so that it could be seen by the transitman more clearly.



Specimen Page from Field Note Book.

The method of traversing a lake is shown by the accompanying drawings. The first shows the notes in the field book, taken at the time, and also the rough sketch; and the second shows the completed plan of a lake, on the usual scale, as placed on the map, with bearings, stations, etc., marked thereon. Two canoes were always required, one for the rodman, picketman and two axemen, and the other for the transitman, stakeman and one or two canoe men. Starting on the railroad line at the bank of the lake, station 1,046, a backsight is taken, and the angle turned, in this case, to the picket held on the rock, at station 1,050 + 50, the angle being read which, in this case, was right, 70 deg. 15 min. This was marked in the proper place in the field book. Next the rod was held on the hub and the distance, 650 ft., read, which was also marked on the red line, as shown, on the right-hand page of the field book, and afterwards placed in the proper column on the left-hand page, as shown. This, of course, could not usually be obtained, except for short distances, until the transit party came up in the canoe to the rod party, which, here, was on the rock. Before the transitman left his station, or while going from one station to the other, a sketch was made on the page of the field book, which being ruled into squares of 100 ft., made it a simple matter to draw fairly well to scale. In drawing the sketch the center red line of the field book is supposed to be the line run, no matter how many angles are made. On reaching the rock and getting the rod reading from the targetman, the rod party proceeds to the next station, affording a good sight, which, here, was on the opposite side of the lake, station 1,057 + 75. The transit man, after taking his backsight and tilting the telescope forward, gets the deflection angle of this new station in the same way as the first, and, similarly, the rod-reading. Several side shots had to be taken here, so the rod party proceeds to two different points on the left bank of the lake, and no one point on the right bank; the readings and angles of these are taken with the rod alone, no hub being considered necessary at those side points, and can, therefore, be thus taken more rapidly. A back picket having been driven the transit party proceeds to the hub just driven at station 1,057 + 75, and sets up, while the rod party proceeds to the next

favorable point, 1,300 ft. away, to station 1,070 + 75. A side shot to the right, 1,240 ft., is also here taken, and so the work proceeds. While the transitman is going from one station to the other, in the canoe, he has time to make the sketch. With some experience in this work one can tell distance on water very accurately. He will note the points, coves, small islands, rocks, etc., and place them in the proper place in his sketch, and the sketch being drawn on the same scale as the general map, viz., 400 ft. to 1 in., can be taken off the field book without much trouble. From station 1,070 + 75 a side shot was taken on the small island shown so as to properly locate it. These side shots are, of course, not shown on the map. They are necessary only for making an accurate sketch and map. The transitman, while waiting, has also usually time to calculate his bearings. The railroad line, at the starting point, had a bearing of N. 40 deg. 00 min. W., or S. 40 deg. 00 min. E., as you like. The angle turned was R. 70 deg. 15 min., which made the bearing of the first stadia station N. 30 deg. 15 min. E. Proceeding, the next angle turned was R. 30 deg. 10 min., which made the bearing of the next station N. 60 deg. 25 min. E., and so on. In the sketch, from actual practice shown, the magnetic variation of the needle was 3 deg. 30 min. east of astronomical, which made the magnetic bearing of the first course N. 33 deg. 45 min. E., as shown in the proper column in the field book.

## The Eastern Bolivian Railroad.

An engineer attaché of the German Minister in Buenos Ayres reports the conclusion of a contract between the government of Bolivia and an Argentine corporation for building the Eastern Bolivian Railroad, which will give Bolivia an outlet to the Atlantic. By far the larger part of its territory lies on the eastern side of the Cordilleras and is a tropical wilderness. Most of it is drained by the upper tributaries of the Amazon, while the southeastern part drains through the Paraguay into the La Plata. The railroad is to run from the Paraguay, at a point not yet determined, westward to Santa Cruz de la Sierra, just north of latitude 18 S., which is just on the eastern edge of the mountains. By an unusual provision of the treaty determining the boundary between Brazil and Bolivia, the right bank, and not the middle of the stream, of the Paraguay is the boundary; and on this account the railroad is to begin at a harbor in a lake or lagoon in Bolivian territory and be connected with the river by a canal, which need be but a very short one, as this part of the territory is to a great extent overflowed. One of three points is likely to be this eastern terminus: Bahia Negra, or Pacheco, the southernmost, is about 25 miles south of the twentieth parallel; Corumba, about 100 miles further north, and Gaiba, about 25 miles north of the eighteenth parallel and about 400 miles due east of Santa Cruz de la Sierra.

The country in this part of Bolivia is almost uninhabited, except by wild Indians, and at present has no practicable outlet. Among those promoting the enterprise in Buenos Ayres are the firms and persons engaged in the "quebracho" business, quebracho being the most durable of woods and a source of tannin, hitherto obtained chiefly in the "Gran Chaco" of Argentina and in Paraguay. The Bolivian government grants the railroad company about 12,000,000 acres of land, and guarantees the 5 per cent. interest on the cost of construction up to $16,000 per mile, which has covered the cost of other narrow-gage roads in the Chaco depression. The members of the syndicate who have undertaken the work are among the leading capitalists of Argentina, and the enterprise seems to have a solid basis.

## The Ventilation of the Kaiser Wilhelm Tunnel.

The *Ann. f. Gew. u. Bauweisen*, of August 15, 1906, contains the following account of the ventilation of the Kaiser Wilhelm tunnel on the line between Coblenz and Trier, which is the longest in the German Empire, 13,776 ft. from portal to portal. It was opened to traffic in 1879 and almost from the beginning gave trouble from poor ventilation which was accomplished by natural draft. It is a double track tunnel with a full circular arch of 13.64 ft. radius and is lined throughout with rubble masonry. There is a difference of 45.85 ft. between the end near Eller and the end near Cochem. With the rapid increase in the traffic through the tunnel between 1895 and 1900 the air in the tunnel became so foul as to seriously inconvenience the track gangs working in the tunnel and passengers on trains passing through it. About 1900 plans were made for providing positive ventilation on the Taccardo system which had been successfully applied in the St. Gotthard tunnel. This system, it will be remembered, is based on the principle of the injector. An annular tuyere is built in the portal and a blast of air from fans is forced into the tunnel through it. The entering air entrains the dead air near the portal and creates a draft through the large bore inside the annular tuyere.

In designing the plant for the Kaiser Wilhelm tunnel the annular tuyere was made with an adjustable opening, the object being to determine by experiment after the completion of the plant the width of discharge opening of the tuyere and the angle of inclination of its central plane to the axis of the tunnel which would produce the maximum current of air flowing through the tunnel with the minimum expenditure of power at the fans. The plant was erected at the north end of the tunnel which has the highest elevation. Two fans 16 ft. 5 in. in diameter were installed, either one of which is sufficient capacity to furnish the required amount of air. These fans are outside of the power house, the connecting shafts passing through the power house wall. They are each direct connected to a two-cycle Koerting gas engine which is supplied with gas from a suction gas plant in an adjoining building. The gas producers are adopted to use either anthracite coal or coke. Two small gas engine generator units also supplied from these producers are installed in the engine room to furnish electric light for the Cochem station.

After the plant was in working order a series of tests were made to determine the most economical dimensions and form of the tuyere. These tests showed that the mean angle of inclination of the tuyere to the axis of the tunnel should be 29 deg. and the width of the discharge opening 1 ft. 3¾ in. All of the adjustable parts of the tuyere and of the discharge deflectors were then securely riveted in this position and the plant has since that time been worked without change. The following table gives the results of some of the tests made to establish the most economical width ot discharge opening:

| No. of test. | Revs. of fan. | Effective H.P. | Velocity of air in m. per minute. In the tuyere: Right. | Left. | Top. | Bottom. | In the tunnel at Cochem. | Eller. | Air pressure in mm. of water column. At the fan. | In the air chamber, Right. | Left. | In the tuyere. Right. | Left. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Width of discharge opening 0.60 m.* | | | | | | | | | | | | | |
| 1. | 90 | 92.2 | 424 | 618 | 550 | 685 | 80 | 65 | 5 | 20 | 8 | 10 | 5 |
| 2. | 105 | 142.8 | 540 | 800 | 612 | 685 | 80 | 65 | 10 | 22 | 10 | 15 | 10 |
| 3. | 120 | 216.5 | 560 | 900 | 702 | 741 | 143 | 105 | 16 | 25 | 12 | 15 | 10 |
| *Width of discharge opening 0.30 m.* | | | | | | | | | | | | | |
| 9. | 90 | 85 | 635 | 780 | 605 | 750 | 124 | 115 | 5 | 20 | 11 | 18 | 10 |
| 10. | 105 | 150 | 705 | 935 | 725 | 845 | 130 | 160 | 9 | 25 | 20 | 25 | 15 |
| 11. | 120 | 210 | 855 | 915 | 830 | 865 | 136 | 150 | 10 | 35 | 25 | 30 | 18 |
| *Width of discharge opening 0.40 m.* | | | | | | | | | | | | | |
| 30. | 88 | 55 | 924 | 747 | 559 | 921 | 126 | 120 | 7 | 11 | 13 | 11 | 15 |
| 31. | 103 | 90 | 1,085 | 878 | 633 | 1,104 | 181 | 105 | 9 | 14 | 17 | 16 | 19 |
| 32. | 116 | 130 | 1,207 | 1,007 | 742 | 1,253 | 202 | 175 | 12 | 18 | 20 | 22 | 25 |

Some other interesting tests were made. A southwest wind produced an air current through the tunnel in the reversed direction when the fans were stopped; both fans were then started at 60 r.p.m. and almost immediately reversed the direction of the current. In a short time the velocity of the reversed current at the opposite end of the tunnel was 453 ft. per minute. An analysis of samples of air from the tunnel taken October 17, 1905, under unfavorable conditions gave at the center of the tunnel 11 parts of carbonic acid in 10,000 parts of air, and at a point in the tunnel a short distance from the end farthest from the fans 17 parts in 10,000 parts of air. This is about one-quarter of the quantity of carbonic acid contained in the air before the installation of fans.

A short distance from each end of the tunnel a gage is mounted on the wall which indicates automatically on a dial in the engine room the velocity of the air at these points, thus enabling the engineer in charge to regulate the speed of the fans and to maintain the desired velocity of the current.

## Old Styles of Car Decoration.

BY C. H. CARUTHERS.

Standing beside a Pullman parlor car in the Waverly station in Edinburgh one September morning in 1878, the writer asked the quiet-mannered Scotch guard his opinion of the coach. "Aye, they're graund; but I dinna lak thon paintin'—it's too lak chancy cup," he replied.

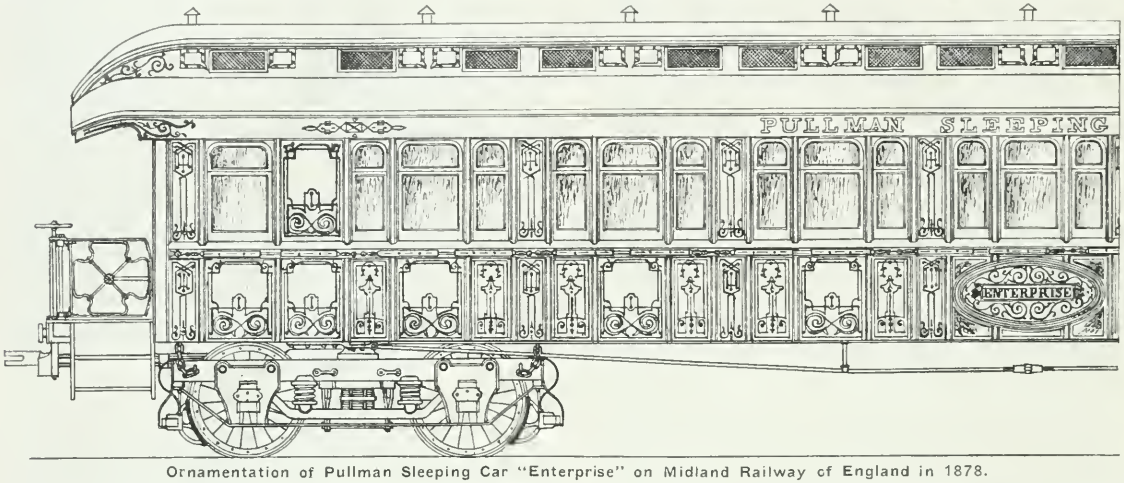
The drawing of another Pullman of exactly similar design, which was then in service on the Midland Railway (England), which accompanies this article, will convey to the younger railroad men of to-day not only an idea of that particular coach, but of the ornamentation of all Pullman cars of that time, as the design is substantially the standard then followed by the company on all its equipment.

This design was the highest point attained by a growth which increased gradually with each year from the building of the first Pullman. This gradation, although slightly accentuated by the efforts in the same direction of the rival Central Transportation Company, in the early seventies, was withal so conservative in each successive step that one unconsciously grew to regard it as the natural accompaniment of a Pullman, and would have been no more surprised to have seen an autumnal landscape without its brilliant woodlands and scarlet ivies, than to have seen these cars without their arabesques of gold and shadings of scarlet, maroon and other brilliant tints.

The reply of the Scotch guard lingered unaccountably in my memory, and as I glanced down along the train the small, neat stripes of gold and the chaste monogram, "MR," which formed the

only ornamentations on the rich vine-colored bodies of the long "double-bogie" carriages of the Midland Railway, appeared in a new aspect and so impressed themselves upon my mind that on again looking at the Pullman, its florid decorations began to stand out in their true light and the comparison to a china cup became more relevant, especially if the cup was of the type of "art" usually seen in the show windows of the average department store.

By reference to the drawing it will be observed that each panel, both below the belt rail and between it and the cornice board, bears an intricate design in no way connected with that in the adjoining panel. The oval panel at the center is also filled with tracery surrounding the rectangular lines around the name. Tracery also appears on the cornice board, and, in fact, on almost every spot where a design could possibly be placed. The body of the car was painted the standard Pullman color, the tracery as well as all lines, lettering, etc., was in gold leaf, and this was in turn shaded with scarlets, maroons, blues, greens and black. The rectangular space within the oval panel at the center, which carried the name, was painted in vermilion and the letters were shaded in darker tints. Even the narrow strip covering the outer part of the belt rail was elaborately decorated, and here colors ran riot in an apparent effort to outdo the design of gold, and yet conceal themselves behind its glitter.




Ornamentation of Pullman Sleeping Car "Enterprise" on Midland Railway of England in 1878.

The development of a craze for the æsthetic, perhaps accompanied by a desire to reduce the cost of construction and maintenance, must have opened the eyes of some of the officers of the Pullman Company about the same time, as very soon afterward all repainted cars had the design widened to cover two panels wherever possible, the moulded panel at the center was much plainer, and the greater part of the decorations on the belt rail was omitted.

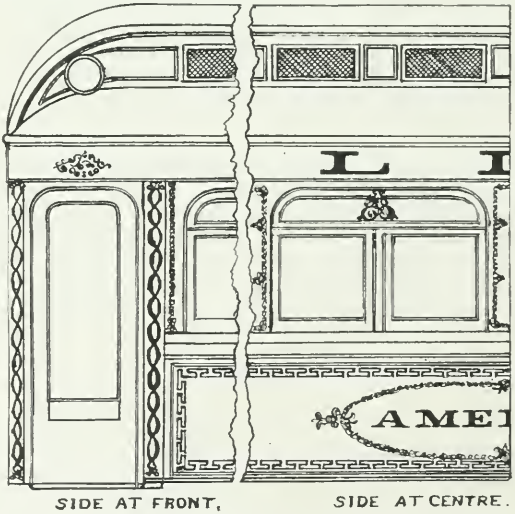
Still later, when narrow, beaded sheathing replaced the wider boards with strips over the joints, the entire length of the part of the car below the windows was divided by lines of gold leaf into three panels of uniform length, and the central one contained the name and type of car on a black ground surrounded by gold lines and neat arabesques.

Still later this part of the car became one panel as far as the painting, etc., was concerned, and the name only appeared in the center, surrounded by an oval of gold. This oval was about the shape and size of the old moulded panel shown on the Enterprise.

It is just possible that doing away with a visible division at the belt rail, and carrying the sheathing from the bottom up to the lower edge of the cornice board, wherever possible, led to the present simple decoration of narrow stripes of gold leaf around the edges of the window and door frames, a long, broad band also of gold leaf, at the bottom of the sheathing, the name "Pullman" on the cornice board, and the name of the car at the center, midway between the windows and the bottom, both being of gold without any embellishment, and of a simple form of light and heavy line letters.

The cornice boards of the early Pullman cars contained the words, "Pullman Sleeping Car," in metallic, silver-plated letters on a black ground, and if I am not greatly mistaken, a number were marked during the late sixties, with the inscription, "Pullman Silver Palace Sleeping Car." At that time many, if not all, of the sleepers had the front of the upper berths covered with the same material as used for head-linings, and painted in the same florid style as the head-linings of that time.

The company has rigidly adhered to the present Pullman standard color wherever possible since 1869, although at that time one of the first dining cars, the "Young America," was painted a rich wine color. Probably the first marked deviation from the standard color was on the cars run by the Pennsylvania on its "Royal Red" trains in 1893, and on those used by the Chesapeake & Ohio on its "F. F. V.," Limited Express. It is said that the Pullman Company objected vigorously to this innovation, however. In 1898 it turned out a lot of cars for the Pennsylvania Limited and the Congressional Limited, which were soon known to the trainmen as "Dolly Vardens," and will doubtless be remembered by many railroad men, as they have been but a short time retired from these trains. From the bottom to the belt rail, dark green was used, cream color covered the belt rail and solid work between the windows, and the cornice board was Tuscan red. The whole was ornamented with striping and lettering in gold leaf. The Baltimore & Ohio also used a few Pullmans on their Royal Blue Line trains between New York and Washington, painted royal blue. At present all Pullmans running in regular service over the Pennsylvania Lines are painted in the Tuscan red used by that company with P. R. R. standard striping.




Ornamentation of Pullman Cars in 1893.

During a recent trip through Pennsylvania, I ran across an old Pullman which had been sold to a party conducting some sort of a theatrical enterprise. It had evidently been one of the highly decorated class at one time, but its purchaser perhaps thought to improve on this. He probably believes he has succeeded. From the bottom of the car to the belt rail it was painted a pale cream color. Ultra-marine blue "ornamented" the panels and formed a broad stripe at the floor line. The cornice board was a dull Venetian red. A few "splotches" of blue were scattered around at random, and the word, "Private" was in yellow letters on the doors. The "chaney cup" had been superseded by the negro quarters of a Southern town!

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

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Much has been chronicled about events and incidents growing out of the San Francisco disaster, but little or no comment has been made in the press upon that phase of it relating to the demoralization of organization and its subsequent restitution. In spite of the wide interest shown, the public will doubtless never fully realize the size of the task with which large enterprises in particular have had to contend. An excellent illustration of this is afforded by the experience of the Southern Pacific Company, with its army of employees. So large a concern has not often been confronted with a combination of conditions involving the partial crippling of its facilities, the destruction of its main offices, the loss of many important records and the scattering of its thousands of employees, while at the same time it was under the necessity of relieving distress by free and unlimited use of its freight and passenger facilities. During the two days of the fire the general office work was at an enforced standstill, and everyone was looking out for his own salvation, but on the third day a handful of employees intuitively reported to the most likely place, namely, the division offices on the Oakland side. Here the company had established temporary headquarters, where only the urgent business of despatching refugees and supplies was transacted, everything else being given secondary consideration. The number of men showing up for work or for information about their future status was constantly increasing; there was neither work to do nor a place in which to do it, but many hung on, anxiously looking for an opportunity to run errands if nothing more. The commotion became so great that the despatchers could scarcely check their train movements. Meanwhile, the department heads were commissioned to cast about for office headquarters, which were rapidly being taken up at fabulous rates. Small amounts of space in various sections of Oakland were with some difficulty secured, and a portion of the forces are at the present time occupying offices transformed from lodging houses, club rooms and hotels. Wooden "horses" were hastily thrown together, across which boards were placed to serve as desks; those who were fortunate enough to find boxes used them as seats; many were for a time without either a board to write on or a box to sit on. Rush orders were placed by wire with neighboring cities for anything in the line of office furniture, stationery and supplies that could be found, and by hurrying them through on passenger schedule the forces were soon placed on a working basis. When face to face with an emergency that must be met, resourcefulness is put to the test and there develop more ways and means than would seem to exist under normal conditions. Thus, in following every avenue of information many lost records have been restored, and while inconvenience will always attend the loss of correspondence, no really serious complications have resulted. Upon the resumption of work the place of every old employee was open for him. The building up of the business anew has in reality required the services of a force even greater than it used to be. The effort directed toward reorganization so quickly after the disaster restored confidence of the employees in the certainty of employment and inspired their willing and energetic assistance. Through it all they have evinced a spirit of loyalty and unanimity which has greatly aided the work of reconstruction. While many difficulties remain to be met before business will run with its accustomed smoothness, the efforts of the company to effect a rapid reorganization have nevertheless been attended with pronounced success.

The details of the British system of handling small freight (and often heavy freight as well) are described fully in another column. The general topic of British freight methods as compared with those of this country has often been discussed in the *Railroad Gazette*, as, for example, in the paper entitled "An American View of British Railways," reprinted in our issue of July 20, 1906. Both authors bring out the point that competition in Great Britain has had the effect of bettering facilities rather than of lowering rates; the splendid service is paid for by the shipper at an average rate not far from a sovereign a ton. But it is nevertheless true that the merchant, the manufacturer of small goods and the private customer get a service far better and far cheaper than that afforded even by the express companies in this country, and it is worth considering whether or not, as the country develops and the railroads become more nearly adequate in mileage and facilities to serve the needs of the population, it may not become profitable for them to develop a traffic which does not now exist, and which is willing and able to pay a high rate. It is not probable that it could ever become far reaching, in this country of great distances, for as once the possibility and the economy of the fast freight service in England lies in the fact that it is analogous to a passenger service, carried on at express speed, during the hours of the night when the lines are least obstructed by passenger movement. Moreover, it finds its chief, almost its entire usefulness, in England within a radius of 400 miles from London. Its characteristic is that it is an over-night service; collections are always made at the close of the working day; delivery is always made prior to the beginning of the next working day. What could be accomplished in the way of creating new high class traffic if such a service were inaugurated in the New England states, in New York

Ohio, Illinois, Indiana or Pennsylvania, can only be a matter of conjecture. But before the experiment can be made, it is essential that great additions be made to railroad facilities, in second and third tracks, sidings and equipment. The fast freight trains must be run substantially as units, without car detention or diversion; the freight must be concentrated for delivery at a few towns and cities only, or else the large American cars would prove an extravagance. In short, the obstacles of imitating the British fast freight system in this country are at present greater than the inducements, and yet the time may come when a fruitful source of new revenue can be attained thereby.

The Master Mechanics' Association specifications for locomotive boiler tubes require that they be circular within two-tenths of an inch, and that lap-welded iron tubes be tested to an internal hydraulic pressure of 500 lbs. per square inch and seamless steel tubes to 1,000 lbs. These requirements accord with those of the American Boiler Manufacturers' Association. This provides a suitable test of strength against rupture, but the stresses to which such tubes are subjected in service are just the reverse of that employed to test thm, since it is collapsing stresses imposed by external pressure that they must resist. It is well known, of course, that while the effect of pressure exerted against the internal surface of a hollow cylinder is to preserve its true form and tend to restore any departure therefrom, external pressure tends to increase any deviation from the true cylindrical form. Since, as the first-mentioned specification shows, boiler tubes even when most carefully made are not perfectly cylindrical, their ability to resist external pressures cannot be determined by rules applicable to the true cylindrical vessel of uniform thickness and strength. Instead, it must be deduced by experiment and by observation of flues collapsed in service. Oddly enough, the only systematic experiments of this character that had ever been made, until recently, were those of Sir William Fairbairn, made in 1858—nearly fifty years ago—and the formula that he deduced has been in common use since that time. According to this formula the length of the tube is a factor in its ability to resist collapse. But now, in the light of the recent experiments referred to,* Fairbairn's formula is shown to have only a limited application, it being established that there is a critical length beyond which the collapsing pressure is constant.

The experiments at the University of Illinois were made on standard steel boiler tubes from 1½ in. to 3½ in. in diameter, some of which were bought in open market and others were given by manufacturers. Fairbairn's law of lengths was ignored except to have the test pieces in excess of the critical minimum length. Nearly all of the pieces were 10 ft. long at the start, and in many cases three or more collapses were made by cutting off the collapsed portion after failure and testing the remainder. Both lap welded and cold drawn seamless tubes were tested; also some brass tubes of dimensions corresponding to the steel tubes. The results of these experiments show that the part of a long tube affected by collapse from hydraulic pressure is generally not longer than twelve times the diameter; beyond this the collapsing pressure is independent of the length. The law of inverse lengths was found to be true only for very short tubes, in most cases from four to six times the diameter. It was deduced from the data that the collapsing pressure is a function of the thickness of the tube and also of the diameter, varying directly as some function of the thickness and inversely as some function of the diameter. In the report of the tests the relation existing between the collapsing pressure and the ratio of the dimensions is exhibited graphically by means of curves, and formulae are deduced for values of P, the collapsing pressure. In applying any formula to calculate the collapsing pressure of a tube, the use of a considerable factor of safety is advised. Slight deformations, as well as lack of uniformity of material, are also important factors to be considered. Collapse of the tubes of certain kinds of stationary boilers was formerly a common source of accident and various expedients were resorted to for strengthening these flues to withstand the collapsing pressures to which they wer subjected. Tube collapses in locomotive boilers are comparatively few nowadays, notwithstanding the fact that locomotive service is far more conducive to the constant subjection of interior boiler parts to undue stresses and injury than any other sort of boiler service. Such failures as do occur are usually directly traceable to injury inflicted by the boilermaker, or resulting from corrosion, or similar causes. This speaks well for the product supplied by the manufacturers. The tests showed a uniformity in the character of the product that is referred to in the report as most creditable.

* Bulletin No. 5 of the University of Illinois Engineering Experiment Station: Resistance of Tubes to Collapse, by A. P. Carman.

## ASPECTS OF NEW RAILROAD CAPITALIZATION.

The present time, which may almost be characterized as a "boom period" of new railroad capitalization, has certain aspects not so novel in themselves, but meriting special attention because accentuated by their own ratios and magnitude. The new capitalization has naturally been limited in the main to two familiar forms —new stock and new bonds, using here the latter term to include debentures and short time notes. The issues of bonds far exceed those of new stocks; and that in spite of the fact that many high railroad authorities, fiscal as well as operating, argue as an ultimate proposition in favor of the new security that takes its chances of a continued dividend rate rather than a security which carries a prior and rigid fixed charge, sometimes with a mortgage lien. In this connection may be noted, incidentally, as a tendency of the times in the case of great railroad corporations with well-assumed dividends, the slow but steady movement toward parity of market value of junior and senior bonds. They are still pretty far apart, and complete parity will, of course, never be reached, but the judgment of investors is beginning to grasp the fact that in past years the difference in price between the junior and senior securities of a large railroad corporation with a vast equity represented by share capital steadily paying dividends has been too large. It would be interesting to observe how low that disparity would fall were three influences removed, namely, (1) large variations in the money rate; (2) effects on its own finances of large bond issues by a corporation, and (3) the statutory restrictions on trust investment in favor of the senior classes of bonds.

But, while issues of railroad bonds have of late years been many in number and diverse in price, new issues of stock increasing railroad share capital have been by no means small, especially if we class in the same category bonds sooner or later convertible into stock. Present methods of such stock increases have their suggestions; one of them historical and a token of the development of sane railroad finance. In the earlier days of first railroad prosperity the absolute and "free" stock dividend was not uncommon. Even in those days it was deemed more prudent or, at least, more convenient to expand stock capital as a free gift to shareholders rather than increase the regular dividend. But that old-fashioned "stock dividend" in the absolute sense is practically a thing of the past. The famous stock dividend of 80 per cent. on New York Central shares and the later distribution to Rock Island stockholders sound now almost like fairy stories. In their place we have stock issues to shareholders at par, or slightly above, with the annexed and consequential "rights." The qualified stock dividend has superseded the absolute one, and not merely because the money is needed for new improvements, but also as a bar to public criticism. There must be, of course, in such a case, a margin for stockholders large enough to induce most or many of them to subscribe, in other words, to have a genuine value in rights, as well as to prevent rights from falling so low as to induce large speculative purchase of them. In a general way this marginal right is recognized even by such a body as the Massachusetts Railroad Commission when, under the state law, it compels new stock issues to be made at the market price, but fixes that price low. New railroad stock, however, as a gift is well-nigh extinct, both in practice and as an idea. Stockholders may get rights but not gratuities.

This question of stock rights of more or less value opens another field of discussion not altogether academic. Those rights connote the fact that they call for shares paying more to the owner than the usual rate of return on investment; in other words, that the railroad company is borrowing from its stockholders at a higher rate than it could borrow from the outside investor. Is or is not that process real stock watering? Massachusetts answers the question affirmatively. In her drastic policy against any form of stock watering she in effect capitalizes the excess of the regular dividend above normal investment return, and compels the stockholder to cash it. Stated in somewhat different terms she capitalizes the railroad by the same rule of paid-in cash during same prosperity as at the railroad's origin, and applies practically the policy to street railway and other corporations. In view that a railroad's ability to serve the public is greater when its dividend

requirement is less, the reasoning is sound practically and mathematically. But it involves some financial anomalies. By parity of reasoning it leads to the dictum that existing premium on stock outstanding is water; which it certainly is not. It ignores possible variations in rate of future dividends, which are not necessarily paid at a fixed rate as is the interest on bonds. This view also, except as the enhanced value of railroad stock may be reached by taxation, while objecting to increasing dividend requirements through issuing of new stock, does not run against a dividend fund increased, not through new stock, but by a higher dividend rate. To illustrate the case concretely, a railroad capitalized in stock at $8,000,000, which pays 8 per cent. dividends, with shares selling at $200, if it offers $2,000,000 of new stock to its shareholders at par, waters its stock, but if it increases the dividend to 10 per cent. does not do so. Yet in both cases the new dividend requirement is $800,000 with the public benefit decidedly favored by the first transaction if the $2,000,000 goes into improvements. Undoubtedly the public interest is better served, theoretically at least, if the new stock is put out at, say, 180. But the anomaly still remains. The high priced stock issued at par is criticised as stock watering; the higher dividend, which in the ultimate analysis is very like the old "free" stock dividend, is not so criticised.

Another feature of increased railroad capitalization is that prospective "rights" have lost most of their power to enhance stock values in the market. A few years ago such stock rights, even though dimly descried, sent the particular shares affected up sometimes by leaps and bounds. A year ago such a prospect left the stock comparatively unaffected even if it did not actually depress it; and, even now, in an average market less suspicious, the old conditions have not been regained, spite of a strong tendency of railroad shares to return to the earlier price soon after rights are "off." For an instance, the New York Central during the year has given stockholders rights which, if originally investing at par, at the market value plus the dividend have returned some 17 per cent. on the investment. With its great equities in the Lake Shore and other allied roads of the Vanderbilt group it is probable that its new stock distribution has not ended. Counting rights as dividends, they fix the New York Central as a 6 per cent. stock during the past twelve-year period, and that on a basis of rights put out within a single calendar year. While it is true that such a return is partly reflected in a price for New York Central stock, which reduces it on the basis of the regular dividend to a little below a 4 per cent. investment, and also that the costly terminal improvements promise no immediate return commensurate with the outlay, yet the price response to rights must still be regarded as strangely inadequate. The same rule has held in the case of other prosperous railroads, notably the "short" convertible debentures of the New York, New Haven & Hartford, whose outlays, while great, promise quick returns. Seeking the causes for such reduction of the power of stock rights in added railroad capitalization one must find it in the vastness of railroad improvements in progress or planned, reaching a financial magnitude in which the investor has lost bearings that he is just beginning to find again; the competitions with railroads of other forms of investment, and the overstrained condition of the money market. But added to these is undoubtedly the habit of the conservative investor nowadays of specializing rather than differentiating his stock rights. He treats them as though they were a kind of accidental bonus, emphasizes their immediate subtraction from the price of his stock instead of marking its quick recovery, and does not bethink himself to differentiate rights over a series of years as an annual addition to regular dividends; as, in fact, a dividend disguised under another name.

The attitude of shareholders and investors toward the extensive new railroad capitalization is obviously important, but not more so than that of the public in its economic relation of "consumer" of railroad service. At this point in their new capitalization the moral position of the railroad corporations is exceptionally strong. Through the old-fashioned gratuitous stock dividend there is now practically no stock watering to be an added burden on future public service; the interest rate carried by new bonds, while not so low as it was two or there years ago, is not high, and will probably go lower rather than higher with a relaxed money rate; and finally and, from the civic viewpoint, most cheering, in the great mass of stock and bonds put out for new capitalization, comparatively small amounts have gone into refunding and an enormous proportion into improvements bearing directly on public safety and convenience. How great that proportion is cannot be stated. But its vast size and the unquestioned public benefits that it will confer have a lesson for those who are making the railroads the objects of demagogical attack.

## THE COASTWISE SITUATION.

The status of the competition and co-operation between the rail lines and the coastwise steamers from New York has remained unchanged for a great many years, but now has potential possibilities of radical new development, occasioned by the purchases of Charles W. Morse. Prior to Mr. Morse's entry into the field, the New York lines were as follows:

Old Dominion Line, New York to Norfolk, Va. Majority of stock understood to be controlled jointly by the Southern Railway, Seaboard Air Line, Atlantic Coast Line, Norfolk & Western and the Chesapeake & Ohio.

Clyde Lines, New York to Wilmington, N. C., Georgetown, S. C., Charleston, S. C., and Jacksonville, Fla., with lesser services between New York and the West Indies, and between New York and Philadelphia; also services from Boston to Charleston and Jacksonville, and occasional irregular services to other points—The Clyde Line has been independent of railroad affiliations and has often been a disturber of rates.

Metropolitan Line, New York to Boston.—Independent.

Ocean Steamship Company of Savannah (Savannah Line), services from Boston and New York to Savannah, Ga.—Owned by the Central Railroad of Georgia.

Mallory Line, New York to Galveston, Tex., with occasional services to Brunswick, Ga., and Mobile, Ala.—An independent water line and a frequent disturber of traffic.

Morgan Line, New York to New Orleans and Galveston.—Owned by the Southern Pacific.

Maine Steamship Co., New York to Portland, Me.—Independent.

Exclusive of off-shore lines to Cuba, etc., and of the Long Island Sound fleet, this completes the list of coastwise lines from New York as it existed a year ago. The Cromwell Line of freight and passenger steamers, which for many years competed with both the Mallory and the Morgan Lines for the New Orleans trade, was absorbed by the Morgan Line several years ago.

Within the last year or so Mr. Morse has bought control of the Eastern Steamship Company running from Boston to ports in Maine and the Provinces; the Metropolitan Steamship Company, running between New York and Boston, and the Clyde Steamship Company. He also controls the Hudson River Navigation Company, and although this cannot be grouped with the coastwise lines, it is important as a feeder. It is safe to say that no one knows exactly what Mr. Morse's plans are, no one at least among the railroads with which he must either compete or co-operate. His field is a large one, and by virtue of abundant capital and a surplus of steamers he can create new services or remodel old ones. For some years the coastwise steamship lines have been allowed a differential below the rail rate, and a fair amount of harmony has been established with occasional disturbances. It is correct to assume, under existing conditions, that the coastwise lines require both the through traffic supplied to them by the railroads, and local traffic, in order to be successful, and that they cannot prosper on either alone. It remains to be seen in what way Mr. Morse will obtain the railroad support necessary. On the gulf, the Gould and Rock Island lines have great need of a through connection to New York, especially for their bulky traffic of the kind that travels more cheaply by water than by rail. This fact at the present time is neither more nor less true than it was during the old regime, but it derives new importance because Mr. Morse can presumably increase the efficiency of the old Mallory Line service if he cares to do so, and will be able to compete more effectively with the Morgan Line steamers. For the service between New York and Boston, he has already made a radical change in the practice of recent years by building two fast passenger steamers. When the old Metropolitan Line was first established it used to carry passengers between New York and Boston, but the more recent steamers of the line have had no passenger accommodations and have been devoted entirely to carrying out a daily freight service, the ships leaving New York late in the afternoon and arriving in Boston a day later. The New Haven road has not been able to keep the Long Island Sound traffic entirely in its grasp. New lines have cropped up every year or so, and the most recent arrival in the field, known as the Enterprise Navigation Company, is now conducting an active competition and selling through tickets at low rates in connection with trolley lines from Fall River to Boston. If the new Morse passenger steamers turn out to be fast and popular, they will doubtless add materially to the competition which the New Haven road has to face. Meanwhile, there are potential combinations which can be made between the Metropolitan Line and the Eastern Steamship Company, with a view to supplying the whole New England coast. Some years ago there were independent lines of small freight and passenger steamers

running from New York to New Bedford, but these gradually died out, and during the last 20 years it may be said that practically no water freight has been carried from New York to New England ports in opposition to the New York, New Haven & Hartford and the Boston & Maine, with the exception of that carried by the Metropolitan Line and by the occasional independent Long Island Sound companies.

It has frequently been said in the newspapers that Mr. Morse controls all of the coastwise lines except the New England Navigation Company, owned by the New Haven Road, the Morgan Line and the Old Dominion. This, of course, is not correct, for besides the Savannah Line, previously mentioned, there exists the Maine Steamship Company, the Boston & Philadelphia Steamship Company, the new Southern Steamship Company, running vessels between Philadelphia and Florida ports, and the old and strong company known as the Merchants & Miners Transportation Company, which runs ocean steamers from Norfolk and Newport News to Boston, Providence and Savannah. So far as is known, this company is also free from railroad affiliations; whether or not it will remain so is quite another matter. It would seem that the Merchants & Miners Company might be used quite effectively by a combination of railroad interests as a protection against the Morse Lines, in case the latter threatened the existing harmony. Both the coastwise steamship lines and the eastern group of rail carriers have been protected (at the expense of the shipper and also of the western rail lines) to an extent not always appreciated, by the navigation law requiring goods from one American port to another to be carried in American bottoms. Without this law, a flock of foreign "tramp" steamers would descend upon the coast whenever freights were dull, and many permanent lines would doubtless be established, with which the American lines, handicapped by higher charges for interest and wages, would be hard put to compete. The entrance of a group of American lines under common ownership bears a certain analogy to this condition, though of course in less degree, on account of the ease with which ships can be transferred from one service to another, to meet temporary requirements.

What Mr. Morse is going to do with the passenger traffic on the coast is another side of the matter, at once interesting and problematical. The history of coastwise passenger traffic in the United States makes a very interesting record and deserves a much longer account than can be given here. In brief, just prior to the Civil War, when railroad connections between the North and South were very poor, involving a break of gage at several points and a slow and unsatisfactory service, passenger business on the coast became very active. The steamers of that day running between New York and Charleston, Savannah and other southern ports represented what was then the climax of marine achievement for anything short of a Cunarder or a Collins liner. They were quite uniformly of the side-wheel type, with passenger accommodations then considered luxurious, and they made their runs almost as quickly as do the coastwise passenger steamers of the present day. Many of these boats were pressed into service during the war. Afterward, the coastwise passenger business again flourished for several years, but as the rail connections got better and better the water accommodations got worse and worse, or rather remained just about the same as they had been for years past, without additions of superior vessels to the fleet and without increases of speed. In the eighties the characteristic fleet of coastwise steamers was made up of slow and comfortable vessels, not at all luxurious and not attempting really to compete with the rail lines, and this same type prevailed until quite recently.

About ten years ago, however, three companies realized the possibilities of doing more than they had been doing for their passenger service: the Old Dominion Line, the Cromwell Line, and the Maine Steamship Company. The Savannah Line, a few years before, had built a fast, luxurious steamship named the "Kansas City," but did not continue to put vessels of this type in service, with the exception of the unsuccessful "City of Savannah." It is understood that there was a division in the Board of Directors of the Savannah Line about five years ago, at the time the existing new fleet was inaugurated, one part of the Board desiring fast passenger steamers of the "Kansas City" type, the other part standing out for steamers to carry freight exclusively. The result was the compromise type seen in the "City of Memphis" and her sister ships; large, seaworthy vessels with considerable freight carrying capacity and small coal consumption, but making no pretensions to speed or to luxurious passenger accommodations.

On almost all the coastwise lines the passenger business is very brisk during the hot months and practically non-existent during the cold ones, but the new Southern Pacific steamers building for the Morgan Line to run between New York and New Orleans are so much larger, so much faster and so much superior in their general type of accommodations to the ordinary coastwise steamers, that it is evident that the company intends to do considerably more with them as passenger carriers than has heretofore been attempted. Mr. Morse is manifesting the same intention in his turbine boats, the "Yale" and the "Harvard," which are to run between New York and Boston. It is said that these steamers will leave New York at 5 in the afternoon and be in Boston at 8 the following morning, which gives them an advantage over the Fall River Line and the other Sound lines, in that the passengers on these steamers have to get up early in the morning and complete their journey by rail. There is the compensating disadvantage that the new boats will run outside Cape Cod, but under ordinary weather conditions this should not prove a serious handicap. No announcement has as yet been made in regard to the new steamers which Mr. Morse is building for the Mallory Line, but it is probable that a fleet of fast steamers on the coast would pick up a passenger business unheard of under the present conditions, at least during the warmer months of the year. Moreover, if the competition became severe, rates could be made considerably lower than they are at present. For some years it has been customary for the coastwise lines to charge for a single passage a rate of fare approximately the same as the railroad, but including meals and stateroom accommodations, and subject to considerable reductions on round-trip tickets.

It is fair to say that the principal representative of a tolerably fast water passage service on the coast at the present time is the Old Dominion Line. The steamers of the Maine Steamship Company are faster, but there are not so many of them and their season is shorter. The Old Dominion Line has been just able to pay a 6 per cent. dividend and no more, while some of the freight lines have done considerably better, notably the Ocean Steamship Company of Savannah, which is controlled by the Central of Georgia Railway. It would be interesting to see, therefore, whether the coastwise passenger business, outside of that between New York and Boston and New England ports, will tempt Mr. Morse, and if so, what success he will have with it.

The principal financial details of the Morse holdings for the last fiscal year are given as follows:

| | Capital stock. | Bonds. | Net earnings. | Per cent. on stk. |
|---|---|---|---|---|
| Eastern Steamship Company... | $3,000,000 | $1,969,000 | $275,000 | 9.1 |
| Metropolitan S. S. Company... | 3,000,000 | 1,000,000 | 225,000 | 7.5 |
| Hudson River Navigation Co... | 4,000,000 | 1,000,000 | 200,000 | 5.0 |
| Clyde Steamship Company..... | 14,000,000 | 4,000,000 | 1,200,000 | 8.5 |
| N. Y. & Tex. S. S. Co. (Mallory) | 14,000,000 | 3,800,000 | 850,000 | 5.0 |
| Total ..... | $38,000,000 | $10,969,000 | $2,750,000 | 7.2 |

## A Probable Test of the Revised Rate Law.

The Interstate Commerce Commission has announced two decisions on motions to reopen cases filed under the old law, which amount to a ruling that where, at the time the law of 1906 became effective, a final order had not been entered it can be reopened.

The first motion was for the reopening of the case of Cattle Raisers' Association of Texas vs. C., B. & Q., et al., the Chicago Live Stock Terminal Case. In this case a final order was made in November, 1905, and the motion to reopen is denied.

The other motion was for reopening the case of the cattle raisers against the Missouri, Kansas & Texas, et al., for a reduction in rates from Texas to Chicago. This case was also decided last year, but the motion to reopen has been granted as no final order had been issued. In announcing this decision Commissioner Prouty says:

"The new Section 15 confers upon the commission power to enforce what has always been required in the statute, namely, just and reasonable rates, by the application of a new remedy, and, as applied to cases like this, in this way alone has the jurisdiction of the commission been enlarged. The new section provides as conditions that there shall be formal complaint and full hearing. Both of these prerequisites have been practically complied with in this proceeding, but both complainant and defendant should have leave to submit whatever additional testimony they desire, and thereupon it is not only the right, but the imperative duty, of this commission to make an order for or against the defendants, under the new fifteenth section. To hold otherwise, this case and many others in which large sums of money and much time have been expended must fail, since the old section is superseded by the new, and the amending act contains no provision continuing the old section in force as to cases previously brought before the commission; the law should not be so interpreted in the absence of explicit provision to that effect."

Some lawyers doubt the soundness of this decision of the Commission, because there is no provision in the law passed this year for continuing cases filed under the original act; but there can be little doubt that Mr. Prouty's action conforms to the liberal spirit of the original law; and no one has accused Congress of intending to be any less liberal toward shippers now than it was then.

If the action of the Commission in reopening this case is sus-

tained by the courts it will doubtless become the test case, settling the question of the Commission's authority to prescribe rates. In this case the Commission on August 16, 1905, held that defendants' advances in live stock rates during 1903 were unjust and unreasonable and that "the present rates are unjust and unreasonable to the extent of such advances." It is safe to assume, therefore, that, unless the roads can show a substantial change in conditions since August 16, 1905, the Commission will order a reduction of rates to those in force before the advance of 1903. Such an order if resisted by the roads will result in a test of the constitutionality of the rate-making provision of the law as now revised.

According to a press despatch from Washington the Interstate Commerce Commission is puzzled by the questions: Are melons fruit? Are potatoes fruit? What is fruit? These questions have been propounded by certain railroads in connection with the clause of the revised rate law which permits free transportation for caretakers to travel with "fruit." The potato carrying roads come forward and say that they have been in the habit of furnishing transportation to caretakers accompanying carloads of potatoes, and they gravely ask, "Are potatoes fruit within the meaning of the law?" The Colorado melon growers present a similar request. The commissioners have determined to hold a special session to define "fruit" as the term is used in the law. How would it do for the railroads to hold a "special session" and withdraw all such free ride privileges? Of course, the transportation of a legitimate caretaker is not free at all; the price for carrying the fruit (or potatoes) pays the road for all the service which it performs in connection with it. If a freight charge is $100, including a $20 ride, why not make it $80, excluding the ride? Then there would be a chance to give equal service and treatment to all; and the business would be put more nearly on a sound basis. Incidentally, such a change would put a stop to unnecessary caretaker and perhaps weed out some abuses. It might bring about a reduction in the annual number of drovers killed and injured in cabooses, and the consequent damage bills. If, in the case supposed, the freight carriage is really worth $100, and the true charge for goods and man ought to be $120, why not make it $120? Could the commission or the courts then entertain the claim that the man was being carried free?

## Wheeling & Lake Erie.

The present First Vice-President and General Manager, some six months after he came to the road from the Harriman lines in Oregon, made the following statement, which suggests the present policy of development on the Wheeling & Lake Erie, in the annual report for 1905:

"The future of this property is dependent wholly on development of its facilities, as the business that can be obtained along its lines should enable it to multiply its earnings per mile of road fully three or four times."

The road forms the connecting link between the Wabash main line at Toledo and the Pittsburg entrance over the Wabash-Pittsburg Terminal, which joins the Wheeling & Lake Erie at Mingo Junction, on the Ohio side of the Ohio river, just across from West Virginia. The Wheeling & Lake Erie also has branches running north from the main line to the lake ports of Huron and Cleveland, and a branch is being built to Lorain. The Cleveland division runs southwest to Zanesville, and there are numerous branches in the coal areas which the road touches. These are in three districts, the Massillon district, the Middle district on the Toledo division, and the Eastern Ohio district, the last with a total daily producing capacity of 20,700 tons, and by far the most important. Wheeling, W. Va., is the southeastern terminus of the road. Thus, although lying in highly competitive territory, the Wheeling & Lake Erie has large possibilities. Aside from the traffic which it will naturally receive as the Wabash connection between the Pittsburg district and the West, as well as its potential possibilities as part of the Gould main line to Atlantic tidewater when the gap between Wheeling or Pittsburg and Cumberland, W. Va., shall have been filled, it runs through a district admirably suited to the heavier kinds of manufacturing, has a chance for ore traffic between the lake ports and the iron centers, a large existing traffic in coal, and large possibilities of business in finished iron and steel products.

In past years the road has been too poor to take advantage of its opportunities. By means of authority, given at a special meeting of the stockholders on September 26, 1905, an issue of $35,000,000 50-year 4 per cent. general mortage bonds was created to provide for retirement of underlying bonds amounting to $15,000,000, and, more important to the welfare of the property, to provide funds for improvements and extensions. An issue of $8,000,000 three-year notes secured by $12,000,000 of these bonds and certain equipment was sold at 95, realizing $7,600,000. Something over $4,000,000 of the proceeds of the notes was paid for equipment and for unsecured floating debt, leaving a balance of $3,400,000 available for general betterments and improvement. Of this amount $1,740,000 had been spent up to the close of the fiscal year ended June 30, 1906.

These general betterments have taken the form particularly of improvements to the line, involving both betterments of the existing roadbed and building of new road to secure better alinement, grades and curvature. On the Toledo and Pittsburg division there were laid 70 miles of 90-lb. rail; on the Cleveland division, 16 miles. For February, 1907, delivery, 10,000 tons or a little more than 70 miles of new 90-lb. rail has been ordered to carry on the laying of heavy rail on these two divisions. During the year, 189 miles of main track were ballasted, 16 miles of passing sidings and 12 miles of new yard tracks were built, and three miles of industry tracks were laid to some 20 different industries. These are large improvements for a road with 442 miles of line operated, of which only 216 miles is comprised in the main line, although counting the line from Cleveland to Zanesville as main line, the total is brought up to 360 miles.

During the summer and fall of 1905 various surveys were made with the object of obtaining a low grade line over Greenville Summit, west of Massillon, where there is a 1 per cent. grade against westbound traffic. After examining into three different routes, it was decided to build a line from Bolivar via Justus, on the Cleveland-Zanesville division, and through the Sugar Creek valley to Orrville, 22 miles. This line has been built under the name of the Sugar Creek & Northern and is nearly finished. It saves 6.6 miles of distance, has a maximum grade of between 0.4 and 0.5 of 1 per cent. as against 1 per cent. on the old line, maximum curvature of 3 deg. as against 9 deg., makes a saving of 1,095 deg. of total curvature, and has 220 ft. of ascents and descents (westbound) as against 490 ft. on the whole line. At a point two miles west from where the new line crosses the Cleveland division 625 acres of land have been bought as a site for permanent locomotive and car repair shops, engine houses, store rooms and division offices. This is on a part of the line where there is four miles of tangent and level grade, with abundant water supply. A large hump yard to contain 46 miles of track is to be built at this intersection of the Toledo-Pittsburg main line and the Cleveland-Zanesville line. The cost of the new cut-off is estimated at $1,000,000. Further surveys have indicated the possibility of making the Wheeling & Lake Erie, from the summit west of the Ohio river near Jewett to each of its lake ports, a line with no grade against westbound traffic steeper than 0.4 of 1 per cent. The eastbound traffic is now much lighter than the westbound, so that there is not the same necessity for reducing grades in that direction, but later on it will be possible to reduce eastbound grades, with the exception of pusher grades out of lake ports, to a maximum of 0.3 or 0.4 of 1 per cent. The additional advantages to be gained in operating efficiency from double-tracking are clearly shown in a statement of trains running over the line between Toledo and the Pittsburg Junction, published in another column.

The branch to Lorain is now under construction by the Lorain & West Virginia, controlled by the Wheeling & Lake Erie. It is to connect with the steel works at Lorain and stone quarries at North Amherst, and to comprise, with branches to quarries, some 35 miles of line. Its tonnage is estimated at 50,000 cars a year. It is to be in operation by January 1.

In spite of a loss in coal traffic on account of the coal strike in Ohio, which began April 1, 1906, and lasted until July 20, estimated at $350,000, the gross earnings of the road increased nearly 16 per cent. and net earnings 63 per cent. For the first nine months of the fiscal year before the strike, the increase in gross earnings was at the rate of 28 per cent., with net earnings larger by 100 per cent. than in the year before. With an increase of 28 per cent. in revenue ton-miles, cost of conducting transportation decreased 3 per cent. There were, however, increases of 8 per cent. in cost of maintenance of equipment and of 14 per cent. in general expenses, in spite of which the percentage of operating expenses to earnings was 71 per cent. against 79 per cent. in 1905.

The train load shows an increase of 26 per cent., from 422 tons in 1905 to 537 tons last year. Including company freight the figures were 443 tons and 562 tons. An increase of 37 per cent. in the mileage of empty freight cars against an increase of 15 per cent. in the mileage of loaded cars probably reflects a larger disproportion of westbound and eastbound traffic. Freight density increased 28 per cent., to 2,191,627 tons one mile per mile of road. Freight earnings were 87 per cent. of gross against 83 per cent. in 1905. It is not possible to tell from what classes of traffic came the gain in freight earnings, as no table of commodities carried is given, but it is fair to assume that it was largely in the heavier kinds of traffic, such as coal, ore, iron products, cement, etc. Neither is it possible to work out the unit maintenance figures with the exception of maintenance of way, as expenses are not given in detail. Roadway maintenance cost $1,793 per mile against $1,657 in 1905.

The present report is a splendid record of achievement on the part of the new management. Gross earnings have largely increased, net earnings remarkably. In spite of a much larger traffic, the direct cost of carrying it has been lowered while more has been

spent on maintenance. A financial plan has been adopted which provides for the improvements intended to make the road an efficient carrier, and this betterment work is being largely carried on. It is an interesting conjecture to consider what will be the position of the Wheeling & Lake Erie five or ten years from now. Particularly if the Gould plan of a through line from ocean to ocean is carried out, the road has large possibilities. Already the business from the Pittsburg district is growing and, according to the report, the greatest misfortune is that there is not sufficient equipment with which to handle it. With a large business from this source, a through traffic between Baltimore and the West and the improvements to the line necessary for carrying this large business economically, the Wheeling & Lake Erie might well come to be a highly successful railroad.

The principal statistics of the last two years' of operation are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 442 | 442 |
| Freight earnings | $4,639,852 | $3,812,461 |
| Passenger earnings | 466,748 | 534,410 |
| Gross earnings | 5,318,801 | 4,595,607 |
| Maint. way and structures | 792,543 | 732,228 |
| Maint. of equipment | 871,930 | 763,899 |
| Conducting transportation | 1,951,802 | 2,015,119 |
| Operating expenses | 3,672,156 | 3,639,135 |
| Net earnings | 1,556,646 | 945,471 |
| Net income | 92,294 | Def., 193,360 |

## Philadelphia & Reading.

The Reading Company, like the Rock Island Company, is a railroad holding corporation. Instead, however, of controlling only railroads, it includes industrial corporations among its subsidiaries. The Philadelphia & Reading Railway covers the 1,000 miles of railroad directly operated, in addition to which the Reading Company owns an interest in a total of 1,126 miles of other roads, the principal of which is the Central Railroad of New Jersey, with 648 miles of line. The Reading Company also controls the Philadelphia & Reading Coal & Iron Company, through which it mines its anthracite and bituminous coal, and the Reading Iron Company. The income of the Reading Company, whose shares are those traded in in the stock market, is derived from the surplus earnings of its underlying companies, principally the Railway Company and the Coal & Iron Company.

Gross earnings of the Philadelphia & Reading Railway for the year were $40,500,000, a gain of $3,000,000 over 1905. This in spite of the influences of the anthracite coal strike which lasted from April 1 to May 10, 1906, and except for which, the year would have shown remarkably favorable results. The effect of the strike is shown more clearly in the income account of the Coal & Iron Company, whose net earnings were nearly $1,000,000 less than in 1905. Net earnings of the Railway Company were $18,400,000, against $18,000,000 in 1905.

The net income for the year before dividends was $8,923,824, against $8,369,600 in 1905. From these sums were deducted for improvements $3,500,000 in 1906, and for improvements and insurance, $1,000,000 in 1905, consequently the surplus after appropriation for betterments was $5,384,472, against $7,359,162 in 1905. To the Reading Company was paid $6,000,000 in 1906, against $4,000,000 in 1905. The extra amount necessary to make up last year's payment of $6,000,000 to the holding company was drawn from the railroad's accumulated surplus of previous years.

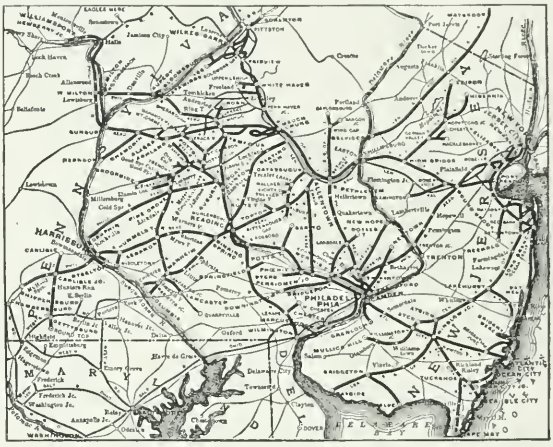
The gain of $3,000,000, or 8 per cent., in gross earnings, was largely offset by an increase of $2,600,000, or 14 per cent., in operating expenses. Maintenance of way increased 17 per cent.; maintenance of equipment, 12 per cent., and conducting transportation, 15 per cent. Per mile operated, maintenance of way cost $3,195, against $2,698 in 1905. Maintenance of equipment cost $2,228 per locomotive in 1906, against $2,554 in 1905; $610 per passenger car, against $475 in 1905, and $62 per freight car, against $59 in 1905. These unit charges are all high, particularly in maintenance of way, since most of the $3,539 per mile spent out of earnings for improvements was used in betterment of the line.

The more important betterments, costing over $2,800,000 of the $3,500,000 spent for improvements, were enlargement of classification yard at Rutherford, double tracking of the Philadelphia, Harrisburg & Pittsburg, additional tracks on the main line, third and fourth tracks on the New York branch, second tracks on the East Pennsylvania branch, and enlargement of the locomotive and machine shops at Reading. With the increased facilities provided, the company was able to build several locomotives during the year. The efficiency of the product may be judged from the fact that the train which made one of the fastest runs on record last summer from Camden to Atlantic City, in the course of which it ran 12 miles in eight minutes, was hauled by an Atlantic type locomotive built at the Reading shops. Besides the charge of $609,000 to improvements for shop tools, the maintenance of equipment item, repairs and renewals of shop machinery and tools, increased during the year 100 per cent.

Under conducting transportation nearly every item shows an increased cost, as is to be expected with an increase of 101,000,000 ton-miles of coal and 260,000,000 ton-miles of merchandise traffic, and 27,000,000 passenger miles, besides 41,000,000 freight ton-miles in company service. Instead of a credit of $163,000 for car service in 1905, there was a charge of $82,000. There was a large proportionate increase in rents of buildings and other property, which rose from $6,000 in 1905 to $116,000 last year. It will be interesting to observe in succeeding reports the effect of the recent wage increase of 10 per cent. All conducting transportation items which include wage payments are already much higher than in 1905.

The revenue train load was 409 tons, against 388 tons in 1905. This in spite of the fact that half of the tonnage was merchandise. The heavy traffic character of the road is also emphasized by the increase of 115 in the number of locomotives during the past year, and that with 1,000 miles of line, there are 486 miles of second and 54 miles of third and other track.

For the first time information is given in the report in regard to the Reading Iron Company, which, in a small way, is an important asset of the holding company. The Reading Company owns all its capital stock, on which 6 per cent. annually is paid. Enlargement, rebuilding and modernizing of the Iron Company's vari-



Reading Company's Lines.

ous plants has been paid for out of earnings, as well as purchase of the Pennsylvania Steel Company. With $1,000,000 capital stock, the company's assets amount to $12,000,000.

The following table sums up the results of the last two years' operation of the Philadelphia & Reading Railway:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,015 | 1,015 |
| Coal freight earnings | $17,198,247 | $17,163,351 |
| Mdse. freight earnings | 15,220,441 | 13,036,336 |
| Passenger earnings | 6,216,316 | 5,717,399 |
| Gross earnings | 40,563,725 | 37,495,719 |
| Maint. way and structures | 3,195,152 | 2,738,215 |
| Maint. of equipment | 6,330,882 | 5,650,984 |
| Conducting transportation | 11,896,370 | 10,387,563 |
| Operating expenses | 22,137,172 | 19,480,350 |
| Net earnings | 18,426,553 | 18,015,369 |
| Net income | 8,923,824 | 8,369,600 |
| Appropriated for improvements | 3,539,352 | 979,643 |

## NEW PUBLICATIONS.

*Management of Electrical Machinery.* By Francis B. Crocker and Schuyler S. Wheeler. New York: D. Van Nostrand Co. 223 pages; 5 in. x 6½ in.; 131 illustrations. Price, cloth, $1.00.

This is a revised and enlarged edition of the "Practical Management of Dynamos and Motors" by the same authors. It sets forth the more important facts with which the man in charge of electrical machinery should be familiar. The methods of handling generators and motors are dealt with in the opening chapter; those next following take up the installation of machines, the foundations and mechanical connections. These points are covered in considerable detail and the general rules laid down may well be applied to any other machinery, wherever it is desired that the installation and operation shall be first class. The second part takes up the testing of electrical machinery. In the third part the troubles that arise in the operation of both generators and motors are localized and the specific remedies prescribed. Each of the ten chapters deals with a particular symptom. These are: Sparking at the Commutator; Heating of Commutator and Brushes; Heating of the Armature; Heating of the Field Magnets; Heating of Bearings; Noisy Operation; Speed Not Right; Motor Stops or Fails to Start; Dynamo Fails to Generate; Voltage Not Right. Each is treated of in detail, and where the difficulty may be brought about by more than one cause, every such cause is stated and the remedy given

categorically. The fourth and fifth parts are devoted to the peculiarities of different classes of electrical machinery as made by the more prominent manufacturers, especially as regards regulation, and conclude with the management of railway motors. The book will be found to be a valuable work of reference for all who are confronted with the peculiar problems that it takes upon itself to solve.

*Consolidation Type Freight Locomotives.* Published by the American Locomotive Co., New York. 68 pages; 32 illustrations; 6 in. x 9 in.

This pamphlet describes consolidation (2-8-0) type freight locomotives weighing more than 175,000 lbs., and is uniform with the pamphlet issued in October describing engines of this type weighing less than 175,000 lbs. The present publication is the fourth of the series and illustrates and gives full specifications of 28 locomotives varying in weight up to 250,000 lbs.

# CONTRIBUTIONS

## Collapse of the Hotel Bixby.

Detroit, Nov. 13, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Associated Press gave currency to a report that the Kahn Construction Co., Detroit, Mich., had a contract for the construction work of Hotel Bixby, Long Beach, Cal., which collapsed on Nov. 9, resulting in death and injury to a number of persons. We beg to give herewith a true statement as to our connection with this building.

The building was originally designed and carefully detailed with twisted bars, and the contract was let to E. S. Spalding, Los Angeles, Cal. When the owner of the building observed some buildings of our system of hollow tile construction, he decided to use the same for his floors and so instructed his contractor. In accordance with this, Mr. Spalding purchased from us the necessary bars for the floor slabs and beams, retaining the original design with twisted bars for the footings, columns, lintels and veranda floors. We have never had anything whatsoever to do with the construction of the building, nor has any of the men directly connected with this company ever been near the building.

The damage which can be done us by a report that we have been in charge of the construction work is very serious indeed. Our steel is used in probably a thousand buildings at the present time. We try to determine the responsibility and reliability of the contractor at the time of selling our steel to him, but one will readily understand that it is not possible for us to safeguard the work of every contractor, and therefore if he is inclined to do bad work it is impossible to prevent serious catastrophes. If the Carnegie Steel Company, for example, were to hold itself responsible for every building wherein its steel beams are used, it would have a very serious undertaking on its hands.

TRUSSED CONCRETE STEEL CO.,
*J. Kahn*, President.

[Since receiving the above letter the verdict of the coroner's jury has been returned. According to press despatches, the cause of the collapse is ascribed by the jury to the premature removal of the supports of the fifth floor and proceeding with the construction of the roof before the supporting concrete had time to set properly. No individual was held criminally responsible. According to the same despatches, Contractor Spalding declared the exact cause of the collapse still to be unknown.—EDITOR.]

## Steam Locomotive and Electric Locomotive Power.

New York, Nov. 20, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial comments* on my letter on the cost of steam and electric locomotive power suggest a few explanations to reinforce my argument.

The objections raised are: (1) That my results are 300 per cent. larger than those obtained by other methods of testing, and that the difference cannot be accounted for; (2) that I neglected the number of trains and calculated the resistance by weight alone; (3) that the actual coal consumption of electric roads per horse-power hour is more than 3 lbs.; (4) that the comparison of the two kinds of power is not made on the same basis To (1) my reply is that the test runs do not directly show the total coal consumption in service, which must be inferred by making allowance for the increase caused by various differences between test runs and actual commercial service. The test runs made by Mr. Bion J. Arnold, which followed actual service conditions much more closely than other tests, substantially confirm those obtained by my method. Large differences between test runs and actual practice occur even where conditions for both are very much alike.

*Railroad Gazette*, Nov. 16, 1906, page 421.

One instance from experience may be cited: For a large pumping plant of a city of 400,000, the commissioner of public works claimed, supported by the initial tests, that the power was produced for less than $50 per horse-power year. The writer was called upon, by those who wished to sell electric power, to investigate. From the official reports of the water department it was proved that the power was produced at a cost of $95.34 per horse-power year. This pumping plant is operated with a load factor of about two-thirds. Steam locomotives work with a load factor of one-tenth to one-fifteenth. Much larger differences between tests and actual service may therefore be expected in the latter case.

Objection (2) is natural, because I dealt with averages only. The average resistance per ton for all the freight trains on a railroad has only one value, however much the actual resistance per ton may vary. The formulas for train resistance quoted show the variations with length of train, with speed and with ratio of load to weight of cars. Heavy trains have at high speed less resistance than light ones. The weight of the cars of freight trains produces much greater resistance per ton than the weight of the load.

The Burlington brake tests reported by Mr. Wellington were made with much lighter trains and smaller percentage of the weight in the form of load than is shown by trains on the roads I considered. Their train resistance is therefore greater than that on the roads which my estimate dealt with. As regards passenger trains, I state in my paper that for some of the trains my resistance of 11 lbs. per ton would be much too small. Since I wrote my letter I have been informed of the results obtained in the tests made with the new electric locomotives of the New York Central. They show train resistances for the speeds here considered, given by the formula $R = 1.8 + \frac{V}{9}$. This gives a resistance of 6 lbs. per ton for the usual passenger train speeds. The average number of cars per passenger train on the roads considered by me varies from 5 to 7.

The large resistances observed with one or two cars at high speed have therefore no bearing on this investigation. I am here comparing the steam and electric locomotives on the same basis, using for both the same speed and the same size of train. By taking 11 lbs. per ton I amply allow for the larger resistance on the short passenger trains and for the waste of power by the frequent use of brakes on the comparatively few suburban and local trains of the lines considered.

The objection under (3) is true for most existing electric roads. I have assumed for electric operation of trunk lines altogether different conditions from those now prevailing on electric roads. The 15,000 volts on the contact conductor will make practicable, on the roads considered, power stations of from 10,000 to 30,000 h.p. with a load factor of 0.6 to 0.75 and direct power transmission of 96 per cent. efficiency from the stations to the locomotives. An average efficiency of two-thirds, or more, from the power station to the rim of the drivers of the gearless locomotives can therefore easily be attained. The present electric roads have generally small geared motors of much lower efficiency than is shown by gearless locomotives. With direct currents and low voltage the transmission losses from the power station to the motor cars, inclusive of those in the rotary converter sub-stations, are generally five to six times as large as they would be under the conditions I assumed. With the alternating current lines so far in operation the voltage in the contact conductor is generally either 6,600 or 3,300 or less, and transformers with an average loss of 4 per cent. are interposed between the power station and the locomotives, making the total transmission loss about three times that which would exist under the conditions I assumed. The power stations of the present single-phase lines are generally only about one-fifth, and their load factor about one-half, as large as will be obtained in electric operation of trunk lines. Under these conditions larger coal consumption is inevitable. The late Dr. Emery, an authority on the subject, gives for a station with 2,500 h.p. reciprocating engines and a load factor of five-eighths, a coal consumption of 1.41 lb. per mechanical horse-power hour. This is equivalent to 1.5 lb. per electrical horse-power hour. The engines of large Atlantic liners are using approximately this amount of coal per horse-power hour. My assumption of 2 lbs. of coal per horse-power hour for the station described is therefore a liberal one. Much lower estimates than 3 lbs. of coal per horse-power hour at the rim of the driver might be quoted.

The objection under (4) expresses a vague but probably general feeling that more favorable conditions have been assumed with electric than with steam locomotive operation. The essence of electric operation is the concentration of power production. The power furnished by 50 to 200 of the present locomotives will be produced in one power station. This concentration of power production creates much more favorable conditions for it. A load factor of one-tenth to one-fifteenth is thereby changed to 0.6 to 0.75. The required capacity of the power station will therefore be between one-sixth and one-eleventh that of the present locomotives, instead of equal to it, as figured in a recently published estimate.

My calculation is apparently complicated, but in reality simple. It ascertains the average train resistance per ton by taking about the largest values found by recent dynamometer car tests and adding to them for losses on curves and by the use of the brakes. It then determines from official reports the ton miles of freight and passenger trains. From the ton miles and the train miles resistances per ton and the horse-power hours needed to do the work are easily determined. From these and the amount of coal used, the amount of coal used per horse-power hour is found. The apparent complication arises from the frequent repetition of the same simple operation. A large part of this repetition is for the purpose of proving the general truth of the statement that the steam locomotive uses from three to five times as much coal as an alternating current electric locomotive doing the same work and fed from a power station.

JOSEPH MAYER, M. AM. SOC. C. E.,
Consulting Engineer.

## The British System of Cartage and Delivery of Freight at Terminals.

One of the most interesting of the many divergencies of practice between American and British railroads in the matter of freight transportation is the completeness of the British scheme for gathering from the premises of the shipper and delivering at the premises of the consignee, without bother to either. British railroads are not content merely to haul their traffic from point to point on their roads, leaving one agency to secure it at the source and another at the destination to dispose of it. They prefer to see the whole thing through from start to finish, and little by little have volunteered (albeit under stress of keen competition) a remarkable series of facilities to the public. From quite early times the tendency seems to have been to provide improvements, often in advance of actual requirements, rather than to decrease the remuneration for the services rendered, as in this country. The trading community may thus to-day be said to have got about to the zenith of its privileges at the present tariff, which has remained substantially unaltered for years, and so gradually and quietly have the British companies educated their customers to better things, that they get but scanty honor for it in their own country.

The present paper shows what the London & North Western Railway, as a leading road, will do for its patrons in this matter of carting. But first, in order to clear the ground, it must be stated what, in common with its confrères, it will *not* do. There are certain kinds of more or less unremunerative freight, such as bricks, coal, creosote, gravel, hay and straw, iron ore refuse, lime, salt, etc., in bulk, manure, peat, scrap iron or steel, sand, slates, turf, wood blocks, and so forth, which the railroads do not collect or deliver at terminals, and for which only the lower, or station-to-station rates exist. Apart from these and like commodities, the companies, whether by their own teams or those of their carting agents, undertake the cartage of the bulk of the traffic at both ends of the journey without extra charge. To this established practice there are exceptions in the case of traders who prefer to arrange their own cartage; then a cheaper (station-to-station) rate is charged, or, if no such rate is quoted on the companies' books, because the freight is of a kind generally carted by the companies, a rebate is allowed off the collected-and-delivered rate. On the other hand, traffic conveyed at a station-to-station rate will be carted by the companies, if desired, at an extra charge. Nor is there any shirking in the case of heavy and unwieldy articles, such as boilers, girders, armor plates, machinery, etc., for which special vehicles are built by the roads, and expert gangs of men provided.

If the cartage agency system in Great Britain is not dead yet, its decease appears imminent, so far, at least, as the more prosperous railroads are concerned. But since the companies' own cartage equipments are kept only at average requirements, outside help continues to be requisitioned in times of pressure. The North Western declared its independence in this respect when, in July, 1901, it ended a long-standing arrangement with Messrs. Pickford & Co., a firm which had existed as carriers before the advent of railroads, and whose control over the business in the early days rendered it unwise too hastily to sever the alliance that had been formed with it. At the present date the North Western has a stock of 5,500 road vehicles employed in carting merchandise hauled in freight trains, the motive power being provided by a stud of some 5,000 horses. These are worked by 4,720 carmen and cart boys, 240 stablemen and 280 supervisors, while they are also supervised, when in the freight depots, by the foremen or inspectors in charge there. In the streets of the larger towns the movements of the carmen are directed by the supervisors, who are provided with light carriages or motor cars for rapid travel, but the men have an additional inducement to do well in the form of a bonus which is offered them by the company. Figures are consulted to find what has been a fair average weight per day over a normal period in a particular district, the average is slightly raised, and the company then says to the carmen, "For every ton over this minimum we will pay you (say) 6d. per ton," or proportionately for a smaller surplus. Under this plan the loafers have grown energetic, and the whole body of men take greater interest in their work, with the best results to the public, the company and themselves.

Steam Lorry for Collection and Delivery Work in a Hilly Country District.

The types of vehicle most commonly employed are illustrated here. Generally they are light, and they are almost entirely horse-drawn. Although a steam lorry has been found successful in a hilly district in North Wales, the speed with which town cartage work is done has, up to the present, proved an obstacle to the employment of motor vehicles. This may seem paradoxical, but is explained by the system of lading. At a large town freight depot consignments for delivery begin to arrive soon after midnight, and by 7.30 a.m., when the horses are ready for work, perhaps 200 vans have been loaded, and these, by 8 a.m., are all despatched on their rounds. There are, say, another 200 vans still available, and the loading of these is at once proceeded with and completed by 10.30,

by which time the first vans are beginning to return empty. All that has to be done is to hitch the returning animals to the newly laden vehicles and send them out again. The same teams thus provide motive power for two sets of vans. Motors could not be detached from the vans like horses, to serve a double set of vehicles, and it would not pay to keep the machinery idle for long periods while vans were being loaded and unloaded at depots. Furthermore, in crowded streets motor vehicles have little advantage over horses in point of speed, while for backing up to warehouses and standing at the angles often necessary in busy thoroughfares, they are less suitable than horse vans, with their simple fore-carriage and possible sideways position of the horse.

Single-Horse Van for Collections and Deliveries.

Two-Horse Lorry for Collections and Deliveries.

The process of delivery and collection is as follows: The carman, having finished his deliveries, starts on his collection rounds. He knows his regular customers, but he will also keep a watchful eye on every window on his route for the familiar card bearing a picture of Britannia, the North-Western Company's badge, the exhibition of which tells him that a call is desired. If he fails to get into contact with any intending shipper, or if the consignment requires unusual strength, the shipper will send by telephone, telegraph, messenger or post an order to collect, and this is responded to as promptly as the engagements of the cartage crew permit; the company often resorting to hiring rather than incur delay. The custom is to hand the carman a "consignment note," setting forth details of the consignment, its destination, and the shipper's wishes in respect to the charges. With the acceptance of this the contract begins. On reaching the depot with his load, the carman weighs in and backs as soon as may be to the unloading platform in the shed, where "checkers" are stationed, who will accept his notes and check his packages off with them as the van is unloaded by porters. Each package will be carefully weighed and the result recorded on the consignment note, both package and note being then transferred to a berth in the shed, alongside of which stands the car, presided over by a second checker and a loader-up. Their duty is to see the package carefully stowed in the car, the number of the car recorded on the note, and the note placed ready to be fetched by the shipping office messenger. In the shipping or billing office the particulars on the note, as well as rate and charges, are transferred to an invoice, which document usually goes forward to destination in advance of the car, a copy being retained for accounts and purposes of reference. On arrival of the package at its destined depot, in town or country, a "delivery sheet," copied out from the invoice by the staff at the receiving station, is in readiness, so that there need be no delay in placing the package, duly checked once more, on the proper van for delivery to the consignee's establishment, where the carman obtains a certificate of receipt on his delivery sheet. Here the contract ends. The package, or consignment of packages, has been transported throughout, from the sender's premises to the door of the receiver, by the railroad company unaided, at a charge inclusive of the services of collection and delivery and in some cases a short period of warehousing also. The delivery sheet is returned to the depot, with any money collected by the carman, and filed for future reference, the collection of any outstanding cash entered on it being entrusted to a staff of collectors. Of course there has to be a limit to the work undertaken in this way. Free collection and delivery only obtain within certain liberally wide boundaries, beyond which extra fees are charged for the cartage services. These limits are agreed on by all the railroads concerned at each place. The companies also have a time limit for collections, which enables the carmen to get to their home depots in the evening in time for the depot staff to relieve the vans of their loads and despatch the freight the same night by the proper services.

Cartage Inspectors.

Characteristic Merchandise.

The excellence of these services is such that for many years past it has been possible to have freight collected in London late in the afternoon and delivered in almost any town south of Scotland the next morning, while now the larger towns north of the Tweed, such as Edinburgh and Glasgow, have been brought within the same radius, notwithstanding the 400 miles separating them from the metropolis. This close linking up of the centers of industry has been largely aided by the fact that the cartage business

is entirely in the hands of the railroads themselves; it is the ordinary feature of every day transit in England, and contrasts most favorably with either the United States or the Continent of Europe - a system of small lots at great speed.

In considering the magnitude of the work thus involved, both indoors and out, a thought should be given to what is often called the "retail" character of British trade. The quick services afford the wholesaler, the retailer or the consumer such facilities for directly satisfying their requirements in a few hours that only small stocks and storage are needed. This has accentuated the growing tendency to small shipments, and the instructive analysis from Pratt's "Railways and Their Rates," which follows, of the weights of consignments forwarded by freight trains from the Camden and Broad street (London) depots of the North-Western Company in the course of a single day, illustrates pretty clearly the amount of handling necessary for only a small tonnage. The total forwarded weight dealt with at the two depots on the date in question was 1,358 tons of 2,240 lbs., giving an average weight per consignment of 284 lbs.

| Weights. | No. of consignments— Camden Goods Depot. | Broad St. Goods Depot. | Total. | Percentages— Camden. | Broad St. | Total. |
|---|---|---|---|---|---|---|
| Not exceeding 28 lbs... | 419 | 827 | 1,246 | 12.12 | 11.41 | 11.64 |
| " " 42 " .. | 252 | 473 | 725 | 7.28 | 6.53 | 6.77 |
| " " 56 " .. | 514 | 841 | 1,355 | 14.86 | 11.61 | 12.66 |
| " " 70 " .. | 173 | 407 | 580 | 5.00 | 5.63 | 5.42 |
| " " 84 " .. | 244 | 404 | 648 | 7.05 | 5.58 | 6.05 |
| " " 98 " .. | 111 | 242 | 353 | 3.21 | 3.34 | 3.29 |
| " " 112 " .. | 328 | 531 | 859 | 9.19 | 7.33 | 8.02 |
| " " 224 " .. | 591 | 1,506 | 2,097 | 17.08 | 20.79 | 19.59 |
| " " 336 " .. | 288 | 676 | 964 | 8.32 | 9.33 | 9.01 |
| " " 448 " .. | 168 | 380 | 548 | 4.86 | 5.24 | 5.12 |
| " " 560 " .. | 77 | 257 | 334 | 2.23 | 3.55 | 3.12 |
| " " 1,120 " .. | 160 | 456 | 616 | 4.62 | 6.29 | 5.75 |
| " " 1,680 " .. | 53 | 126 | 179 | 1.53 | 1.74 | 1.67 |
| " " 2,240 " .. | 27 | 38 | 65 | 0.78 | 0.52 | 0.61 |
| " " 2 tons..... | 33 | 57 | 90 | 0.95 | 0.79 | 0.84 |
| " " 3 " ..... | 13 | 15 | 28 | 0.38 | 0.21 | 0.26 |
| " " 4 " ..... | 9 | 9 | 18 | 0.26 | 0.12 | 0.17 |
| Total ..... | 3,460 | 7,245 | 10,705 | ..... | ..... | ..... |

This feature may be still more clearly seen from the following table, which shows the business done at North-Western freight depots at three important provincial centers as well as at the Broad street (London) depot.

| From | Tons, of 2,240 lbs. | —Consignments— No. of. | Weight. | —Packages— No. of. | Av. w't. |
|---|---|---|---|---|---|
| Curzon Street, Birmingham | 1,615 | 3,110 | 532 lbs. | 51,114 | 70 lbs. |
| Liverpool Stations ..... | 3,895 | 5,049 | 1,728 " | 79,513 | 110 " |
| London Road, Manchester.. | 1,341 | 5,522 | 544 " | 28,277 | 106 " |
| Broad Street, London..... | 906 | 6,201 | 327 " | 23,067 | 88 " |

The traffic in smaller parcels taken on passenger trains, in which the North-Western has an enormous traffic, will be discussed in a subsequent paper. In many ways the inhabitants of the United Kingdom, and especially the trading population, owe gratitude to their well-worked railroads, but in nothing more than the thoroughness with which they undertake the whole office and incidentals of transportation, by either passenger or freight trains, with as little trouble to sender and receiver as would be involved in a transaction over the counter.

## The Roadmasters' Convention.

The Roadmasters and Maintenance of Way Association held its twenty-fourth annual meeting at the Sherman House, Chicago, November 13 and 14. President C. Buhrer (L. S. & M. S.) was in the chair and about 50 members were in attendance. Mayor Dunne, of Chicago, delivered the address of welcome, to which Secretary C. E Jones made response. Fifteen new members were added.

The committee reports and papers presented for discussion were: "Best Method of Maintaining Track for the Tonnage and Speed of To-day"; "Tie Plates"; "Wood, Metal and Combination Ties"; also the subject, "What Can Be Done to Induce Young Men to Enter the Track Service and Remain Long Enough to Enable Them to Take Charge of Track as Foremen?" which was assigned for committee work, but on which there was no report, was discussed briefly. In addition, Mr. E. E. R. Tratman (*Engineering News*) read a paper on "The Construction and Maintenance of Track in Tunnels," which he explained was largely made up of matter which has already appeared in his journal.

The most important report, and the one receiving the most discussion, was the one on "Best Methods of Maintaining Track for the Tonnage and Speed of To-day." It is reprinted practically in full on another page. The reports on tie plates and on ties were briefly discussed; also, as already noted, the matter of track labor. Following the discussions of papers and reports a novel procedure was introduced. Representatives of the supply houses having exhibits at the convention were invited to come before the meeting and explain the character and merits of their devices. Quite a number took advantage of the opportunity.

The officers for the ensuing year are: President, C. H. Cornell (C. & N.-W.); First Vice-President, J. W. Guffy (A., T. & S. F.); Second Vice-President, John Kennedy (B. & O.); Secretary and Treasurer, W. E. Emery (C. & N.-W.). A. E. Hanson (C. & N.-W.) was elected to fill an unexpired term in the Executive Committee. Standing Committee on New and Improved Appliances, C. E. Jones (C., B. & Q.) and Jas. Sweeney (C. & E. I.). The next convention will be held at Chicago.

Following is a list of the exhibits:

American Steel & Wire Co., Chicago.—Wire fencing.

American Trackbarrow Co., Lowell, Mass.—Models of trackbarrow, pony car and timber truck.

American Valve & Meter Co., Cincinnati, Ohio.—"Economy" switchstands.

Atlas Railway Supply Co., Chicago.—Atlas rail joints, braces, tie plates and switchstands.

B. B. Fence Co., Peru, Ind.—Fence stays and fence posts.

Belle City Malleable Iron Co., Racine, Wis.—L. & N. anti-rail creepers, joint tie holders and Murray tie spacing and straightening jacks.

Buda Foundry & Manufacturing Co. and Paige Iron Works, Chicago.—Ramapo switchstands, hand cars, track levels and gages, semaphore stands, jacks, drills and special track-lining jack.

C. Buhrer, Sandusky, Ohio.—Buhrer new improved I-beam type steel tie with wooden cushion and insulation blocks.

Chicago Steel Tape Co., Chicago.—Tapes, leveling rods and lining poles.

Cleveland Frog & Crossing Co., Cleveland, O.—Prentice anti-rail creeper.

Cook's Railway Appliance Co., Kalamazoo, Mich.—Track jacks, track drills, tool grinders, and cattle guards.

Dressel Railway Lamp Works, New York.—Switch and signal lamps.

Louis Dunn, St. Paul, Minn.—Dunn's frog and switch indicator and blueprints showing the Dunn safety and the Dunn-Strawhorn switch adjuster.

Fairbanks, Morse & Co., Chicago.—Track jacks, gasolene section car, velocipedes and track supplies.

Grip Nut Co., Chicago.—Samples of grip nuts.

Hayes Track Appliance Co., Geneva, N. Y.—Lifting derails and pivot derails with target stands.

Hussey-Binns Shovel Co., Pittsburg, Pa.—Shovels, spades and scoops.

O. F. Jordan, Chicago.—Model of ballast spreader.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Hand and velocipede cars, track drills, gages, levels and jacks, wheels and axles.

Locomotive Appliance Co., Chicago.—Smith derailing switches, Freeland automatic derailing switches, Newton wrecking frogs and Newton divided frogs.

Luther Bros. Company, North Milwaukee, Wis.—Grinding machines.

Marshall & Dunn, St. Johns, Mich.—Model of boltless rail joint.

McCord & Company, Chicago and New York.—Model of Gibraltar bumping post.

McMyler Manufacturing Co., Cleveland, Ohio.—Odenkirk switchstand and Economy separable switch points and lock cranes.

National Lock Washer Co., Newark, N. J.—Nut locks, and samples showing efficiency.

Pennsylvania Steel Co., Steelton, Pa.—"New Era" and "Century" switchstands, semaphore switchstands with disappearing blade, "Manard" frogs, and track material.

Quincy, Manchester, Sargeut Co., Chicago.—Bonzano rail joint, Q. & C. rail anchor, elastic nut lock and Cafferty tie tongs.

Rail Joint Company, New York.—Samples of Continuous, Weber and Wolhaupter standard rail joints. Insulated joints and step joints.

Railroad Supply Company, Chicago.—Tie plates, Stanford bumping post and railroad supplies.

Railway Specialty & Supply Co., Chicago.—Smith improved lock nut.

Ramapo Iron Works, Hillburn, N. Y.—Safety split switches and automatic switchstands.

Joseph T. Ryerson & Sons, Chicago.—Working model of Ryerson flue-cleaning machine; Simplex track and car jacks.

Van Wormer & Moudy, West Unity, Ohio.—Loose-pin nut lock.

Western Association of Inventors and Patent Development Co., Corona, Cal.—Model showing method of railroad construction with ties parallel with rails and literature describing same.

A. J. Wilson, Chicago.—Nut locks.

## Single Track Train Operation on the Wheeling & Lake Erie.

The accompanying photograph shows graphically the extra and regular trains run on September 2, 1906, on the main line of the Wheeling & Lake Erie between Toledo and Steubenville, including a specially busy stretch of single track line. The following tables sum up the information contained in the chart:

| | Eastbound. | Westbound. | East & Westbound. |
|---|---|---|---|
| Total No. trains, (helpers and short runs) | 85 | 75 | 160 |
| Total No. through freight trains..... | 34 | 30 | 64 |
| Total mileage of through freight trains... | 2,250.1 | 2,101.1 | 4,351.2 |
| Total hours, through freight trains on road | 257:08 | 261:28 | 518:36 |
| Total hours delay to through freight trains | 105:27 | 115:41 | 221:08 |
| Av. speed, through freights, bet. terminals | 8.7 | 8.0 | 8.4 |
| Av. speed, through freights, while moving | 14.8 | 14.4 | 14.6 |
| Total No. of cars handled on through freight trains..... | | | 2,612 |
| Average No. of cars handled on through freight train, per train..... | | | 42.3 |
| Total No. meeting and passing points (Huron Junct'n Pittsburg Junct'n) | | | 296 |
| Average No. of cars handled on through freight trains, per train..... | | | 42.3 |
| Least No. meeting or passing points, any one hour..... | | | 6.0 |
| Greatest No. meeting or passing points, any one hour..... | | | 21.0 |

It will be observed that the time spent in delays on through freight runs averaged a little over three minutes per mile run. Daily records for a period of two years on different divisions of the Southern Pacific lines, showed that the time actually consumed in stops on freight runs having physical characteristics similar to the Wabash lines east of Toledo varied from thirty seconds to one minute per mile run on single track line, according to density of traffic. The very much higher figure shown on the Wheeling & Lake Erie, three times that on the Southern Pacific, is due to the congested condition of the line.

While there is no information available showing the time actually consumed by freight trains on a double track line, which, of course, would be affected by the number of fast passenger trains which freight trains running in the same direction would be required to clear, it is reasonable to assume that the delay on a double track line under average conditions would not be greater than on single track line under average conditions, namely, one minute per mile run.

Assuming that the line between Pittsburg Junction and Huron Junction were double track, the time allowance for stops on the 124

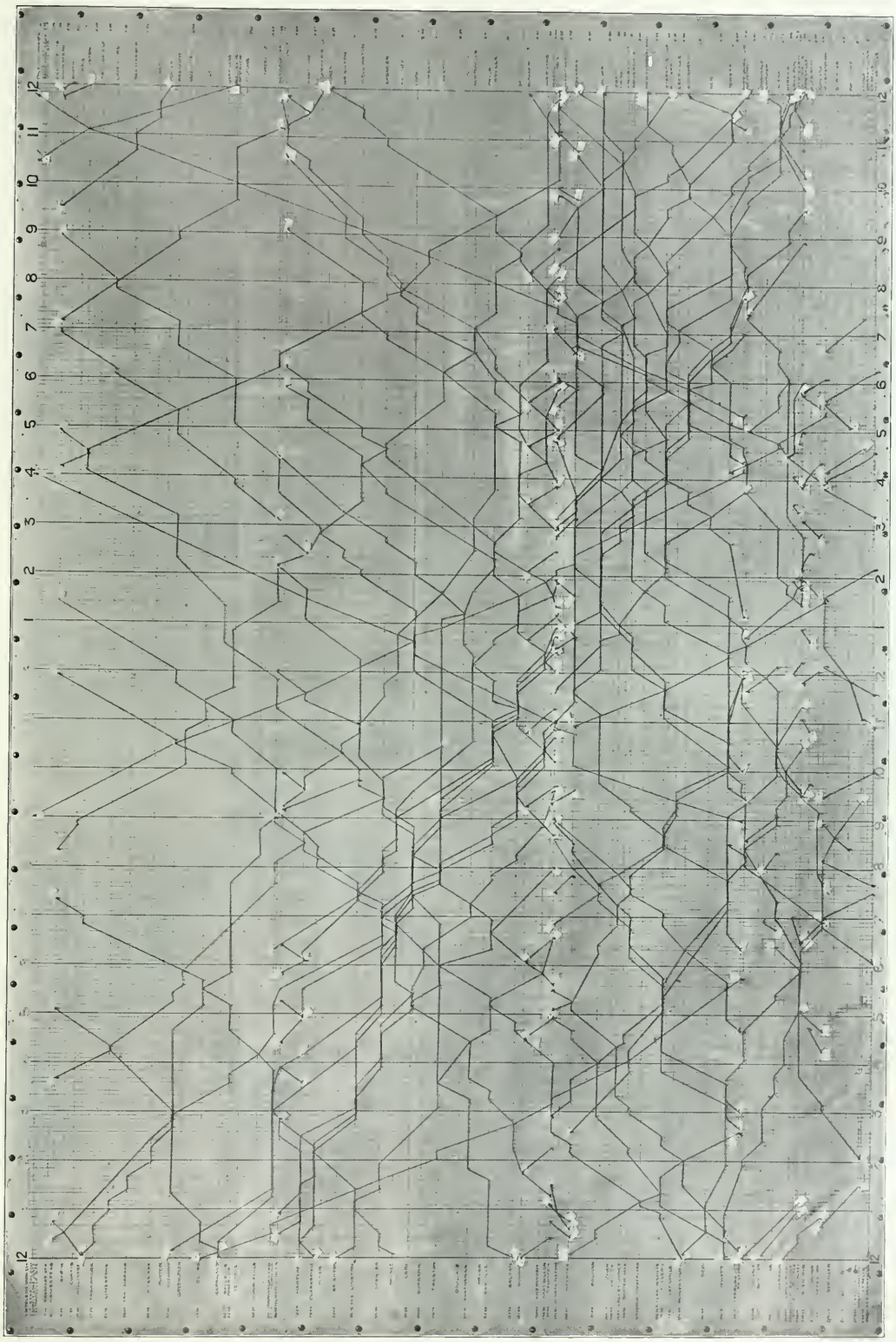


Chart Showing Extra and Regular Trains on Wheeling & Lake Erie Between Toledo and Steubenville on Sunday, September 2, 1906.

miles would be two hours and four minutes, which would seem to be ample. On this basis, the delay of 221 hours, 8 minutes, shown under present conditions, would become 72 hours, 30 minutes, a saving of 148 hours, 37 minutes, and as this saving of time would readily be converted from "delayed" to "moving" time, the average speed of through freight trains between terminals would become 11.8 miles an hour instead of 8.4 miles an hour as now. Yet the actual running time of trains need be no faster than at present. Furthermore, overtime payments now average about $12,000 a month in train service, and probably would also be reduced in the same proportion as delayed time, or a saving of about $8,000 a month on this item.

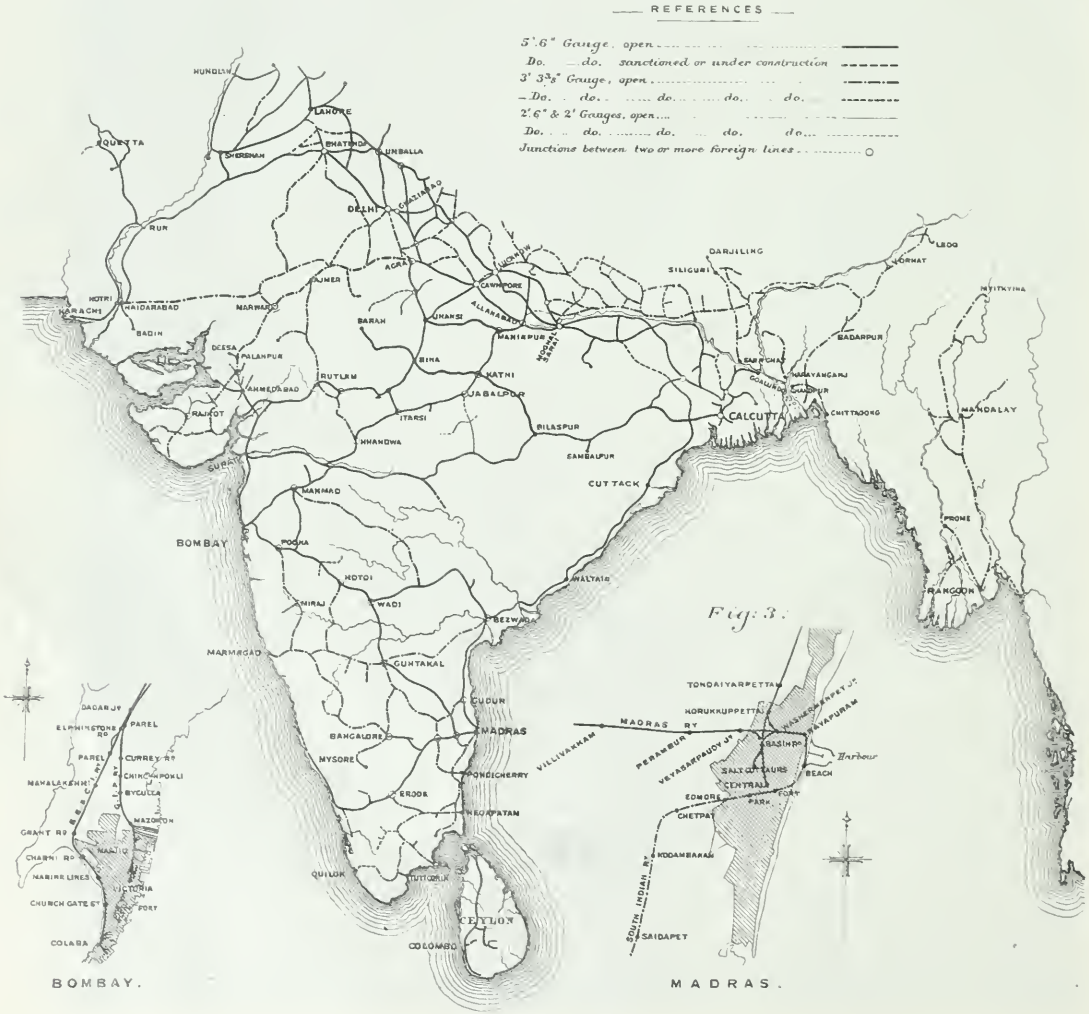
The increase in the speed of through freight trains between terminals would mean a gain of 1,753.48 train miles on the particular day shown on the chart. The average earnings per freight train mile for September were $3.21. Applying this to the increased train mileage (1,753.48 train miles) the earnings on this particular day would be increased $5,629, and as this is only an average day's business, the annual gross earnings would be approximately increased $1,500,000. Allowing 60 per cent. for operating expenses, the net earnings would be $600,000, and this amount, capitalized at 5 per cent., would be equivalent to earning interest on $12,000,000. At the same time the road would be getting the benefit of a double track, which would enable it to increase its volume of traffic fully three times. It will be seen that if with a double track line there were an average movement of 11.8 miles an hour between terminals, instead of 8.4 miles an hour, which is not an unreasonable expectation, this result alone would increase the capacity of the present car and locomotive equipment over 40 per cent.

The chart shows considerable delay to westbound trains at Bolivar and Navarre and to eastbound trains at Sherwood, due to inadequate yard facilities at Columbia, the principal intermediate freight terminal, necessitating holding out trains until this yard can be relieved. When the new 2,000-car yard at Brewster, now in process of construction on the 22-mile cutoff line from Orrville to Bolivar, is completed, the delay at Columbia yard will be entirely done away with. The estimate of the cost of double track between Huron Junction and Pittsburg Junction, including quite a number of line and grade changes to improve alinement and to attain a 0.4 per cent. maximum grade eastbound and a 0.6 per cent. maximum grade eastbound, is $3,404,550, to which should be added about $1,000 per mile for 124 miles to cover electric automatic block signals to bring the road strictly up to modern practice. For this information we are indebted to B. A. Worthington, First Vice-President and General Manager of the Wheeling & Lake Erie and the Wabash Pittsburg Terminal.

## The Railroad Gages of India.*

The subject of the railroad gages of India was discussed at the Institution in 1873, and again, after an interval of 16 years, in 1889. A similar interval has now elapsed, and the present seems to be an appropriate time to review what has been done since the latter date, and to examine the possibilities of gradually attaining uniformity of gage, and the advantages to be obtained thereby. The questions which naturally arise are: (1) whether the cost and

*From a paper presented before the Institution of Civil Engineers by Sir Frederick R. Upcott.




Map of Indian Railways Showing Present and Proposed Lines of Different Gages.

confusion which will necessarily accompany gradual conversion outweigh the advantages of uniformity; and (2) whether the growing needs of traffic may not be met by continuation and extension of different gages, treating each case on its merits, without attempting to establish any definite scheme.

In examining these questions it is hardly necessary to take into account the countries bordering on India which may in the future connect with the Indian railroad system, because Russia and China have adopted gages differing from those in India, and Persia has only a few miles of railroad at the present time. India is a vast country, and the bulk of its imports and exports are carried by sea. Moreover, its internal trade is very large, and its overland trade with these countries can hardly become of sufficient importance to warrant the adoption of a gage differing from those now in existence in India.

The policy which was formulated in the early seventies, and reiterated at the close of 1888, of adopting two gages and restricting them to certain defined areas, has not been rigidly adhered to, the pressure of trade requirements and of rival interests having resulted in encroachments by each on the other's territory, induced by the necessity of linking groups of railroads of similar gage. Until 1890 the area served by the meter-gage lines was fairly well defined, being limited to the country north and east of the Ganges river, starting from longitude 80 deg. E., the whole of Burma, Rajputana and Gujrat, and the country south and west of the standard-gage line connecting Bombay and Madras; but by that time the meter-gage lines had gradually increased in efficiency with heavier and larger rolling stock and permanent way, so that they passed out of the category of light lines. On the other hand, the later standard-gage lines were built at less cost per mile than the earlier ones, and thus it became a still more difficult question to decide which gage should be adopted in any given case, the difficulty being accentuated by the very reasonable demands of the meter-gage lines to obtain access on their own gage to all the large centers of trade near them on the standard-gage lines, as well as to be linked with adjacent meter-gage systems, and in some cases to obtain connection with the seaports. The result has been that, in giving effect to some of the demands of the meter-gage lines, the standard-gage lines have been crossed at many places, and the gage that was originally intended to feed the standard-gage lines has become competitive; this, however, may be held to have actually resulted in benefit to the country and to trade, rather than the reverse, as has been often asserted by those who deprecate rivalry in the great arteries of traffic.

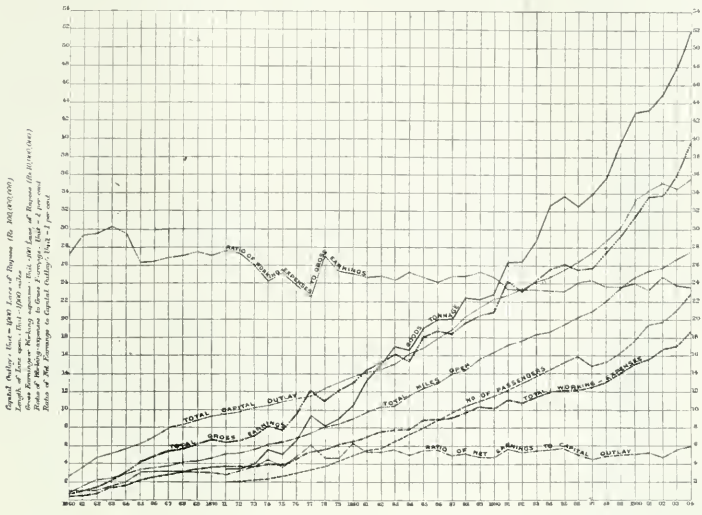



Chart of Principal Operating Statistics of Indian Railways.

The present result is that at the close of 1903 there were in India 14,477 miles of standard, or 5-ft. 6-in. gage; 11,421 miles of meter or 3-ft. 3⅜-in. gage; 796 miles of 2-ft. 6-in. gage, and 262 miles of 2-ft. gage, open to public traffic, making a total of 26,956 miles; while 1,162, 1,273, 575 and 113 miles, respectively, were under construction and sanctioned. To a large extent the areas originally set apart for the meter-gage lines have been fairly well preserved, although, as was inevitable, certain connections have been made between the systems served by the meter-gage lines. Thus the meter-gage lines north of the Ganges have been joined with the meter-gage systems of Rajputana on the west and with the Assam meter-gage system on the east, while the Gujrat meter-gage system has been joined to that of Rajputana. The Rajputana system has approached the seaport of Karachi and may press for the short extension to that port, although there is already a double standard-gage track between Kotri and Karachi. An extension of the meter-gage line from Khandwa to Hotgi appears likely to be necessary in the near future, to link up the southern and northern meter-gage system; while the meter-gage line along the Godavari valley was undertaken by the Nizam's Government with a view to opening out that country as economically as possible, instead of laying down a light standard-gage line. Of the 2-ft. 6-in. and 2-ft. gages, now reaching a total length of 1,058 miles, it may be said that the success of the first two lines on these gages, the Darjiling and the Barsi lines, both constructed by private companies, not only drew the attention of the military authorities to the capabilities of a small gage for serving hilly tracts at a reasonable cost, to act as pioneer lines for the standard gage, but has also led to other lines being started as tramways which have eventually developed into railroads. These small-gage lines do not, in general, serve

TABLE I.—STANDARD-GAGE RAILROADS, 1903.

| Railroad. | Mileage. | Cost per mile. | Return on capital. | Per cent. of working. | Average: Cost of carriage per pass'ger-mile. | Average: No. of passengers per train. | Average: Charge per ton-mile. | Average: Cost of carriage per ton-mile. | Average: Weight per train. | Percentage freight to gross weight of train. | Gross earnings per mile per annum. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Miles. | | Per cent. | Per cent. | Pence. | No. | Pence. | Pence. | Tons. | Per cent. | |
| East Indian | 2,231 | £15,000 | 9.4 | 34 | 0.06 | 210 | 0.35 | 0.12 | 240 | 43 | £2,200 |
| East Bengal | 278 | 18,000 | 6.4 | 54 | 0.11 | 188 | 0.39 | 0.31 | 150 | 34 | 2,452 |
| Oudh and Rohilkhand | 1,105 | 7,800 | 5.3 | 49 | 0.10 | 155 | 0.42 | 0.21 | 157 | 33 | 800 |
| Great Indian Peninsula | 2,745 | 13,000 | 7.7 | 51 | 0.13 | 131 | 0.54 | 0.26 | 145 | 25 | 1,378 |
| North Western | 3,744 | 9,600 | 4.8 | 49 | 0.09 | 176 | 0.42 | 0.22 | 161 | 40 | 1,208 |
| Bengal-Nagpur | 1,667 | 8,900 | 3.9 | 54 | 0.09 | 212 | 0.39 | 0.23 | 138 | 36 | 582 |
| Madras | 1,400 | 9,100 | 3.6 | 58 | 0.11 | 233 | 0.56 | 0.35 | 107 | 21 | 827 |
| Bombay Baroda and Central India | 825 | 13,000 | 5.9 | 50 | 0.13 | 221 | 0.66 | 0.29 | 262 | 43 | 1,590 |
| Total | 13,996 | ..... | ... | ... | ... | ... | ... | ... | ... | ... | ..... |
| Average | ..... | £11,806 | 5.7 | 50 | 0.10 | 191 | 0.46 | 0.25 | 167 | 34 | 1,380 |

TABLE II.—METER-GAGE RAILROADS, 1903.

| Railroad. | Mileage. | Cost per mile. | Return on capital. | Per cent. of working. | Average: Cost of carriage per pass'ger-mile. | Average: No. of passengers per train. | Average: Charge per ton-mile. | Average: Cost of carriage per ton-mile. | Average: Weight per train. | Percentage freight to gross weight of train. | Gross earnings per mile per annum. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Miles. | | Per cent. | Per cent. | Pence. | No. | Pence. | Pence. | Tons. | Per cent. | |
| Bengal North West | 1,418 | £5,300 | 6.3 | 43 | 0.06 | 208 | 0.49 | 0.19 | 101 | 42 | 559 |
| South Indian | 1,249 | 4,600 | 8.5 | 39 | 0.06 | 302 | 0.60 | 0.28 | 79 | 40 | 688 |
| Burma | 1,323 | 6,250 | 4.0 | 61 | 0.12 | 209 | 0.59 | 0.42 | 73 | 35 | 684 |
| Eastern Bengal | 732 | 6,250 | 5.6 | 50 | 0.12 | 194 | 0.63 | 0.36 | 83 | 36 | 689 |
| Southern Marhatta | 1,646 | 5,650 | 2.5 | 62 | 0.11 | 185 | 0.57 | 0.37 | 76 | 38 | 387 |
| Rajputana-Malwa | 1,871 | 5,000 | 7.6 | 50 | 0.10 | 240 | 0.55 | 0.28 | 128 | 47 | 792 |
| Jodhpur-Bikaner | 824 | 1,700 | 6.6 | 50 | 0.10 | 187 | 0.61 | 0.29 | 81 | 38 | 222 |
| Rohilkhand-Kumaun | 280 | 3,000 | 7.0 | 48 | 0.10 | 166 | 0.56 | 0.30 | 87 | 40 | 432 |
| Total | 9,343 | ..... | ... | ... | ... | ... | ... | ... | ... | ... | ..... |
| Average | ..... | £4,750 | 6.0 | 50 | 0.096 | 211 | 0.57 | 0.31 | 88 | 39 | 557 |

meter-gage lines but have been built as continuations of, and feeders to, the standard-gage lines.

The tables given herewith, which have been compiled from the Railway Administration Report for 1903, present, so far as statistics can help to solve the problem, a fair basis for comparison of the relative merits of the standard and meter-gage systems. It is not claimed that an exact comparison can be drawn between them, because the conditions are not entirely similar; the physical nature of the country varies greatly, and strategic considerations have often compelled the adoption of a more expensive line than the commercial importance of the country justified. Nor is it suggested that the government could, under the numerous contracts entered into with companies for working state-owned lines, carry out any sudden or drastic change; any approach to uniformity that may be possible and desirable must of necessity be gradual. It may also be noted that the question of actual profit or loss to the Imperial government does not enter into the scope of the present inquiry, because, although the Indian railroad system does now yield a handsome profit to the government—which is the owner of nearly the whole of it—yet, owing to the plan originally adopted of guaranteeing sterling interest on lines since purchased, to the fluctuations of silver, to the premiums paid on purchase of the older lines, and to the provision, for its own lines, of capital raised partly by borrowing at various rates of interest and partly from the general revenues of the country, it is very difficult to calculate closely what may be called the fixed charges. Suffice it to say that 4 per cent. is generally accepted as approximately correct.

For the purpose of comparing the leading features of the two gages, the eight principal lines on each gage have been selected, and various particulars relating to them are shown. In making comparisons there are certain facts to be remembered: first, that so far all the meter-gage lines are single tracks, whilst 1,360 miles, or about 9 per cent., of the standard-gage lines are double tracks; secondly, that the branches to the meter-gage lines, especially north of the River Ganges, are much more numerous than those to the standard-gage lines; and thirdly, that the coal fields are served almost entirely by standard-gage lines, as is shown by the fact that in 1903, whilst the standard-gage lines carried 7½ million tons of coal, the meter-gage lines carried only the insignificant total of 112,000 tons. The year 1903 has been taken, not only because it is the most recent for which complete statistics are available, but also because some of the meter-gage lines had nearly arrived at their maximum capacity on a single track. The statistics have been compiled to exhibit in as fair a manner as possible the comparative value of the gages. The author does not claim that the question laid before the profession can be decided by figures; there are so many circumstances which have to be taken into account that it seems almost an insoluble problem. So far, the evil of the two gages has not been so great as was anticipated, but there is a feeling among many whose knowledge of the subject entitles them to be heard, that the confusion will grow from year to year, unless some more definite policy is adhered to than that which has been followed during the last 30 years. It is considered that there is a distinct danger lest the whole continent may be covered with a network of lines, of three different gages; and that the meter-gage and the 2-ft. 6-in. gage, originally introduced on the plea of cheapness and lightness, will, in course of time, be so strengthened that they will be able to carry a traffic that would almost support the standard gage.

*(To be continued.)*

TABLE III.—THOUSAND PASSENGER-MILES AND THOUSAND TON-MILES DURING 1903.

| Railroad. | Thousand passenger-miles. | Thousand ton-miles. |
|---|---|---|
| Standard Gage. | | |
| East Indian | 1,417,665 | 2,227,443 |
| Eastern Bengal | 216,199 | 153,624 |
| Oudh and Rohilkhand | 394,233 | 257,503 |
| Great Indian Peninsula | 874,084 | 1,223,607 |
| North Western | 1,183,292 | 1,315,489 |
| Bengal Nagpur | 415,176 | 362,087 |
| Madras | 476,766 | 283,145 |
| Bombay, Baroda and Central India | 405,059 | 294,571 |
| Average per mile of track | 385 | 437 |
| Remarks:—Nearly 9 per cent. of these lines are double track. | | |
| Meter Gage. | | |
| Bengal North Western | 458,027 | 213,814 |
| South Indian | 587,977 | 149,265 |
| Burma | 386,651 | 181,569 |
| Eastern Bengal | 213,179 | 111,135 |
| Southern Marhatta | 263,501 | 162,724 |
| Rajputana-Malwa | 605,676 | 414,581 |
| Jodhpur-Bikaner | 82,581 | 42,221 |
| Rohilkhand-Kumaun | 50,740 | 28,162 |
| Average per mile of track | 283 | 140 |
| Remarks:—All these lines are single track. | | |

TABLE IV.—AVERAGE SPEEDS AND AVERAGE GROSS WEIGHT OF TRAINS DURING 1903.

| Railroad. | Average through speed per hr. | | | Average gross weight of trains. | | |
|---|---|---|---|---|---|---|
| Standard Gage. | Pas-senger. Miles. | Goods. Miles. | Mixed. Miles. | Pas-senger.* Tons. | Goods. Tons. | Mixed.* Tons. |
| East Indian | 20 | 14 | 17 | 197 | 487 | 240 |
| Eastern Bengal | 19 | 15 | 14 | 173 | 422 | 217 |
| Oudh and Rohilkhand | 29 | 13 | 18 | 185 | 333 | 225 |
| Great Indian Peninsula | 27 | 13 | 13 | 157 | 351 | ... |
| North Western | 21 | 12 | 15 | 205 | 330 | 250 |
| Bengal-Nagpur | 26 | 11 | 17 | 197 | 332 | 340 |
| Madras | 26 | 12 | 10 | 151 | 348 | 276 |
| Bombay, Baroda and Cent. India. | 21 | 10 | 14 | 162 | 562 | 246 |
| Average | 23 | 12 | 15 | 178 | 396 | 256 |
| Meter Gage. | | | | | | |
| Bengal North Western | 17 | 10 | 12 | 151 | 182 | 163 |
| South Indian | 18 | 10 | 12 | 85 | 152 | 167 |
| Burma | 19 | 11 | 13 | 131 | 166 | 174 |
| Eastern Bengal | 19 | 11 | 13 | 112 | 225 | 143 |
| Southern Marhatta | 16 | 7 | 12 | 95 | 273 | 212 |
| Rajputana Malwa | 18 | 10 | 14 | 105 | 251 | 138 |
| Jodhpur Bikaner | 19 | 11 | 13 | 93 | 176 | 117 |
| Rohilkhand-Kumaun | 17 | 10 | 14 | Not furnished. | | |
| Average | 18 | 10 | 13 | 110 | 204 | 159 |

*For the purposes of these tables passengers are taken as weighing, with luggage: First class, 0.10 ton; second class, 0.08 ton; third class, 0.06 ton.

TABLE V.—THOUSAND PASSENGER-VEHICLE MILES AND THOUSAND GOODS-VEHICLE MILES DURING 1903.

| Railroads. | Thousand passenger-vehicle miles. | Thousand goods vehicle miles. | Railroads. | Thousand passenger-vehicle miles. | Thousand goods-vehicle miles. |
|---|---|---|---|---|---|
| Standard gage. | | | Meter gage. | | |
| East Indian | 119,480 | 304,185 | Bengal N. Westn | 50,569 | 58,386 |
| Eastern Bengal | 17,447 | 30,628 | South Indian | 40,230 | 39,527 |
| Oudh and Rohilkhand | 36,610 | 59,033 | Burma | 38,800 | 56,643 |
| Gt. Indian Penin. | 103,370 | 215,820 | Eastern Bengal | 21,171 | 35,328 |
| North Western | 166,008 | 219,640 | Soth'n Marhatta | 30,218 | 47,088 |
| Bengal-Nagpur | 37,893 | 58,368 | Rajputana-Malwa | 60,882 | 97,554 |
| Madras | 37,396 | 59,727 | Jodhpur-Bikaner | 9,488 | 12,490 |
| Bombay, Baroda and Cent. India | 29,342 | 44,738 | Rohilkhand-Kumaun | 5,912 | 7,486 |
| Average | 60,943 | 122,892 | Average | 32,159 | 44,313 |

METHOD OF CALCULATING COST PER PASSENGER-MILE AND PER TON-MILE.

The average cost per passenger-mile and per ton-mile is calculated by dividing the working-expenses in the ratio of the gross ton-mileage of freight and of dead load, assuming the weights of the passengers, with luggage, to be: First class, 0.1 ton; second class, 0.08 ton; intermediate and third class, 0.06 ton. For example, take the East Indian Railroad passengers for 1903, in thousands:

| | | |
|---|---|---|
| First class | 10,550 x 0.1 ton = | 1,055 |
| Second class | 28,277 x 0.08 ton = | 2,262 |
| Intermediate class | 102,655 x 0.06 ton = | 6,159 |
| Third class | 1,276,183 x 0.06 ton = | 76,571 |
| | | 86,047 |
| Add other coaching traffic, parcels, etc., in ton-miles | | 21,880 |
| | | 107,927 |
| Total dead weight in ton-miles | | 1,836,741 |
| Total coaching | | 1,944,668 |
| Goods total freight in thousand tons | | 2,227,442 |
| Goods total dead weight in thousand tons | | 2,890,426 |
| Total goods | | 5,117,868 |
| Total ton-miles | | 7,062,536,000 |
| Total working-expenses (in rupees) | | 233,63,000 |
| Total gross receipts (in rupees) | | 713,80,000 |

Working expenses in ratio of gross receipts:—

749 + 1,587 = 2,336 ; 22,929 + 48,451 = 71,380 ; $\frac{1}{3.1}$

6,433 + 16,930 = 23,363 ; 19,450 + 51,180 = 70,630 ; $\frac{1}{3.63}$ ratio of ton-miles.

Then the total working expenses in thousands of rupees, namely, 23,363, divided in the ratio of the ton-miles, namely, 1,945 and 5,118, will give 6,433 and 16,930. If, however, the division be made on the gross receipts from coaching and goods, namely, 22,929 and 48,451, respectively, the ratio is—

| Coaching. | Goods. |
|---|---|
| 1 | 3.1 |
| as against 1 | 3.63 in the former case. |

The foregoing passenger weights give an average of 0.061 ton per passenger, which agrees fairly closely with the figure arrived at by Mr. Jeans, in his work on Railway Problems, namely, that for the purpose of ascertaining the proportion of working expenses due to passengers, as distinguished from goods, fifteen passengers may be taken to weigh 1 ton.

This method shows incidentally, as far as it is considered reliable, the ratio of paying load to dead load in carrying passengers and goods.

## Best Method of Maintaining Track for the Tonnage and Speed of To-day.*

*Foundation.*—The committee recommends that more care be taken to prepare the foundation for roadbeds. Material of the soundest and hardest character or quality should be used, such as stone, natural soil, hard clay, slate, gravel, sand or cinders. Muggy, spongy, water-holding clay or quicksand should not be used. Where roadbeds are built on soft, water-holding clay or quicksand, not less than 3 to 4 ft. of sound, solid material should be placed on top of it. In soft cuts, containing spongy clay or quicksand the grading should be done low enough to allow at least 3 or 4 ft. of good ballast under the ties.

Foundations for tracks should be built so that every rainstorm will not affect the surface and line of the track. The committee has observed cases where good surface, which took months of hard work and large sums of money to prepare, was destroyed during heavy rainstorms. This result could have been avoided on a permanent roadbed. It would justify the first cost of building a permanent roadbed, as the expense of continually surfacing up low and uneven places is high; and besides uneven track is very annoying to high speed trains, and is also dangerous. Where the tracks are laid close to spongy clay and close to quicksand, if the grade will not permit of raising the track high enough, sufficient depth of material should be dug out at these places, and supplied with 3 to 4 ft. of good, clean stone ballast. In this way continuous settlement and uneven track can be avoided at these points.

Permanent roadbeds should be built 20 to 22 ft. wide, for single tracks, and 24 to 35 ft. wide for double track, on high fills, and the same width in cuts to make room for good surface side ditches. The wide banks on high fills will pay for themselves by being made broad enough to keep ballast and ties from going down the slope while unloading. The time spent from year to year in getting up ties, ballast and rails that have rolled down high banks is expensive, and it would more than justify the building of wide banks for roadbeds on high fills. The slopes on embankments, earth, should be built $1\frac{1}{2}$ to 1, rock from 1 to $1\frac{1}{2}$ to 1. In excavation earth should stand $1\frac{1}{2}$ to 1, to 3 to 1, loose rock $\frac{1}{2}$ to 1; solid rock $\frac{1}{4}$ to 1 within the limits stated. These ratios may be varied as existing conditions demand.

*Drainage.*—To have good permanent track it is absolutely necessary to have good drainage. All track and roadbed should be kept free from water. No water should be allowed to remain on roadbed or tracks. Drainage should be provided by open surface ditches and tile drains, as the existing conditions permit and demand. The committee recommends that more tile drain ditches be laid, but nothing smaller than 4-in. drain tile should be laid in them; larger drain tile is preferable for the roadbed and track drainage.

On roadbeds built on soft, water-holding material, cross drains should be provided to keep the roadbed dry. Careful drainage of cuts with drain tile will, to a great extent, avoid heaving of track in the winter time. Surface ditches should be kept clean, and all rubbish, grass and shrubbery should be cut from the bottom of the ditches at least once a year. Good outlets should be provided for drains so that the water can run away freely. The ditching on roads that have a great many cuts causes expensive maintenance, and great care should be taken to provide the proper slope for the banks in order to avoid sliding or washing. All slopes or cuts should be built to the proper slope for the material to keep it from sliding or washing down upon the track and ditches, and at times covering the track and mixing clay with the ballast, thereby doing a large amount of damage. The extra expense so caused would more than justify building the proper slope for the banks when the road is constructed.

All cuts should be provided with good surface ditches on top of banks. No water should be allowed to enter cuts. By good surface ditches on top of banks a large amount of sliding material can be avoided. In cuts drain-tile ditches should be laid on each side of the track, about 1 ft. from the end of the ties; on double track, drain tile should be laid between the two tracks, and cross drains provided about every 500 ft. Drain tile should be laid at least 2 ft. below the top surface of the ballast, on the roadbed, and covered with porous cinders for about 1 ft. Borrow pits along the tracks should be connected with the nearest water course. Material should not be borrowed to a greater depth than will permit proper drainage. Where water is standing near the track in borrow pits or other depressions that cannot be drained, the pit should be filled to sufficient depth to prevent the standing of water near the track.

*Depth and Kind of Ballast.*—On account of the increase in tonnage and speed in past years the committee recommends broken or crushed stone durable enough to resist the disintegrating influences of the weather and climate where used. It should be hard enough to prevent pulverizing under the treatment to which it is subjected, and stone should be selected that will break in angular pieces when crushed. The maximum size of ballast should not exceed that of pieces which will pass through screens having $1\frac{1}{2}$ to 2 in. holes. The minimum size should not pass through a screen having $\frac{1}{4}$ in. holes. For new roadbed the depth of ballast should not be less than 18 in., but on old roadbed, where gravel or cinder ballast has been used to a depth of 10 or 12 in. an additional 6 in. of stone ballast supplied under the ties will give good results. This class of ballast will be free from dust, which is a very essential point, as dust is very annoying to the traveling public during the summer season, when the weather is hot and the windows are left open. Gravel ballast, unless it is washed and the fine dust removed, will be more or less dusty, and besides, much of the gravel used is badly mixed with clay, and during wet weather gets soft and mushy, causing the track to get loose and out of surface. Gravel ballast cannot be worked sucessfully while wet. Stone ballast can be worked during wet weather as well as in dry weather. While stone ballast is harder to work than gravel ballast, it will maintain surface and line better than gravel and will make a more permanent roadbed.

*Size, Length and Spacing of Ties.*—The committee recommends 7 in. x 9 in. x $8\frac{1}{2}$ ft. ties as the proper size to take care of and hold up the track under present traffic. It believes that by supplying more bearing surface outside of the rails better results will be obtained. The 8-ft. tie in almost universal use was of sufficient length until the heavy rolling stock came into use. The engines of to-day are much higher and wider than the engines of five or ten years ago, making them top heavy, and the track department is expected to, and must, maintain the track with ties of the same length as were used with lighter equipment and rolling stock. We would recommend as the proper spacing of ties of 8 in. face, 18 in. center to center; for 9-in. face, 20 in. center to center; shoulder ties at joints should be 16 to 18 in. center to center. This spacing would provide better bearing surface for the traffic of to-day. Ties should also be uniform in length, to supply an even bearing on both sides of the track.

*Weight, Height and Pattern of Rail.*—The committee recommends for steam railroads on heavy traffic lines, rails weighing 90 to 100 lbs. per yard, and from 30 to 33 ft. long. Rails weighing 90 to 100 lbs. per yard at this length will be heavy enough to handle and unload from cars and lay in track. The committee has observed that some of the failures of the pattern of rail now used are caused by the head of the rail being too wide for the web. A stronger web in proportion to the head of the rail should be provided to give sufficient support to the head of the rail and avoid splitting, or what is ordinarily called piping.

The committee considers a rail 5 in. high is high enough, on account of the danger of spreading track. The higher the rail stands above its base or bearing the stronger is the leverage on the same. When we consider the speed of trains as high as 70 to 75 m.p.h. with a 200-ton engine, swinging back and forth on the rails and striking a blow which it is impossible to figure, it stands to reason that the top of the rail should be kept within moderate height. The committee recommends that a rail with a 6-in. base and 5 in. height rolled in proportion, is a safe and proper rail to be used with the present rolling stock. The wide base would materially lessen the tendency of the rail to cut into the ties. It will give a larger and a more solid bearing surface, and with this design of rail there should be less spreading of track.

RENEWING TIES IN DIFFERENT KINDS OF BALLAST.

*Stone Ballast.*—If a general renewal can be made, the best result will be obtained by lifting the track with jacks sufficiently high after the stone has been removed from between the ties so that the old decayed ties can be removed without destroying the roadbed under the same, and then placing the new ties on the old foundation and resurfacing the track carefully and true. These ties should be carefully tamped with tamping picks. But when only two or three decayed ties are to be removed from under one rail and the track is in general good surface, it would not be justifiable to disturb the roadbed. In that case the cheapest and quickest way is to dig out for these ties so that they can be removed without disturbing the remainder of roadbed.

*Gravel Ballast.*—If a general renewal is to be made the best results can be obtained by lifting the track sufficiently high to remove the old ties without disturbing the roadbed, and permit the new ties to be carefully bedded. In this way the general surface of the track will not be disturbed. The new ties should be carefully tamped with shovels on the day they are placed in the track, and on the following day this track should be carefully resurfaced and all ties carefully tamped with tamping bars or picks. Where there are only from three to five ties to be removed in one rail length and the general surface is good it is not proper to raise the track, but the decayed ties should be dug out and the new ties placed on the old foundation, as existing conditions will permit. On roads with very heavy and fast traffic all track should be resurfaced and carefully tamped with tamping bars or tamping picks on the same day the ties are put in, for the reason that if the roadbed is dug deeper in some places than in others the tendency will be to settle unevenly, and result in rough and unsafe track for fast trains.

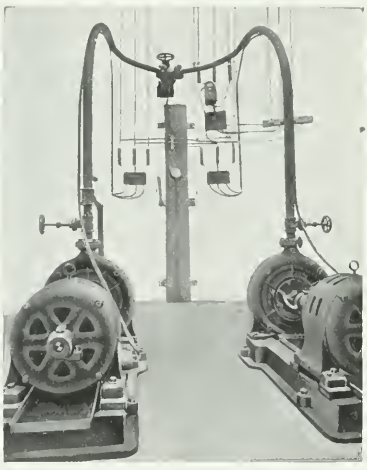
*A report presented to the Chicago convention of the Roadmasters' and Maintenance-of-Way Association, by a committee, consisting of C. Buhrer, chairman; T. Hickey and M. Burke.

Track of this kind should be resurfaced and tamped the second time in the course of eight or ten days, and all new ties and low places should be carefully retamped.

*Surfacing or Tamping Track.*—To have true and even track it should be raised to perfect level. Great care should be taken by the foreman in charge to raise the track level. Sighting boards should be used and set at high points in order that short sags can be taken out. All track should be carefully examined with a true level board before any raising is done in order to find out which side of the track is the higher. When this has been done and the track is in general good surface the low spots should be raised on the high side and the other side should be raised by using a true spirit level. It is of the greatest importance that both sides on tangents be on the same level. First it is necessary that the track be raised level. After the track is raised level it becomes necessary that the ties be tamped solid. In raising or surfacing up low places tamping bars or tamping picks should be used and all ties that have been raised should be tamped until they are solid. The hardest tamping should be done under the rail and on the outside and about 15 in. on the inside of the rail. From there to the center of the tie tamping should be done only about half as hard to avoid the track getting center bound. In light raising in stone ballast tamping picks are the proper tool to tamp with, but in gravel ballast tamping bars are preferable; however, it is well to use tamping picks to retamp all joint ties after using the tamping bar. The joint ties should be tamped the hardest.

*Lining and Filling in Track.*—In order to maintain good, true line it is absolutely necessary to have true and exact gage, and true and even surface. True line, true gage and true surface are the three essentials of perfect track. The best results can be obtained by lining track after the raising and tamping has been done. The raising and tamping of the track should be so arranged that the track can be properly lined over the portion of the track raised during the day, and the track properly filled in and then completely finished up by the time to quit work, so that the day's work will be entirely finished. The filling in of the track should be done in workmanlike manner. Ballast should be filled in solid between the ties, and in the center of the track level with the top of the ties. From a point under the rail to the end of the ties the ballast should be sloped from about $\frac{1}{2}$ in. below the base of the rail to 2 in. below the top of the ties at the end. This will give the water free outlet. Tangents should be adjusted by throwing the track between summits, between curves or by throwing the curves to meet the tangents; or by partly throwing the curves and partly throwing the tangents, as may better suit the conditions. Centers should be set with a transit to insure accurate line.

Pump House.



Interior of Pump House.

Water Tank.

*Adjustment of Curves with Consideration as to Easements.*—It is recommended that easement curves should be as follows:

For speed not exceeding 30 m. p. h., on all curves exceeding 2 deg.

For speed not exceeding 60 m. p. h., on all curves exceeding 1 deg.

When higher speed is attained, on all curves exceeding 30 min.

Easement curves should be used between curves of different degrees in the same way that they are used between curves and tangents.

The length of the easement curve should be the same as the distance in which the curve elevation is run out; therefore, as the elevation of a curve depends not alone on the degree, but also on the speed of the trains, the length of the easement curve should vary in the same manner.

For ordinary practice a chord length equivalent to 100 ft. for each degree of variation in curvature is recommended.

Where the distance between curves will not allow this, or if for other reasons, a chord length of 25 to 30 ft. may be used.

For very high speed roads, a chord length equivalent to 150 ft. or more per degree of variation is recommended.

Any form of transition is satisfactory which gradually changes the degree of curvature and in which the length of chord per degree of variation can readily be changed to suit each particular case, the essential point being that the length of the easement curve shall be the same as the distance in which the elevation of the outer rail is raised from zero to full elevation.

Any transition curve of the type of the Searles, Crandall, Holbrook, Talbot or the cubic parabola, which is susceptible of being run in by deflection or offset, is good for this purpose.

Elevation of curves with special consideration to the amount of the beginning and the end of the elevation as modified by the location of the curve and the condition of the traffic, will attain good results if the formulas which were expressed in our last Proceedings are followed. Since the elevation required is a function of, and depends on, the train speed, this speed is the first element to be determined in general as a matter of safety; the preference should be given to fast passenger traffic. The inner rail should be maintained at grade.

## Automatic Electric Motor Driven Pumping Plant.

A successful induction motor-driven pumping plant for supplying railroad water tanks is in operation on the Lake Shore & Michigan Southern at South Bend, Indiana. The pumping outfit consists of two Worthington single-stage turbine pumps, each direct connected to a six-pole, $7\frac{1}{2}$-h.p., three-phase, 440-volt General Electric Company induction motor. Two pumping sets are installed, so that in case one set fails, repairs can be made without shutting down the plant. Power for operating the induction motors is taken from the lines of the St. Joseph & Elkhart Power Company.

The pumping house is a round brick structure erected at the top of a concrete lined well. The floor is of concrete, supported by I beams, and is ten feet below the level of the ground. On this the pumps are erected, the interior arrangement being shown in one of the illustrations. For keeping the pump room dry, four ventilating ducts are built into the wall of the pump house, the outlets appearing in the pilasters in the exterior view.

Each pump discharges water through a $2\frac{1}{2}$-in. pipe connecting with a 4-in. main which leads to the supply tank. This tank is located at the side of the tracks about 100 ft. from the pumping station. The controlling device is arranged in the housing on the roof, the motors being started and stopped automatically by a small oil-switch operated by a float which has a vertical movement of about one foot. The difference in level in the tank corresponds to 3,000 gallons of water. This is the average amount taken by a locomotive and is replenished by the pumping set in about 25 minutes. The supply tank holds about 50,000 gallons and could supply fifteen locomotives within a few minutes if necessary. However, such a heavy demand will probably never be made, and in actual practice the pumps stand idle for the greater part of the time.

The Austrian State Railroads recently contracted for 1,252,000 cross-ties, for which they will have to pay about $800,000, or an average of 64 cents each. Less than a third are to be oak, two-fifths fir, more than a fifth larch, and very few pine and beech. All will be treated with preservatives after purchase.

## Finished Repair Parts for Locomotives.

BY HARRINGTON EMERSON.

The work of a railroad repair shop may be divided into three classes: (1) The erecting floor work; (2) the machine work for engines on the erecting floor; (3) the manufacture of new engine repair parts or the repair of old ones—these parts either for engines already in the shop or for stock to be held until called for by the needs of the erecting floor. The importance of the first two are thoroughly understood by motive power officials. The third, which is fully as important, has not been worked out as completely.

In the following I shall treat on this from five sides:

1. The saving of engine delays possibly effected both in the general repair shop and in the roundhouse by having a supply of finished repair parts in stock ready to be applied at a moment's notice.
2. The necessary standardization of locomotive parts.
3. The determining of shop costs.
4. The storehouse side.
5. The possibility of buying manufactured repair parts in the open market.

*The Saving of Engine Delays.*—The value per day of engine service is reckoned on various roads from $15 to $35 per day, the average being about $25. Engines are delayed more often in the repair shop for want of material than for want of men, and this delay is increased still more if, after waiting days or weeks for material, time must still be taken to do the machine work. It is evident that with a complete stock of repair parts finished and ready to be taken from stock as called for, the delays due to backshop and roundhouse repairs can be cut down. Just how much is a matter of trial. In the largest locomotive manufacturing plant of the country only four days are allowed for the erecting or assembling of an engine after the parts are ready to be assembled. It may be expecting too much to cut down the time of engine overhauling to this figure, as the stripping or taking down of the old parts takes time. It does seem that if the manufacturer can erect an engine in four days from its component parts, the railroad repair shop should take down and replace worn parts in eight days. If the repair parts for a locomotive are all on hand and finished before the engine comes into the shop, the railroad is in the same condition as the manufacturer who has all his parts ready to assemble and then starts to erect his engine.

*Standardization of Locomotive Parts.*—Magazines and technical journals have been full of standardization articles. Every one realizes the importance of this without adding here another chapter to the literature on the subject.

*Determining Shop Costs.*—Costs are usually figured on the basis of material plus direct labor, with little regard to a suitable distribution of the extra charges or surcharges, such as power, supervision, spoiled work, interest on investment, depreciation of machinery, buildings, etc. The general feeling has been that in order to keep trains moving the engines must be put through the shop regardless of expense, and that the exact figuring out of costs would not make the work any better or cheaper. This is a mistake, as it is only by accurate records that we can tell what has been done and from these records draw conclusions as to the future course to be pursued.

Cost determination with surcharges is not as difficult as it would seem. On the average a man and machine cost, surcharges included, close to $1 an hour. This has been determined very accurately by a series of years in commercial establishments, and can be accepted as a reliable basis. When a shop contains many machines, some large and costly, others small and cheap, the average of 70 or 80 cents per machine can be distributed over the different machines, some being as high perhaps as $10 an hour, others as low as 10 cents, but averaging 70 or 80 cents. If there is no machine rate, as in erecting jobs, it is safe to add 100 per cent. to direct wages.

The surcharge or distribution of all general expenses in a machine shop is something that commercial establishments have been considering for years, and have worked to an accurate basis. There are few if any railroads that have given it much serious consideration, and there was no need that they should, for when one is taking from one pocket and putting into the other it does not matter much what is charged for the transaction. This is what takes place on a railroad. Rough material is purchased and finished, the final cost being figured as the labor added to the material, without the necessary adjustment of extra charge for all surcharges. It has not mattered if the final or "book value" was altogether too low, as the piece was simply passed from one department of the road to another, as from store to mechanical department, or from one division to another.

*The Storehouse Side.*—With the many classes of engines on our railroad systems the question arises whether it is economical to carry finished material for all classes. On a certain road having 125 classes of engines it was found that 12 principal classes covered 80 per cent. of the power. The policy of carrying material for these principal classes was followed out, a very much simpler proposition than attempting to carry material for all classes.

Custody and care of finished and repaired material is nothing new to the store department, as every railroad storehouse is now carrying material to meet the needs of tributary shop or district. It is a mere detail as to whether this material shall be carried in the rough or finished state. As material is carried in stock to avoid delays, it is important that it be as near finished as possible, thus still further shortening delays. Incidentally, certain engine classes should, as far as posible, be assigned to certain divisions, thus avoiding the duplication of repair supplies for the same class at many different points. On the other hand, when an engine class is transferred from one division to another, all material for that class should follow. Recently on a large system nearly $1,000,000 worth of issued material was inventoried and returned to stock. This material had accumulated largely because engines had been transferred to other divisions, but the repair and renewal parts had not followed.

*The Possibility of Buying Manufactured Repair Parts in the Open Market.*—There is a growing feeling among motive power men that a railroad cannot make locomotive material in its shops as cheaply as it can be bought. If it is advantageous to buy locomotives, would it not be wise to buy supplementary repair parts to be used on these same locomotives? Would any trouble be experienced in regard to repair work if on an order for ten engines, nine were bought set-up and the tenth received in unassembled pieces that could be used to replace parts of the other nine as their parts wore out or proved defective?

Transportation of passengers and freight is the principal business of a railroad. The manufacture of locomotive parts is merely one of the necessary detail complications that arises, and any method of getting rid of this detail and keeping busy at straight railroading should be tried out. Many railroads have tried with marked success the policy of centralizing their work at some large central shop and supplying all outlying shops and roundhouses with finished material from the central plant. This reduces the outside shops to mere repair points. Their material comes to them ready to be put in place, and all that is required, in overhauling an engine, as far as new parts are concerned, is to take down the old worn-out or broken pieces and replace them by new ones from stock.

It is found that the central shop manufacturing repair parts in quantities can get work out much cheaper than the local shop with poor facilities finishing the material one piece at a time as called for by engines. If this centralization is carried to its fullest extent, the work at outside shops is reduced to a minimum, and work at the central shop is increased to such an extent that it must certainly interfere with the rapid and regular overhauling of locomotives.

If it is found that the central shop manufacturing in quantities can reduce the cost of finished material, why cannot this same process be carried a step further and instead of manufacturing in the central shop, buy all material from highly specialized manufacturing plants? With a little encouragement in this line we should find manufacturers specializing on machinery to a greater extent than any railroad can afford, because the man who has a special machine and special methods for making one piece—a piston rod, for example—would not expect to confine himself to the needs of one road, but would offer to make piston rods for all roads of the country, which, with the great demand he would thus have for his one special article, would allow him to make large reductions in price.

A difficulty the railroads have when they try to manufacture is that the manufacturing of repair parts is carried on as a matter of secondary importance in their locomotive shops. This means that the locomotive repair shop is run for two purposes: (1) to repair engines and (2) to manufacture repair parts. This being the case, the manufacturing end is bound to suffer, as the output of engines is the most important thing, and if any engine work is called for from any machine, that machine will be stopped and a manufacturing job set aside to make way for an engine job coming from the erecting floor. To manufacture cheaply, all the duplicate parts of an order should be made at one time, but the continual changing of machines to make way for engine work prevents a cheap manufactured output being obtained in the ordinary repair shop.

Repair shops should be run for two purposes only: Repairing engines and repairing repair parts. Finished material and repaired material should be furnished from stock. If a railroad deems it necessary to manufacture either locomotives or repair parts, it should be done in some shop under management and control separated from the regular repair work. Would it not be better to encourage manufacturers already equipped with necessary special machines to supply this manufactured material? If the railroad standardizes locomotive parts they can be bought in the open market from shops organized to produce at less cost these special articles. Manufacturers working under a competitive system are continuously forced to reduce manufacturing costs. Railroad shops, not

having the stimulus of competition, have no strong incentive to economy of manufacture.

In considering whether to buy material or not the cost must be looked into. It has been shown that railroads commonly figure costs in such a manner that their values, although in a way satisfactory when dealing between different departments of the same road, are of no use in comparing manufacturers' prices with railroad values. Manufacturers' prices compared with railroad "book values" may appear high, but everything considered, the highly specialized manufacturing plant should sell its output at a less figure than the ordinary railroad repair shop can produce the same.

From the foregoing the following conclusions are drawn:

1. Shop and roundhouse delays can be reduced by carrying finished repair parts in stock.

2. To compare railroad prices with the open market, or one shop with another, accurate costs must be determined.

3. Manufacturing of repair parts should be entirely separated from the repair of engines.

4. Manufacturers can produce repair parts more cheaply than a railroad, and with more prompt delivery.

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The official statistics of the Russian railroads for the first quarter of 1906 show, compared with the corresponding quarter of the previous year, an increase of 1 per cent. in the number of passengers, of 2¾ per cent. in the tons of freight carried, and 13¾ per cent. in gross earnings.

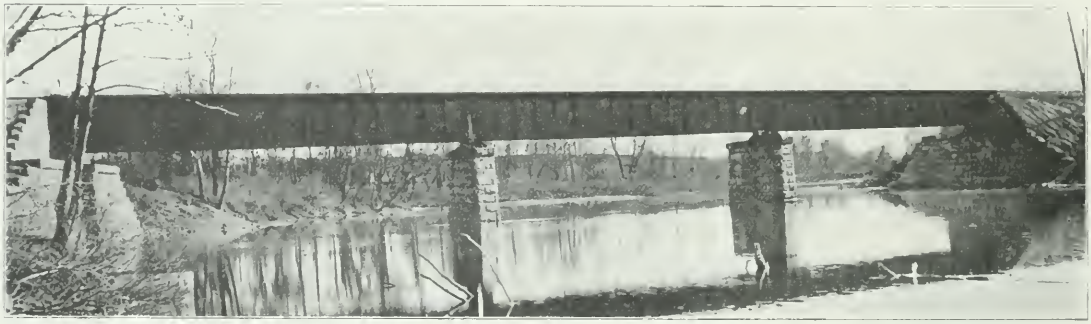
## Unit Costs of Railroad Building.*

IV.

The first two articles of this series gave costs per mile for completed railroad lines in the East and in the Southwest; the third article, cost and quantities of broken stone ballast per mile for single-track, double-track and four-track lines on a railroad of heavy freight and passenger traffic in the East.

The following information covers the cost complete per mile of some of the new road built within the last few years by one of the through trunk lines east of Chicago. The construction includes a short low grade line, a branch to coal mines, new line in bituminous coal territory, a cut-off and a 50-mile low grade line for fast service in comparatively open country. None of the estimates of cost include real estate, stations, equipment or signals.

Line E.



Line E.

Line E.

Line E.

(A) LOW GRADE LINE IN EASTERN WEST VIRGINIA.

(1) Length of new railroad, 10.72 miles *single* track.

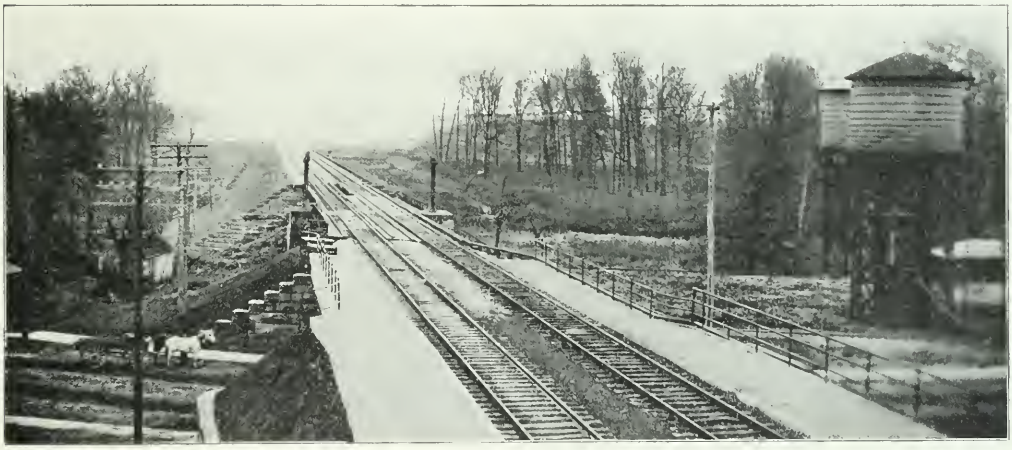
(2) Year built, 1903.

(3) Cost, including preliminary surveys, clearing right-of-way, roadbed, ties, rails, ballast, in shape for operation, but not including any real estate, stations, equipment or signals, $78,000 per mile.

(4) Brief description of physical characteristics of country traversed: For two-thirds of the distance the line was excavated from sandstone, slate, shale and limestone, and the balance, limestone, clay and loam. The cuts were 24-ft. embankments 8 ft. wide.

*Previous articles in this series appeared in the *Railroad Gazette*, Sept. 7, Oct. 26, and Nov. 16, 1906.

Line E.



Line E.

Line E.

Standard masonry structures, stone ballast and 85-lb. rail were used.

(B) BRANCH LINE TO COAL MINES IN CENTRAL OHIO.

(1) Length of new railroad, 4.1 miles *single* track; 2.35 miles of sidings.

(2) Year built, 1903.

(3) Cost, including the items above mentioned in "A" and side tracks, $40,700 per mile.

(4) Brief description of physical characteristics of country traversed: Line crosses ravine and through summit by tunnel, single track, timber lined, 475 ft. long; thence along and down small streams to terminus at mines. Pipe culverts and timber trestles were used. Excavation consisted of earth and solid rock.

(C) NEW LINE IN SOUTH CENTRAL WEST VIRGINIA.

(1) Length of new railroad, 12.48 miles *single* track; one-half mile of sidings.

(2) Year built, 1903 and 1904.

(3) Cost, including the items above mentioned in "B," $40,000 per mile.

(4) Brief description of physical characteristics of country traversed: Line follows small river for 2.5 miles, then up a small run 4.4 miles, across summit and down another small run 2.7 miles to its mouth, then following small river 2.9 miles. The line along river is in a farming country slightly above the out-crop of the Freeport coal, but strikes the out-crop of Pittsburg coal about two miles above mouth of the first run. Follows this out-crop over the summit until it strikes the river again. The general surrounding country is rolling, with low divides.

(D) CUT-OFF IN EASTERN WEST VIRGINIA.

(1) Length of new railroad, 8.1 miles *double* track.

(2) Year built, 1902 and 1903.

(3) Cost, including items above mentioned and tunnel 4,120 ft. long, double track, arched with brick, $154,000 per mile.

(4) Brief description of physical characteristics of country traversed: This cut-off leaves main line, following up creek valley for two miles; thence into valley of small run, following stream to its source in range of high hills; thence pierces hills with tunnel 4,100 ft. long, comes to river opposite main line, crossing same at elevation of 70 ft. This line has 0.3 per cent. grade eastbound and 0.8 per cent. westbound, and was built to save distance. The present distance by main line is 17 miles, and by cut-off 6¼ miles, saving of 10¾ miles.

(E) LOW GRADE LINE IN NORTHEASTERN OHIO.

(1) Length of new railroad, 51.84 miles, *double* track; 25 miles of sidings.

(2) Year built, 1903, 1904 and 1905.

(3) Cost, including the items above mentioned in "B," $100,000 per mile.

(4) Brief description of physical characteristics of country traversed: This line passes through a thickly populated valley for about nine miles; thence through a rolling and prosperous farming country, plentifully supplied with streams. At several places deposits of muck earth were encountered, and in one case it was necessary to construct artificial support to carry the track. Line was located especially with a view to speed, safety and distance; consequently, it required an unusual amount of grading and masonry. Wherever it was at all practicable the road crossings were placed over or under. At numerous important street and railroad crossings separation of grades was made. Typical parts of this line are illustrated in the accompanying photographs.

## Steam Versus Electric Operation of Trunk Lines.

BY JOSEPH MAYER, M. AM. SOC. C. E.*

It is here attempted to show by a single instance, which is typical of a great many others, what financial results may be expected from the change from steam to electric operation of trunk lines. The instance used is the Lake Shore & Michigan Southern from Buffalo to Cleveland. The writer's information in regard to present conditions is derived from the published report to the stockholders for the year 1905. This report refers to the whole system. The cost of steam locomotive operation of the assumed amount of traffic on the selected part of the line can be inferred from the published data with a fair degree of accuracy. For the purpose of this argument, an approximate estimate of the present amount of passenger and freight traffic is sufficient.

AMOUNT AND KIND OF TRAFFIC.

The number of passenger trains at present is given in the timetables. There is in existence a competing parallel electric road which would undoubtedly be improved if steam locomotive operation were to be indefinitely maintained. The local passenger traffic, which has already suffered severely from this competition, would decrease still further. There are now approximately 28 daily passenger trains going over the line, four being local trains. The probable future traffic with steam locomotive operation is estimated at 26 daily trains for through passengers and two accommodation trains for local passengers. The average number of cars per passenger train is estimated at eight and the earnings per passenger-train car-mile are estimated at 24 cents. This gives, for steam locomotive operation, passenger-train earnings of $3,590,000. This includes $3,333,000 from through traffic and $257,000 from local traffic.

INCREASE IN PASSENGER TRAFFIC AND EARNINGS.

The tracks are very crowded with traffic, and it is believed that it would not be expedient to run single cars or cars with trailers. The traffic for the shortest distances will probably generally remain with the present competing line. By establishing frequent fast local trains, the passenger traffic for medium distances can be secured. The combined population of the two terminals is about 900,000, that along the line is about 180,000. It is estimated that, by the service hereafter described, the local passenger earnings can be increased by $540,000, or $3 per head of population along the line. The increase in through passenger train earnings is estimated at 20 per cent. of the present earnings. The future loss in local passenger traffic by improved service on the competing electric road, if steam locomotive operation is maintained on the Lake Shore, is estimated at $123,000.

The total difference in future passenger-train earnings between electric and steam locomotive operation, therefore, is 20 per cent., of $3,333,000, or ..... $667,000
Increase in local passenger earnings ..... 540,000
Loss in local passenger earnings avoided ..... 123,000
$1,330,000

Recently, it has been the policy of steam railroad companies to buy competing parallel electric roads. By such purchase and consequent removal of competition for local traffic, passenger fares can be maintained, which give a larger profit from the local passenger traffic of the two lines than would be obtainable by them when competing with each other and each lowering the fares for the purpose of securing a larger proportion of the total traffic. This increase in profit can be divided among the two companies, and the change of ownership can thereby be made profitable to both.

If the steam railroad is electrified before the purchase of the competing electric line the prospective earnings of the latter are much reduced. This will correspondingly reduce the purchase price. The prospective loss of earnings due to the inferiority of steam railroad operation can only be avoided by the introduction of electric operation, because when the steam railroad purchases the competing electric road, the price includes the capitalized value of this loss of earnings. The avoidance of this loss, therefore, is one of the gains secured by the electrifying of the steam road even if the latter afterward buys the competing electric road.

PRESENT AND FUTURE TRAINS.

At present there are, approximately, 224 passenger train cars going over the line daily. These could not be materially reduced in number, in spite of decreased local traffic. Of these cars, 208 are in through trains. With 20 per cent. increase in through passenger train earnings, 250 cars would be required for the through trains. For the $540,000 increase in local passenger earnings, with earnings of 24 cents per car-mile, 34 cars per day going over the line would be required. This gives 50 cars per day for local traffic, or a total of 300 cars per day for the whole passenger train traffic.

The future traffic can be provided for by an average of 22 daily trains of nine cars and an average of 21 daily trains of five cars, giving a total of 303 cars going daily over the whole line. In reality, the number of trains and of cars per train would vary with the season and, on different parts of the line, with the density of population along the line. As the increase in passenger traffic will be greatly affected by the schedule speeds and as high speeds can be secured at moderate cost by electric operation with cheap water power, it will be advantageous to increase greatly the average train speed. An average increase of one-third over present speeds has been assumed in the following calculations. The through trains of nine cars, therefore, should have a schedule speed of from 50 to 60 miles per hour, according to the number of stops. The five-car trains should have a speed of from 30 to 45 miles per hour with stops from two to six miles apart.

CAPACITY AND COST OF ELECTRIC MOTIVE POWER.

The nine-car train would weigh, with locomotives, 500 tons. The five-car train, with two motor cars, would weigh 250 tons. Two 1,100 h.p. electric locomotives would be required for the long trains, and three 500 h.p. motor cars for the short ones. The horse-power here given is not the commercial rating, but the average capacity of the motors in service.

The present freight traffic is estimated at 34 revenue and three work trains per day going over the whole line. It is assumed that the amount of freight traffic will not be affected by the method of operation. The average weight of freight trains is estimated at 1,600 tons. The trains going east are much heavier than those going west. Two 1,100 h.p. locomotives would be needed for the heaviest trains. Two such locomotives can haul a train of 2,200 tons at 36 miles an hour over a level, straight track. If an average of two locomotives is used per train much higher speeds can be maintained than with the present steam locomotives. Assuming

*From a paper presented Nov. 21, before the American Society of Civil Engineers. Published in the Proceedings of the Society for September, 1906, page 643.

35,000 revenue train-miles per year per electric passenger locomotive, two-thirds of this number per electric motor car, and 25,000 per electric freight locomotive, which allows for the fact that each train is assumed to have two or three motor units, there will be required, for the above traffic, 42 passenger locomotives, 90 freight locomotives and 60 motor cars.

From various data, the following estimate of the cost of this motive power equipment is obtained:

| | |
|---|---|
| 42 passenger locomotives, each 1,100 h. p., at $33,000 | $1,386,000 |
| 90 freight locomotives, each 1,000 h. p., at $30,000 | 2,700,000 |
| 60 motor cars, each of 500 h. p., at $18,000 | 1,080,000 |
| Total | $5,166,000 |

PASSENGER CARS AND LOCOMOTIVES SAVED.

The present passenger traffic requires 14,960,000 car-miles, or, with 45,000 car-miles per car, 332 cars. The future traffic will give 70,000 car-miles per car. It will require 76,032,000 car-miles per year, not counting the motor cars, of which there are three in each five-car train. There will be needed 229 passenger cars, and 103 passenger cars will be saved. From data in the published report of the Lake Shore Railroad it is inferred that 150 locomotives will be saved. The value of the rolling stock saved is estimated at $2,286,000; the net cost of new rolling stock, therefore, is $5,166,000, less $2,286,000, or $2,880,000.

NEW TRACK AND STRUCTURES REQUIRED.

The length of track at present on the 183 miles of line between Buffalo and Cleveland is estimated at 550 miles. The larger passenger traffic will require additional track. The necessary new track is estimated at 50 miles, its cost at $1,000,000. For this traffic there would be required seven transformer stations having a total capacity of 45,000 k.w., costing, complete, $8 per k.w., or $360,000. For each track is needed a 1¼-in. suspended contact rod with suspenders 12 ft. apart; for each rod, one 1-in. carrying rope of 40 tons ultimate strength, with 7 ft. maximum vertical sag and 350-ft. spans. For every 350 ft. of line one overhead bridge will span the tracks and be supported between two steel transmission towers. The towers are required to carry the high-tension lines and feeders. To reduce to 4 per cent. the average loss in the secondary circuit, with maximum traffic and with 15,000-volt, 25-cycle, single-phase current, two No. 0, B. & S. gage, copper feeders are required for each pair of tracks. The contact rods should be in insulated sections two miles long, the ends and center of the sections connected to the feeders by circuit breakers, so that any section of the rods can be cut out in case of a short-circuit. The rails must be bonded and cross-connected to serve as a return circuit. On account of the low conductivity of the rods for alternate currents, the transformer stations must be nearer together than if 0000, B. & S. gage, contact wires are used with the same relay feeders. The contact rods carry for most of the distance but a small current, and the rail return circuit to the transformer stations is shorter than with contact wires. The secondary circuit with contact rods, therefore, has about the same self-induction as the longer secondary circuit with contact wire.

The cost of the secondary circuit, the towers along the line for the primary circuit, and the transformer stations, all per mile of track, will be approximately as follows:

| | |
|---|---|
| Supporting steel structure, insulators, circuit breakers, etc. | $2,428 |
| Transformer stations | 660 |
| Contact rods and suspenders | 712 |
| Ropes | 608 |
| No. 0 feeders and accessories | 372 |
| Track bonds, etc. | 80 |
| Total per mile of track | $4,800 |

This makes the total cost, for 600 miles of track, $2,880,000. The cost of steel erected is assumed to be 3 cents per pound; that of concrete foundations, $8 per cu. yd. Power would be obtained from Niagara Falls. Two lines of steel towers, each 25 miles long, would be required between Buffalo and Niagara Falls, at $2,000 per mile, and would cost $100,000. The cost of towers along the line is included in the cost of the contact line.

AMOUNT AND COST OF ELECTRIC POWER.

A maximum of 42,150 h.p. will be needed at the primaries of the transformers in the transformer stations along the line. The average distance of transmission to these stations is 117 miles. If the average voltage received is 50,000, and the loss in transmission 15 per cent. of the power leaving the power station, if the power factor is 85 per cent., and if single-phase transmission is used, then the quantity of copper required for the high-tension transmission line is approximately 5,100,000 lbs. This copper costs, in place, with accessories, about 22 cents per lb. This gives for its total cost $1,122,000. An aluminum line would probably be cheaper. The amount of power needed for the trains given above is obtained as follows:

The train resistance for freight trains is estimated at 8 lbs. per ton. This is intended to cover the small amount of power lost by the use of the brakes, which includes the net grade resistance on the nearly level line. The train resistance of through passenger trains is estimated at 18 lbs., that of the local trains at 26 lbs. per ton. This includes the power wasted by the use of brakes. The last estimate is based on running sheets assuming an acceleration of 1.2 ft. per sec. and a retardation by the brakes of 2.4 ft. per sec. Power is used for lighting the trains, for the operation of the brakes, and for switching. These last three items are estimated at 15 per cent. for freight trains, 7½ per cent. for through passenger trains and 5 per cent. for local trains.

If it is kept in mind that 1 h.p.-day is equal to 23,760 foot-tons per day, the following formulas for the horse-power needed by the 37 daily freight trains averaging 1,600 tons, the 22 daily through passenger trains averaging 500 tons, and the 21 daily local passenger trains averaging 250 tons, each running over the 183 miles of line, are self-evident:

$$\frac{5{,}280 \times 183}{23{,}760} \times 37 \times \frac{1{,}600 \times 8}{2{,}000} \times 1.15 = 11{,}073$$

$$\frac{5{,}280 \times 183}{23{,}760} \times 22 \times \frac{500 \times 18}{2{,}000} \times 1.075 = 4{,}328$$

$$\frac{5{,}280 \times 183}{23{,}760} \times 21 \times \frac{250 \times 26}{2{,}000} \times 1.05 = 2{,}914$$

$$18{,}315$$

The tracks will be so crowded that the freight trains must run mainly during times of small passenger traffic. A load factor of two-thirds, therefore, can be easily secured. The maximum power required at the wheels of the motor units, therefore, will be $\frac{3}{2} \times 18{,}315 = 27{,}473$ h.p. The average efficiency of the electric locomotives and motor cars will be at least 70 per cent.; that of the low-tension transmission, at 15,000 volts, 96 per cent.; that of the step-down transformers, 97 per cent. This gives an efficiency, from the primary of the step-down transformers to the wheels of the motor units, of $0.70 \times 0.96 \times 0.97 = 0.6518$ per cent. The maximum power required at the primary of the step-down transformers, therefore, is $\frac{27{,}473}{0.6518} = 42{,}150$ h.p.

The efficiency of the high-tension transmission is 85 per cent., when the maximum power is transmitted. The total efficiency from the step-up transformer station to the wheels of the motor units, therefore, is $0.6518 \times 0.85 = 55.4$ per cent.

The maximum amount of power required at the secondary of the step-up transformers, therefore, is 49,600 h.p., or approximately 50,000 h.p. At $12 per h.p. this will cost $600,000 a year.

MAINTENANCE AND DEPRECIATION OF ELECTRIC EQUIPMENT.

The cost of maintenance and depreciation of electric locomotives is not known. It is estimated at 10 cents per train-mile, or $3,500 per passenger locomotive and $2,500 per freight locomotive per year. This is probably excessive. The cost of maintenance and depreciation of motor cars is estimated at 8 cents per train-mile, or $1,867 per motor car per year. The cost of maintenance and depreciation of passenger cars is estimated at 1.4 cents per car-mile. With steam locomotive operation, approximately 224 cars go over the whole line daily. The future traffic will require 303 passenger train cars to run daily over the whole line. Of these, 63 will be motor cars and 240 other passenger train cars, an increase of 16. This represents 1,068,800 car-miles per year. The increase in cost of maintenance of passenger train cars, exclusive of motor cars, therefore, is $15,000 per year.

OPERATING COSTS.

The cost of train service and motive power is estimated, first, for the traffic with steam locomotive operation as follows:

*Cost of Steam Locomotive Power.*—The Lake Shore report for 1905 gives the cost of locomotive power per locomotive-mile for the whole system as 32.07 cents. The revenue train mileage is 15,901,016. The locomotive mileage is 25,741,488.

The cost of locomotive power per revenue train-mile, therefore, is $\frac{25{,}741{,}488}{15{,}901{,}016} \times 32.07 = 55.28$ cents, say, 55 cents. The 28 passenger trains and 34 revenue freight trains per day represent 4,140,000 train-miles per year. The total yearly cost of locomotive power on the line and for the traffic here considered, therefore, is $2,277,000. The trains are larger on this line than the average train of the system; for this reason this is probably an underestimate.

*Cost of Electric Locomotive and Motor Car Service.*—For electric operations the cost of motormen for passenger trains is estimated at 3 cents, and for freight trains at 6 cents, per train-mile.

*Cost of Train Service.*—The other trainmen on the freight trains will cost considerably less with electric than with steam locomotive operation, owing to the higher train speeds practicable with the former. The new passenger trains will have about one-third more cars running daily over the whole line and one-third greater speed; the cost of car service, therefore, will remain about the same.

*Cost of Maintenance of Way.*—In the opinion of high authorities, the cost of maintenance of way is mainly caused by the steam locomotives. The excessive weights on the drivers of the largest locomotives, especially at high speeds, are very severe on the track. The imperfectly balanced drivers and the heavy reciprocating parts produce vertical hammering and lateral swaying. The electric locomotives have no heavy reciprocating parts, and the weights on the drivers are very moderate. The cost of maintenance of way will

probably be largely reduced. The amount of this reduction is unknown and is here neglected.

*Summary of Comparison of Costs.*—The results of these considerations are summarized in the following tabulation:

Estimated future daily trains on 183 miles of line from Buffalo to Cleveland with steam locomotive operation:

28 passenger trains of 8 cars,
34 revenue freight trains,
3 work trains.

| | |
|---|---|
| Est. future passenger earnings with steam locomotive operation | $3,467,000 |
| Est. increase of passenger earnings by electric operation | 1,330,000 |
| Future passenger earnings with electric operation | $4,797,000 |

Future trains with electric operation:

34 revenue freight trains,
3 work trains,
22 passenger trains of 9 cars,
21 passenger trains of 5 cars.

*Cost on New Plant for Electric Operation.*

| | |
|---|---|
| 50 miles of tower lines | $100,000 |
| 5,100,000 lbs. copper for high-tension lines, in place, with switches, lightning protection, etc. | 1,122,000 |
| Overhead contact lines, sub-stations, and track bonding, etc., for 600 miles of track | 2,880,000 |
| 50 miles of new track | 1,000,000 |
| | $5,102,000 |
| 42 passenger locomotives of 1,100 h. p. at $33,000 | $1,386,000 |
| 90 freight locomotives of 1,000 h. p. at $30,000 | 2,700,000 |
| 60 motor cars of 500 h. p. at $18,000 | 1,080,000 |
| | $5,166,000 |
| 150 steam locomotives and 103 passenger cars saved | 2,286,000 |
| Net cost of new rolling stock | $2,880,000 |
| Total | $7,982,000 |
| Contingencies | 798,000 |
| Total new investment | $8,780,000 |

*Cost of Electric Operation of Future Traffic.*

| | |
|---|---|
| Current, 50,000 h. p., at $12 | $600,000 |
| Maintenance and depreciation of 50 miles of tower lines, 3 per cent. | 3,000 |
| Of copper, etc., for high tension lines, 1½ per cent. | 16,800 |
| And depreciation, 600 miles contact line and sub-stations, 4%. | 115,200 |
| And depreciation of electric locomotives, 10 cts. per train mile | 394,100 |
| And depreciation of motor cars, 8 cts. per train-mile | 142,224 |
| Motormen of freight trains, 6 cts. per train-mile | 148,296 |
| Motormen of passenger trains, 3 cts. per train-mile | 86,170 |
| Increase in cost of maintenance of passenger cars | 15,000 |
| Total | $1,490,790 |
| Interest and taxes on cost of plant, 5 per cent. | 439,000 |
| | $1,929,790 |
| Cost of steam-locomotive power saved | 2,277,000 |
| Net saving | $347,210 |
| Increase in passenger earnings | 1,330,000 |
| Total gain | $1,677,210 |

This is 19.1 per cent. of the capital invested, and is in addition to about 4 per cent. interest counted among the yearly expenses. If the power were derived from four steam turbine power stations along the line, the stations with their machinery would cost about $3,200,000. The transformer sub-stations could be replaced by feeders. The power could be produced at the stations in the form of 15,000 or 20,000-volt, single-phase current. The saving in the cost of the transmission system would be about $1,200,000. The net increase in investment would be about $2,000,000.

The efficiency of transmission would be about 95 per cent., and the total efficiency, from power stations to wheels, $0.70 \times 0.95 = 66.5$ per cent. The average power required at the power houses would be approximately 20,600 k.w., its cost at the power house would be approximately $60 per k.w. per year, or $1,236,000, allowing 5 per cent. on the cost of the plant for interest and taxes. The cost of water power and of its transmission, amounting, with interest and taxes on transmission plant, to $680,900, would be saved. The net increase in yearly cost of operation and interest and taxes, therefore, would be $555,100. This would reduce the yearly gain from electric operation to $1,142,200, or 10.6 per cent. on the investment. Adding 4 per cent., as previously allowed, the total return on the invested capital would be 14.6 per cent. With the more expensive steam power, better financial results would probably be obtained with slower passenger trains, requiring much less power. It is apparent, therefore, that the electric operation of lines of similar amount and kind of traffic will be profitable even where no water power is available. The density of population along the line, the degree of its prosperity, the presence or absence of a competing electric line, and the fare per passenger mile determine the increase in local passenger traffic that can be counted upon. The amount of existing through passenger traffic on the line considered, and the intensity of competition for it, as well as the amount of the through passenger traffic on the competing lines and the fare per passenger mile, determine the increase in through passenger traffic which will be the result of electric operation and the consequent improvement in the service. On all lines of large traffic, the increase in traffic capacity of a given number of tracks will give valuable advantages which have been entirely neglected in this calculation.

ALTERNATE ESTIMATE.

The adopted estimates of the increase of the passenger earnings are based on voluminous statistics of the amounts of passenger earnings secured by interurban electric roads. These statistics can be found in various technical and financial periodicals of the last few years. The writer was greatly surprised at the amount of new passenger traffic developed by these roads. Without knowledge of the results obtained by them, he would have considered excessive the estimates here given for the probable increase of earnings due to the introduction of electric operation. It would probably require a longer paper than that here submitted to convince those unfamiliar with the facts here referred to that the estimate herein adopted is conservative and will be more than confirmed by the actual results. Since this estimate will be accepted as reasonable by but few without the elaborate proofs which cannot here be given, it is desirable to show how a lower estimate of the increase in earnings will affect the rate of return on the invested capital.

Where Niagara Falls or other equally cheap power is obtainable it can be easily shown that the electric operation of a line with the traffic here assumed is advisable even with one-half the increase in passenger earnings above estimated. The reduction of $665,000 in passenger earnings, as compared with the foregoing estimate, would permit a reduction of one in the average number of cars per passenger train. The locomotives for the through passenger trains would then have to be of 1,000 h.p., and the local passenger trains would require, with a slight reduction of the schedule speeds, an average of two motor cars instead of three. This would reduce the power required to 94 per cent. of the former amount. An equal reduction would take place in the required capacity of the transformers, and in the amount of copper in the high-tension lines.

The number of motor cars required would be reduced to 40. The reduction in cost of plant would be approximately as follows:

| | |
|---|---|
| Copper for high-tension line | $67,300 |
| Transformers | 21,600 |
| Motor cars | 360,000 |
| Electric locomotives | 126,000 |
| 20 passenger cars | 80,000 |
| | $654,900 |
| Contingencies, 10 per cent. | 65,500 |
| Total reduction of cost of plant | $720,400 |

This gives the revised cost of plant as $8,059,600.

The reduction in yearly cost of operation would be as follows:

| | |
|---|---|
| Current | $36,000 |
| Maintenance of copper | 1,400 |
| Maintenance of sub-stations | 1,600 |
| Maintenance and depreciation of motor cars | 37,100 |
| Maintenance of passenger cars | 20,570 |
| Interest and taxes on cost of plant | 36,020 |
| Increase in net saving | $131,990 |

The new net saving by electric operation would be $479,200. If $665,000 is added, for the new increase of passenger earnings, the result will be $1,144,200 as the total gain by electric operation. This is 14.2 per cent. of the total investment. The total return on invested capital, inclusive of about 4 per cent. interest allowed among the operating expenses, therefore, is 18.2 per cent. This estimate will undoubtedly appear more reasonable to those acquainted with recent results on interurban electric roads.

COST OF HAULING A CAR.

It is of interest to compare the cost of hauling a freight or passenger car one mile by steam locomotive and by electric power. In this calculation it is fair to include the interest and taxes on the cost of the plant, because the stockholders, who will govern the decision, are mainly interested in the question whether the cost of hauling, inclusive of the new interest charges, is increased or decreased.

It is found, by distributing the total cost of locomotive power among the number of revenue train-miles, that the cost per revenue train-mile is approximately 55 cents. If this cost is assumed to be the same for passenger and freight trains, there is obtained, with eight cars per passenger train, 6.875 cents as the cost per car-mile. This does not include the interest and the taxes on the value of the locomotive and tender. Taking their value to be $12,500, and estimating, from published data, the number of revenue passenger train-miles per locomotive at 33,000 a year, and taking interest and taxes at 5 per cent., the interest charge per car-mile is equal to $\frac{12,500 \times 0.05}{33,000 \times 8} = 0.237$ cents. This gives for the total cost of hauling a passenger car one mile in a revenue train by steam locomotive $6.875 + 0.237 = 7.112$ cents. This includes the estimated share of the cost of switching and work trains.

The freight cars at present in use vary considerably in size. The writer has calculated the cost of hauling one mile a car weighing 70 tons when fully loaded, inclusive of the estimated share of the cost of the switching and work trains. For the average train of 1,600 tons the locomotive and tender will weigh approximately 150 tons. The cost of hauling a train one mile is 55 cents, exclusive of interest and taxes. Taking 23,000 revenue freight train-miles per locomotive per year, the interest and taxes per train-mile amount to $\frac{12,500 \times 0.05}{23,000} = 2.72$ cents; this makes the total cost of hauling a freight train one mile, including a proper share of the cost of the switching and work trains, 57.71 cents. The average train of 1,600

tons, inclusive of locomotive, contains 20.71 cars of 70 tons. The cost per car-mile, therefore, is $\frac{57.71}{20.71} = 2.788$ cents.

For determining the cost of electric power at the motor car or electric locomotive there must be added to the cost at the power house that of transmission. The cost of the transmission plant proportioned for receiving 50,000 h.p. and delivering at motor cars 39,575 h.p. is $4,102,000. The total cost of the delivered power, therefore, is as follows:

| | |
|---|---|
| 50,000 h. p. at power station | $600,000 |
| 5 per cent. interest and taxes | 205,100 |
| Maintenance of copper, etc. | 16,800 |
| Maintenance of 50 miles of tower line | 3,000 |
| Maintenance of secondary lines and transformer stations | 115,200 |
| Total cost at train of 39,575 h. p. | $940,100 |

Cost per horse-power per year, $23.75.

Since the load factor is two-thirds, the horse-power-year contains two-thirds of 8,760 horse-power-hours. The cost of power per horse power-hour used at motor car or locomotive, therefore, is 0.4067 cents. The power required at the wheels for hauling 22 daily through passenger trains 183 miles was found to be 4,328 h.p. This includes the power required for switching, train lighting and the operation of the brakes. It does not include the power for the three work trains. The latter is $\frac{3}{37}$ of 11,073 = 898 h.p. In the calculation of the cost of steam power all the costs of power have been charged to the revenue trains. Following the same method, the cost of the power for the work trains will be charged to the cost of hauling the passenger trains. The cost of power per passenger train-mile becomes, therefore $\frac{(4,328 + 898) \times 24}{22 \times 183 \times 0.7} \times 0.4067$ = 18.11 cents. These trains have an average of nine cars; the cost of power per car-mile, therefore, is 2.012 cents. The costs incurred on the locomotive, per revenue train-mile, are 10 cents for maintenance and depreciation, 3 cents for motormen, 4.73 cents for interest and taxes, a total of 17.73 cents, or 1.97 cents per car-mile. This gives the total cost of hauling a passenger car one mile 2.012 + 197 = 3.982 cents. The schedule speed of this car is one-third greater than that of the car hauled by the steam locomotive. This higher speed increases the energy required about 25 per cent. The corresponding cost of steam locomotive haulage at the slower speed was found to be 7.112 cents. Steam locomotive haulage at the higher speed, if practicable at all, would cost more than twice as much as electric haulage.

It was found that it takes 11,073 — 898 = 10,175 h.p. to haul 34 daily revenue freight trains a distance of 183 miles. The cost of power per revenue train-mile, therefore is $\frac{10,175 \times 24}{34 \times 183 \times 0.7} \times 0.4067 = 22.81$ cents.

The costs per train-mile on the locomotive are: Maintenance and depreciation, 10 cents; motormen, 6 cents; interest and taxes, 6 cents; total, 22 cents. The cost of hauling a 1,600-ton freight train one mile, therefore, is 22.81 + 22 = 44.81 cents. This is $\frac{44.81}{20.71}$ = 2.164 cents per car-mile. This includes the cost of switching and the operation of the brakes. The speed is one-third greater than with steam locomotives; this reduces the cost of the train crews per train-mile. The corresponding cost of steam haulage at the slower speed is 2.788 cents. In the same manner the cost of hauling with electric power a passenger car of a five-car train is found to be 5.09 cents. The schedule speed is one-third greater than for steam trains with the same number of stops. All items of cost that are the same with steam locomotives and by electric operation have been omitted in these comparative estimates.

CONCLUSIONS.

Unless these calculations are greatly in error, it is evident that electric operation of many steam railroad lines will be extremely profitable, especially where the passenger traffic is large, where there are no existing parallel electric lines, and where cheap water powers are available.

All estimates of cost of electric plant and operation were intentionally taken very high. The writer is convinced that the cost of electric operation here given is in excess of what it will prove to be upon actual trial. The figures given were chosen with a view of being able to prove from past experience with similar, though not identical, apparatus and plant that they are at least adequate. The cost of single-phase electric locomotives and motor cars will probably greatly decrease within a short time, and this will make possible a much better showing for electric operation. For roads with small traffic, an entirely different and much cheaper contact line, and smaller and slower trains would be used. The results here obtained do not justify any inference either for or against the electric operation of such roads.

Various estimates of the cost of electrically operating a given amount of either freight or passenger traffic have been published. The writer believes that the only way to obtain a correct answer to the question, Will electric operation pay? is to consider the problem as a whole, and to compare the probable increase in future net earnings, due to the changes and improvements in passenger service which become practicable and will be adopted with the introduction of electric operation, with the required new investment of capital. Wherever electric operation has been adopted, the gain in passenger earnings has been by far the most important factor in making the change profitable.

## Steel Rails.*

BY ROBERT JOB.

Twenty or thirty years ago steel rails did not cause the difficulty which is found with the present product. This is due to a number of causes. A vastly greater tonnage is handled to-day by the mills, and the same care is not used in the preparation and cropping of the ingots, while in the rolling much higher finishing temperatures are maintained, resulting in coarser structure with relatively rapid wear. In many cases the composition is better to-day than formerly, yet in spite of what, under present practice, would be considered dangerous composition, it is a well-known fact, that the old rails gave generally excellent service, this being due largely to thorough working of the steel down to a low finishing temperature. Some old 67 John Brown rails rolled and laid in 1864 have been in track for 34 years. The composition was as follows: Carbon, .330 per cent.; phosphorus, .039 per cent.; manganese, .390 per cent.; sulphur, .030 per cent.; silicon, .070 per cent.

An 80-lb. rail of somewhat the same general composition, namely: Carbon, .396 per cent.; phosphorus, .072 per cent.; manganese, .660 per cent.; sulphur, .033 per cent.; silicon, .286 per cent; and rolled a few years ago has a far greater coarseness of structure. Under the same traffic the one has given long service, while the other would cut out rapidly.

Rails with coarse structure obtained at present and with a composition of carbon, .620 per cent.; phosphorus, .094 per cent.; manganese, 1.000 per cent.; sulphur, .033 per cent.; silicon, .100 per cent. wear relatively rapidly and tend to brittleness when the steel is unsound.

The question arises, why is not the former close-grained slow wearing structure produced to-day? Is the change due merely to the insistent efforts of the mills for higher tonnage, or do other elements enter into the case? The answer is complex. In the first place the increased weight of the present sections of 90 or 100 lbs. per yard instead of 60 or 65 lbs. has radically upset the ratio between the various components of the area of the rail, that is, head, web and flange. The former is far thicker and of much greater mass than formerly, while the other parts in many cases have increased but little in thickness, or even have decreased. As a result of these changes the flange gets to the lowest temperature at which it can be rolled long before the head reaches the same temperature, so that even though the flange be fine grained and tough, as fine even as was obtained in the old practice, the crystals of steel in the head may be very coarse, since they were growing in size from the time that pressure upon them in the rolls ceased until the steel at that point had fallen below a dull red heat. This condition would mean relative rapid wear and brittleness.

It is evident that in order to get fine grained structure clear to center of head two courses are open. First, to rearrange the proportions of the rail in such manner that each component part shall reach the critical temperature at more nearly the same time, as in the old sections, or, secondly, to change the heat treatment given the steel, either during the rolling or subsequently. By the first method the large crystals would be prevented from forming, while by the second, even though formed, they would be broken up by the reheating.

In some of the mills it is common practice to hold the rail before the last pass with the object of giving greater toughness and better wearing qualities to the steel, owing to the finishing at a lower temperature. Unluckily the plan is of little benefit, since thereby a fairly fine granular structure is produced to a depth of only about an eighth of an inch from the surface. This, in service, is quickly worn away, exposing the coarse structure beneath. What is needed is thorough working of the steel throughout its mass at a temperature as near as possible to its critical point.

As an example of the influence of heat treatment after rolling, it may be of interest to detail the results of an investigation carried out several years ago under our direction upon the Reading Railway. Eleven 90-lb. rails of coarse granular structure were, through the kindness of the Pennsylvania Steel Company, sawed in halves, and one-half of each run into a reheating furnace, brought to a cherry red, and at once removed and let cool in the air. The annealed rails assumed a structure in which the coarse granular condition was entirely obliterated and replaced by a very fine structure resulting in great toughness. These 22 rails were laid in track at Reading at a point where they were subject to slow heavy traffic. All of them were in the same line, laid alternately, first an annealed

* Abstract of a paper read before the New York Railroad Club, Nov. 16, 1906.

rail, and then its untreated half. From time to time measurements were made of the contour with a rail indicator. After being subject to a traffic of approximately 88,128,000 tons, we were surprised to find that the annealed rails showed 31.9 per cent. the more rapid wear, while they also showed the greatest tendency to mash down and splinter. The average loss of weight was 2.85 lbs. per yard for the untreated rails and 3.77 per yard for those treated. Upon cutting out strips from the heads and subjecting to tensile test we found the following averages:

| | Natural. | Annealed. |
|---|---|---|
| Tensile strength, lbs. per sq. in. | 129,700 | 126,100 |
| Elastic limit, lbs. per sq. in. | 80,600 | 70,225 |
| Elongation, 2-in. section, per cent. | 21 | 22 |

The composition averaged about as follows: Carbon, 0.540 per cent.; phosphorus, .079 per cent.; manganese, 1.060 per cent.; sulphur, .080 per cent.; silicon, .090 per cent.

This trial showed that heavy traffic high elastic limit is essential to the best service, and it was also evident that if we propose to get greater toughness and safety by some treatment, like the annealing, which lowers the elastic limit, we should also, to get the best results, increase the carbon or manganese content to the point at which the elastic limit will be high enough to resist crushing, even though the steel be somewhat unsound. In other words, the toughness and elasticity produced by the fine granular structure permit an increase in the hardening contents considerably beyond the point which otherwise would be safe, thus obtaining greater capacity for wear.

Unfortunately, annealed rails, with their freedom from brittleness and internal strain, are of hardly more than theoretical interest, since they cannot be obtained in any considerable quantities under present conditions.

We have already referred to the influence which the type of section may exert upon the granular form of the steel, and hence upon the strength and ductility of the product. It has been our experience also that the form of section may yield a decided influence upon the mechanical strength of the rail. To express the matter in another way, we may say that with steel of precisely the same composition and degree of porosity one section will tend to support loads better and show greater freedom from crushing and splintering than will another section of the same weight per yard. To illustrate the point we may cite an instance which occurred upon the Reading. A considerable length of track had been laid in 1890 with 90-lb. rails of the then standard P. & R. section, which had a rather deep head with angle at the side of head approximating the converse of a wheel flange. These rails gave excellent service for 14 years, and in order to note the comparative influence of section upon wear, we arranged to have a number of them removed and placed in track, turned, on an 8-deg. curve, in the same track and adjoining 90-lb. rails of the A. S. C. E. section. Measurements were taken last May, after one year's service, and we noted that very little wear had resulted with the P. & R. section rails. The top of head after 15 years' service is but little affected, while the angle at side of head is almost unchanged. The composition of one rail averaged: Carbon, 0.600 per cent.; phosphorus, .070 per cent; manganese, 1.000 per cent.; sulphur, .060 per cent.; silicon, .120 per cent.

Another rail of the same section showed considerably more wear, although the side angle was little changed. In this rail the composition averaged: Carbon, 0.500 per cent.; phosphorus, .085 per cent.; manganese, .900 per cent.; sulphur, .070 per cent.; silicon, .100 per cent.; and the effect of the increased softness of the steel is clearly evident in the greater wear. In the case of the A. S. C. E. section, the side of the head was ground away until the contour approached that of a wheel flange, although little wear was found upon the top of head. The composition averaged: Carbon, 0.570 per cent.; phosphorus, .088 per cent.; manganese, 1.000 per cent.; sulphur, .065 per cent.; silicon, .120 per cent.

From this instance it will be seen that the square head rail holds its angle for only a comparatively short time under heavy traffic, and it is also a matter of frequent observation that when porosity of the steel is present, rails of the square-head type have a much greater tendency to sliver and crush along the outer edge than do rails of the other type or section, the reason evidently being that the mass of metal supporting the edge is very much less in the former than in the latter.

A good deal of discussion has arisen from time to time concerning the effects consequent upon overloading of rails, and in some instances we have heard manufacturers attribute the crushing down and splintering of their product to the heavy wheel loads now prevalent. A lot of 90-lb. A. S. C. P. rails had been furnished upon an absolute guarantee of five years' service, but a considerable number had mashed down completely within six months. The mill made inspection and refused to make replacement, claiming that the condition was simply a result of heavy-wheel loads and other severe conditions for which the mill was not responsible. The appearance of an etched section proved beyond all possible contention that the failure was due to unsound steel, and replacement was made without further quibbling.

The appearance of the fracture of a rail which has failed owing to overloading is distinctive. The fracture generally takes place immediately over a tie, due, of course, to the repeated straining of the metal beyond its elastic limit. At first, merely a hair crack is found. This, with repeated bending, gradually extends into the rail and the broken surfaces become smooth and darkened by oxidation, as shown in the figure. Finally, the remaining metal is too slight to support the weight of a passing load, and the final fracture occurs. We have taken one of these light rails from track, broken it under the drop, and found one of these typical cracks developing over each tie showing clearly the need of close watchfulness in the maintenance of track subjected to heavy traffic.

We have referred above to the necessity of avoiding porosity and unsoundness of steel if good service is to be obtained. Curiously enough a frequent characteristic of nickel steel is somewhat allied to this condition. It is a matter of general observation that nickel steel rails have not given the service which was anticipated and hoped for, but that there has been a tendency to sliver and to have a life not at all proportioned to the cost. Several years ago, while investigating some of these rails, we came upon a condition which seemed to account fully for this unfortunate behavior. The very lightly etched surface of an 80-lb. nickel steel rail of the following composition: Carbon, .530 per cent.; phosphorus, .093 per cent.; manganese, .940 per cent.; sulphur, .040 per cent.; silicon, .082 per cent.; nickel, 3.480 per cent.; showed a number of dark spots scattered over the section. These we found were not particles of slag or oxide due to failure to crop the ingots to clear metal, for the steel was thoroughly sound. The spots had a silvery appearance and were exceedingly hard, and evidently were either pure nickel or else an alloy high in nickel. The important point was that the metal was not homogeneous, and at these places appeared to be imperfectly welded, so that under severe stress the effect would be the same in a way as though the line of hard alloy had been a line of slag. There would be an imperfect bond and the surfaces would slip apart and slivering would result. Upon taking a portion of this at center of head etching and magnifying fifty diameters, we found that the greater part of the area was of exceedingly fine uniform structure. There were, however, occasional patches of metal in which relatively large silvery granules appeared, showing that the nickel had evidently not thoroughly melted and diffused through the heat. Consequently the strength of the metal under lateral stress was deficient, owing to the seam lines, although if subjected to direct longitudinal force as in the ordinary tensile test it undoubtedly would have been normal and high. Small seam lines extending longitudinally through a rail, are often the cause slivering or "flowing" of the metal. The latter term we found to be usually a misnomer, since the condition to which it is generally applied is in most cases produced by the breaking away of the steel at seam lines under pressure and not by actual elongation of the metal; it is merely a consequence of unsound steel. True flowing of metal takes place seldom, if ever, to a noticeable extent in a thoroughly sound rail, even when of very soft steel. Rapid cutting results in such a rail but little real flowing.

The old John Brown rail, referred to above, although of mild steel and in track for 34 years, has shown no indication of flowing, though it was cut down considerably upon the head. It was, however, of quite sound steel throughout the head, although a slight pipe line appeared in the web.

The important question remains, how can better rails than are now secured be obtained. We have already suggested that by modifying the section of the rail a finer granular form, with its inherent toughness and tenacity, may be obtained. By insisting upon cropping of ingots clear to sound metal, and by testing a rail-butt, which is with certainty known to have been taken from the top of an ingot, so that if marked unsoundness be present the heat may be rejected by the drop test, a reasonable degree of soundness can be secured, and slivering and crushing largely prevented. By increasing the hardness of the rail as much as is compatible with the character of the roadbed, the rate of wear may be decreased, but we believe that further aids are necessary, and can before long be obtained. The Bessemer rail has filled an important need, particularly in the days of light, easily rolled sections and light wheel loads. Under present conditions, however, there is urgent demand for harder, tougher steel. In the Bessemer rail the hardness, with the proportion of phosphorus usually present, cannot be increased much beyond present practice, say, 0.60 or 0.65 per cent. carbon, without causing undue brittleness, and hence advantage has been taken of the basic open hearth process by which phosphorus and sulphur can be nearly eliminated. With these elements of brittleness largely removed the proportion of carbon has been increased safely and with very favorable results to nearly 0.90 per cent., thus securing great hardness, together with great tenacity and a very low rate of wear. Bessemer rails will undoubtedly continue to be used for the lighter sections and in locations where traffic is light, but we believe that under the more exacting conditions this quality will before long disappear, replaced by the harder, tougher steel of the basic open hearth process.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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VOL. XLI., No. 22. FRIDAY, NOVEMBER 30, 1906.


Mr. Alfred Akerman, State Forester of Massachusetts, is the author of an interesting document (Bulletin No. 5 of the State Forest Service) concerning forest fires. His discussion is always rational and interesting. He states the causes of forest fires to be numerous and to include matches, cigar stumps, camp fires, bonfires, brush burning and locomotives. Of these he finds brush burning and locomotives most deserving of special notice. Farmers are the chief offenders in the careless burning of brush and rubbish. The number of fires set by railroads is greater than from any other single known cause. Fires may be set by workmen in burning ties or rubbish along the right of way, or by coals dropped from ash pans of locomotives, or by sparks from locomotive stacks. Fires set by workmen or by coals from ash pans are invariably the result of pure carelessness. He thinks there is no excuse for either. Mr. Akerman admits, however, that the setting of fires by sparks from locomotives is a complicated matter. Unlike most writers of such reports he is refreshing in his understanding of the conditions under which a locomotive must be operated. He admits that a normal locomotive cannot do the work for which it has been designed without the possibility of emitting sparks, a statement, the frankness of which coming as it does from a state forester, is significant. After such a statement, the railroad officials of Massachusetts may well bow to their forester when he urges the desirability of frequent and careful inspection of the front end of the locomotive and the removal of inflammable material for a distance of 50 ft. from the center of the track. An interesting deduction to be made from the facts presented by the report, and which, by the way, is not suggested by the Forester, though it stands in full view upon the face of his figures, is to the effect that while the railroads are responsible for a portion only of the whole number of fires set, presumably for less than half, they apparently pay for the damage done by all. The records, unfortunately, are in such shape that a strict comparison of damage and payments can only be made for the year 1904. In that year the estimated value of timber or wood, cut or growing, which was destroyed in the State of Massachusetts by forest fires arising from all causes, is placed by the state census report at $14,764. But the amounts paid in Massachusetts by railroads, in settlement of damages from forest fires alleged to have been set by locomotives during the same year was as follows:

| | |
|---|---|
| Boston & Albany, year ended Nov. 1, 1904..... | $4,699 |
| Boston & Maine, year ended Dec. 31, 1904..... | 19,426 |
| New York, New Haven & Hartford, year ended June 30, 1904..... | 19,395 |
| | $43,520 |

The census year ends December 31. Two of the railroads in the list give returns from fiscal years ending at other periods, and the objection may be made that their damages were incurred, partly or entirely, in the previous calendar year. But even if the sums paid by the New Haven and the Boston & Albany be excluded entirely, it will be seen that the Boston & Maine paid damages some 30 per cent. in excess of the estimated total. For 1903 and 1904 together, the Boston & Maine paid $54,285, and the two other roads (using the figures of their respective 1904 fiscal years only) paid $24,094, a total of $78,379. This excludes payments by the New Haven from January 1 to June 30, 1903, and from June 30 to December 31, 1904, and payments by the Boston & Albany from January 1 to November 1, 1903, and from November 1 to December 31, 1904, yet the incomplete total is 120 per cent. greater than the actual damage as estimated by the census bureau. Evidently the careless farmer does not even pay for the damages he occasions his own property. Indeed, forest fires at 120 per cent. profit to the owner of the timber seem more attractive, commercially, than the better-known industries of the state.

## EARNINGS SINCE THE CLOSE OF THE FISCAL YEAR.

Earnings from most of the principal railroads in the country for the three months ending September 30, 1906, are now at hand, and afford an interesting study in the progress of events during the continuance of the great wave of prosperity. The table printed herewith gives the returns from 34 roads. All but one of these increased their gross earnings during the three months. The results in net were not quite so satisfactory, although the showing is not a bad one. Just half of the roads in the list give a smaller percentage of increase of net earnings than of gross, while five roads show decreases in net as compared with the same three months in 1905. If full returns for the month of September were

at hand, it would be seen that the net showed a very general tendency to fall off, especially in certain quarters, but returns for a single month are not of great value, being subject to many influences that do not necessarily affect the total for the year.

*Percentages of Increase, Gross and Net—July 1 to Sept. 30, 1906.*

| | Gross. | Per cent. Inc. | Net. | Per cent. Inc. |
|---|---|---|---|---|
| A., T. & S. F. | $21,293,597 | 14 | $8,255,803 | 21 |
| A. C. L. | 5,706,345 | 9½ | 1,166,823 | 23* |
| B. & O. | 28,125,241 | 10 | 10,171,177 | 6 |
| B. & M. | 11,219,155 | 7½ | 3,353,434 | 2 |
| C. P. R. | 18,291,187 | 28 | 7,272,322 | 39 |
| C. & O. | 6,273,478 | 9 | 2,379,671 | 4 |
| Alton | 3,284,017 | 8 | 1,305,987 | 38 |
| C. G. W. | 2,468,709 | 12 | 823,792 | 13 |
| Colo. & S. | 3,223,893 | 12 | 967,729 | 9 |
| D. & H. | 3,675,538 | 11 | 1,643,273 | 21 |
| D. & R. G. | 5,313,463 | 7½ | 2,113,576 | 5 |
| Erie | 13,317,380 | 4 | 4,030,477 | 2* |
| Grand Trunk | 8,656,529 | 8½ | 2,668,788 | 5 |
| Hocking Valley | 1,831,163 | 9 | 691,346 | 6 |
| I. C. | 13,475,940 | 15 | 3,711,502 | 20 |
| L. S. & M. S. | 11,277,882 | 11 | 2,945,131 | 24 |
| L. V. | 9,432,555 | 11 | 4,186,743 | 18 |
| L. & N. | 11,580,734 | 13 | 3,100,032 | 4 |
| M. St. P. & S. S. M. | 3,432,317 | 20 | 1,772,083 | 12 |
| M. K. & T. | 5,877,585 | 13 | 2,057,129 | 59 |
| M. P. | 12,155,506 | 9 | 4,063,955 | 12 |
| N. C. & St. L. | 2,804,494 | 10 | 611,080 | ½ |
| N. Y. C. & St. L. | 3,450,752 | 11 | 611,259 | 9 |
| N. Y. N. H. & H. | 14,299,619 | 3 | 5,372,047 | 1* |
| N. & W. | 7,526,577 | 8 | 2,875,396 | 5 |
| P. & R. | 10,055,677 | ½* | 3,943,045 | 9* |
| C. R. I. & P. | 14,357,357 | 9 | 4,749,741 | 19 |
| St. L. & S. F. | 11,542,716 | 12½ | 4,010,347 | 16 |
| St. L. S. W. | 2,431,321 | 15 | 814,974 | 64 |
| S. A. L. | 3,546,158 | 3½ | 410,593 | 5½* |
| Southern Pac. | 28,871,743 | 12 | 10,707,781 | 22 |
| Southern Ry. | 13,695,325 | 7 | 3,230,153 | 12 |
| Union Pac. | 18,913,650 | 8 | 9,206,111 | 9⅓ |
| Wabash | 7,202,702 | 12 | 2,470,271 | 17 |

*Decrease.

It is interesting to take up the three months' earnings somewhat in detail with a view to understanding their causes, although it is impossible to make a full analysis. It will be seen that the roads which have made the most striking record of increased growth are, first of all, the Canadian Pacific, with an increase of 28 per cent.; next the Minneapolis, St. Paul & Sault Ste. Marie, 20 per cent.; then the Illinois Central and the St. Louis Southwestern, 15 per cent., and the Atchison, 14 per cent. The greatest increase in net for the period was made by the St. Louis Southwestern, 64 per cent., but this showing is, in itself, scarcely a fair test of prosperity, since the road dragged along through 1905 with a succession of bad records, occasioned partly by its traffic conditions and by the quarantine, but chiefly by the fact that the trunk lines wanted cars and were not disposed to give the Cotton Belt its own or any of their own. Something the same thing is true of the Missouri, Kansas & Texas with its increase of 59 per cent. in net, yet the showing made by these two roads for the present quarter is unmistakably a very good one. The best showing in the entire list, from a standpoint both of gross and of net, is unquestionably the Canadian Pacific, which increased its net earnings 39 per cent. on top of an extraordinarily profitable quarter last year. There seems to be no limit to the possibilities of this road's achievements, and beside its large earnings from current sources, it has as an extremely valuable asset, its land grant holdings, worth, nobody knows how much, in view of the great development of the Northwest country. Other extremely good showings in net are made by the Alton, the Lake Shore, the Southern Pacific, the Illinois Central and the Delaware & Hudson. In addition to the Cotton Belt, the Missouri Pacific, Wabash and Denver & Rio Grande, constituting the other Gould roads on the list, also did well. The showing of the Denver & Rio Grande is the least conspicuous, chiefly for the reason that it had a good quarter in 1905, while the other roads had a very bad quarter. It is curious to see that two of the Southern roads covering, with their joint mileage, a vast extent of territory—the Atlantic Coast Line and the Seaboard Air Line—show considerable decreases in net, especially the Coast Line, which makes the worst net showing in the list. The position of the Atlantic Coast Line is partly due to the fact that the 1905 quarter was a very good one and partly due to increased operating expenses. In the case of the Seaboard, we strongly suspect that the under-maintenance which has characterized the property for years, is being corrected. The sums spent per mile of track and per locomotive and freight car have been clearly inadequate for several years, and there is much to be done out of earnings which the road's prosperous condition makes it profitable and advisable to do at the present time. It is unnecessary to take up in detail the criticisms of this property made by Mr. John Skelton Williams. Whether or not the car supply has been badly handled, there is need for more money to be spent, and the decrease in net is rather healthy than otherwise. The decrease on the Erie is disquieting, even though it amounts to only 2 per cent., for the reason that this road has more or less constant difficulty over the wage question, and is so situated that it will be harder for it to resist demand for increased pay by employees than it would if it were a little farther away from the other trunk lines. Mr. Underwood has brought this company success in the face of much adversity, but even small wage increases, apart from the general higher cost in materials prevailing, would be likely to prove quite an embarrassment.

It is probably safe to say that it lies within the power of every road on the list that has made a poor showing this quarter in net earnings to improve that showing (excepting perhaps the Erie and the Boston & Maine) by a curtailment of the expense account. It has always been true in seasons of great prosperity that expenses have tended to extravagance, because there was no obvious and stern need to keep them down. It will be recalled how this was limited three years ago, when there was a halt in increased earnings, by setting aside work which was not pressing and reducing forces. In spite of the tremendous amount of betterment work which is urgent and much of which should be paid for out of earnings it is distinctly possible to reduce the expenditures on this account whenever it may seem necessary to do so. The only increases of serious moment are those in wages, which can be increased very readily, but are not so easy to decrease when prosperity slackens its pace.

## FUNDAMENTALS.

Personally, I am one of those who look with serious distrust on each extension of political activity. I believe that the Interstate Commerce law did more to prevent wise railroad regulation than any other event in the history of the country. I think that the courts would have dealt with our industrial problems better than they have done if the anti-trust act had never been passed. I have gravely doubted the wisdom of some of the more recent measures adopted by the national government. But I cannot shut my eyes to the fact that these things are what business men must expect unless business is somewhat modified to meet existing conditions. Industrial corporations grew up into power because they met the needs of the past. To stay in power, they must meet the needs of the present and arrange their ethics accordingly.—*A. T. Hadley.*

During an era of political excitement, in which corporations and all large vested interests constitute the center about which the storm is raging, it is refreshing to revert occasionally to fundamental principles. When the stockholders of the Standard Oil Company transferred the control of their property to trustees and created the first "trust," they sought to accomplish good, not evil; when the Northern Securities Company was formed, in an eastern state, to hold the stocks of certain railroads in western states which were parallel and which the law desired to make competitors, economy and lack of economic waste were the objects, not oppression. Yet to-day the Northern Securities Company exists only in memory, and the Standard Oil Company is fighting for its corporate life, while the very title "trust" has become a byword. After the decision of the courts in the Northern Securities case, we took occasion to make a list of the railroad properties which seemed equally culpable, or nearly so, as regards the harmony of management and operation which they represented in the case of parallel lines in the same territory. This list need not be reproduced; it is sufficient to say that it represented a tolerable portion of the entire mileage of the country. Then the government announced that it did not propose to "run amuck," suggesting the obvious comment that the stability of the principal commercial ventures of the United States rested rather on the whim of the Chief Executive and his legal department than on any assured basis guaranteed them by the government. In a nation where sovereignty was intended to be bounded quite sharply by state lines, and where business has come to be transacted almost wholly without regard to them, it is inevitable that friction should have resulted, and it is probably also inevitable that the central government should have taken authority over certain corporate acts and relations not amenable to the jurisdiction of any single state. But it is most unfortunate that the laws providing for these extensions of power are worded so loosely that their scope and meaning is no definite thing, but a variable, depending, in the last analysis, upon the composition of the United States Supreme Court and upon the individual beliefs of its members.

The facts as related are not new ones, but they bear new significance from the radical attitude of the present government towards corporate interests. What is the end to be? Dr. Hadley has hit the keynote of the present situation in the two points he makes: that corporations to stay in power must meet the needs of the present and arrange their ethics accordingly, and that exist-

sions of political activity are to be feared. On the one side are Harriman methods; on the other, a government about to place its chief prosecutor on the bench of the Supreme Court. Corporation ethics to-day are materially better than they were in the days of Jay Gould and Jim Fisk; better, even, than they were ten years ago, yet they are considerably short of perfection. But does the remedy for them lie in the tangled web of the anti-trust act? It is surely not in the interest of the consumer that kerosene should be sold at prices which would prevail without the great skill of the Standard Oil Company or some equally efficient organization directed towards reducing the cost of production, and the ultimate cost of railroad competition must always fall on the passenger and the shipper, as it has always fallen in the past. Does the government propose to abolish all forms of consolidation that tend to cheapen production, in the interest of the enterprises that are too small to produce cheaply? If so, why not make the political issue squarely on that ground! It is evident that every combination that is successful is in restraint of trade just so far as it succeeds in producing more cheaply than its small competitors can; is that the meaning of the anti-trust act?

These are all fundamentals, as is also the proposition that the national police power should be exercised to punish extortion and dishonesty, when such extortion and dishonesty come within its proper jurisdiction. They are worth keeping in mind at a time when the efforts of the government are directed at tearing down rather than at building up, and the Supreme Court, so far as this lies within the power of the Chief Executive, is to be lined up with the prosecutors.

## WHEN THE FLAGMAN INSULTS THE SIGNALMAN.

The brief paper on the flagging rule which Mr. Slater, of the Southern Pacific, sprung on the Signal Association at Washington last month arrested the members' attention with great success. It was equal to a flag and a torpedo combined. True to the nature of flags and torpedoes, it came unexpectedly; and thereby illustrated the disadvantage which unexpected things labor under, as compared with things, such as fixed block signals and previously printed papers, that everybody is prepared for. The discussion had to be cut short for lack of time, and for that reason each member who spoke felt, no doubt, that the quality of his remarks was in inverse proportion to the importance of the subject. But it will be taken up at another meeting, and it is to be hoped that there will then be a strong representation of transportation officers present, for in discussing this subject the signal engineers are constantly restrained by the feeling that their superiors may think that the signal association is stepping outside of its proper field. It is a good thing, however, to have this question agitated in any field, so long as the agitators are well qualified to speak on it; and most of the signal engineers certainly are.

The inconsistencies and absurdities of our present practice are apparent to everybody who looks into the matter. The hodge-podge of block signaling, time-table, time interval, flagging, torpedoes and fusees is defended by nobody. On the most important through lines, with an equipment of block signals that is lauded in the road's advertisements as the best, passengers in sleeping cars are awakened in the middle of the night by the noise of the whistle of the engine calling in the flagman after a brief stop, and are thus constantly reminded of the imperfection or supposed imperfection of the block signals. Every superintendent who keeps watch of his brakemen and has occasion frequently to investigate the practice of his flagman and engineman labors constantly under the feeling that he is leaning on broken reeds—which he hopes to put together in bundles that shall be so large and so securely tied as to take the place of one sound staff. Every committee which has tried to frame a satisfactory flagging rule has failed; and the best flagging rules have served only to show the difficulty or impossibility of getting men who will intelligently and faithfully carry them out.

As a result of this condition, railroads everywhere are keeping up the inconsistent practice which Mr. Slater described in his paper. A flagman is required to go back as though there were no other protection for his train from rear collision. If he goes beyond a fixed block signal the discredit to that block signal is glaring. If he goes only to it and stops there, the question arises, Why should not the signalman in the tower (where the manual block system is used) go down to the ground and stand there with a flag every time that he puts his signal up behind a train? In the case of an automatic signal there is no tower there, and no signalman: for this reason the feeling that man-operated signals are superior to automatic still survives. It exists so generally that the Signal Association, following the discussion of Mr. Slater's paper, voted unanimously that man-operated signals were the only kind that could be trusted absolutely. Even these were declared to be fully trustworthy only when equipped with electrical lever locking (from one station to another) and with apparatus by which each train shall always put the signals in the stop position behind itself regardless of any negligence on the part of the signalman.

Conditions like these, and others with which the reader is already thoroughly familiar, may well cause every railroad officer to join Mr. Slater in asking the question whether our automatic block signals are to be anything more than ornaments.

But we have the anomalous condition that we already do treat these signals as something more than ornaments. In committee meetings and public discussions we set up our theories of perfection and swear eternal allegiance to them, thus declaring the signals imperfect; but in practice we run trains so close together that the flagging rule is not likely to be of any service whatever as a protection, and therefore we do depend entirely on the block signals, whether we acknowledge the fact or not. In short, we are in the situation where the flagging rule is used as a buttress to the block system when and where it is convenient to use it and is omitted where and when it is inconvenient or impossible to use it. The question where it shall be used and where it shall not, is decided by the general manager, the superintendent, the brakeman and the conductor on premises so mixed that nobody tries to formulate them. From this condition—and brakemen all the time learning by experience that flagging is unnecessary in millions (perhaps billions) of cases (where required by the rule) to one case where it will actually prevent a collision—we seem destined to slowly drift into that prevailing on the English railroads, where flagging is almost universally neglected and where the critical inspectors of the Board of Trade seem to be utterly oblivious to it as a protection from collision.

Whether we do or do not become more like England, the fact remains that we, like the English, have thousands of miles of road on which the block system is nearly perfect, and the question is whether we are going to bring it sufficiently near perfection to abandon definitely and officially the costly, inconsistent, annoying discipline-destroying flagging rule. Without block signals the flagging rule is every superintendent's *bête noire*. With block signals it is liable to bring him into contempt.

Naturally it requires rare courage to make a change which can not be warranted in advance to cure the collision disease absolutely, for everybody fears that the credit of any improvement effected by the change would be nullified by those collisions which should occur, howsoever much their frequency might be reduced. So difficult a problem must therefore be undertaken with caution, and Mr. Slater's proposition is in that respect commendable. He would take only one simple step. Where there is a block signal that protects a train with a half-mile overlap (the rear of the train having passed the signal half a mile) or more than half a mile, the brakeman, having seen the signal, and having put down his torpedoes at least a quarter mile back of the rear car, may return to his train. That would be a very conservative innovation. If the Southern Pacific superintendents refrained from recommending it because they had never heard of anyone else who did such a thing we advise them to reconsider their decision. Their conservatism is excessive. Whether the torpedoes half way between the train and the signal are worth what they cost—say five cents—may well be questioned. Logically the approval of this feature would lead to a demand for an automatic or man-controlled torpedo-placer at every home block signal.

Without regard to the torpedo, however, logic—or common sense—leads us to a second conclusion. If the brakeman's certificate that the block signal stands in the stop position is a sufficient protection to his train (with the torpedo 80 rods back) why should not he have observed the signal when he passed it and thus be able to certify its position without going back to look at it? Then the train would not be delayed any longer in a three-mile block than in a half mile block. If rear brakemen observed all signals and made a record of their position, the block system as a system, would be perfect; for the conductor of a train could by referring to the brakeman's record at any time learn whether or not the last signal passed was left in the stop position.

The block system ought to be made perfect, for reasons already indicated and suggested. This idea of having rear brakemen know what kind of signals they have passed has been recognized, and

even put in practice to some little extent, but it still needs extensive testing. Is this not a question well worth settling? If brakemen cannot be disciplined so that they will bring in complete records every trip let us ask whether the discipline in that feature can be any more defective than it is now in respect to flagging. If there is a question as to the prompt filling up of the record immediately after the passage of the train past each signal, surprise checking is available as an antidote to carelessness. If signals are sometimes hidden by steam or smoke, so that brakemen must report frequently that the position of a signal is unknown, the only remedy may be to have some additional attachment or contact fixed to each signal; but would not that be worth trying? At all events there is no reason in leaving the matter of train protection in its present unsatisfactory condition while so apparently feasible and simple a safeguard has not been fully tested. That some man on a train ought to know that the last block signal passed by it was left in the stop position is a definite need. This need is recognized on some roads by fixing the signal post 200 ft. beyond the entrance to the block section, so that the engineman can see it turn to "stop" a moment before he passes it. On roads where this practice—on some grounds objectionable—is not in vogue, where the signal remains clear until the engine has passed it, the same need should be met by having some one else see that it moves or has moved to the stop position. The rear brakeman is the man who can best do this.

The New York Subway, with its overlaps and automatic stops, represents a definite attempt to make the block system perfect in itself and not dependent on the aid of flagmen. The New York Central's proposed signaling in its electric zone, with its long overlap, is another attempt in the same direction. Expressions here and there from expert railroad officers indicate apparently a growing approval of the principles on which the officers of these roads have acted. Some railroad officers who believe in the principles, take no action looking to their adoption on their own roads because of the real or supposed excessive cost of maintaining such safeguards. But if the principle is correct—the principle of making the block system as nearly perfect as it can be made—only the most complete evidence of imperfect results or extravagant cost can justify any passenger railroad in relaxing its efforts to attain the desired perfection.

One of the chief elements in the argument for the use of the block system is the need of providing a method of running trains under which the superintendent of the road can enjoy a reasonable freedom from anxiety. His peace of mind is a valuable asset of the company. The improvement here suggested is necessary to the accomplishment of that result. Mr. Slater has made what should prove a most fruitful suggestion.

## October Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of October, printed in another column, contains accounts of 21 collisions, 23 derailments and 5 other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | October. | Killed. | Injured. |
|---|---|---|---|---|
| 1. | Lansingburg, N. Y. | 4th | 5 | 25 |
| 2. | Carondelet, Mo. | 11th | 4 | 10 |
| 3. | Whitefish, Wash. | 14th | 3 | 5 |
| 4. | Foraker, Okla. | 22d | 0 | 20 |
| 5. | Boutte, La. | 22d | 4 | 36 |
| 6. | Durbin, Ohio | 27th | 4 | 2 |
| 7. | Atlantic City, N. J. | 28th | 57 | 20 |

The first and the last accidents, Lansingburg and Atlantic City, are the only ones in this list which are out of the ordinary. The first one affords a striking example of a state commission quickly stirring to lock the door after the horse is stolen, and the other is equally notable as a case where the public is peculiarly interested in having a full and unprejudiced report of all the facts, but where there is no public authority to furnish anything of the kind. New Jersey has no competent investigating body, and the Federal Government investigates only by letter. It takes the report of any accident, even the most serious, about as the railroad company offers it. Such a report may be very insufficient, for even those railroad managers who will make an unprejudiced report—there are a few such—are quite likely to fall short in the other essential, fulness of detail. Once more the need of a strong governmental information bureau in this field is brought home to everybody's mind.

As to the facts of these cases, the New York Commission finds, according to the published accounts, that the engineman in the Lansingburg case had not enough distance to stop in. Whether or not this throws the whole blame on the preceding train's flagman is not clear, for we are not informed whether a safe time interval had been prescribed and maintained at frequent intervals north of Lansingburg. The remedy recommended is a second main track and automatic block signals, which illustrates the confusion of thought often seen in the state commission reports. How would a second track cure the disease of rear collisions? It would not. It would reduce congestion of course. But if removing congestion is the main thing to do in dealing with this danger, some roads are in a desperate case! In the Atlantic City case there seems to be no dissent from the conclusion of the coroner's jury as to the cause of the car jumping the track, though the railroad apparently still holds to its claim of "not proven." As intimated above, the need is for a full exposition of all the circumstances; the rail and its fastenings and locking apparatus; the floor of the bridge, the guard rails, their material size and situation, outside and in, and the signaling and interlocking. In the last big drawbridge disaster, that in Virginia a year ago, it appeared that there was no interlocking whatever. A well-posted railroad officer recently remarked that he knew of only one road which had approach locking (by track circuit) at its drawbridges. With facts like these before us, who dissents from the proposition to establish Government investigation?

The number of electric car accidents reported in the newspapers of the United States in the month of October was 207; 10 persons were killed and 191 injured. The worst accident in this list was one which occurred at Toledo on the evening of October 10, when a street car was struck at a crossing by a passenger train of the Cincinnati, Hamilton & Dayton. Fifteen persons were killed or injured, the deaths, according to the reports, numbering four.

## Kansas City Southern.

In 1897 the Kansas City, Pittsburg & Gulf was put in operation from Kansas City to the Gulf at Port Arthur, Texas. It was an independent road built under speculative methods, and it promptly began to make its influence felt among the railroads of the Southwest by sharp rate cutting. A period of severe competition in rates during which the road lowered its tariffs to a point which probably little more than covered direct expenses of operation, was followed in 1899 by the receivership of the property, which was reorganized in 1900 as the Kansas City Southern. For the first five years the road was operated under a voting trust of which E. H. Harriman was chairman, several general officers of the Harriman Lines being appointed to similar positions on the Kansas City Southern. A large share of the ownership of the road was held in Holland and the Dutch holders formed the nucleus of the independent stockholders, who, in May, 1905, took over the property from the voting trust and proceeded to reorganize the management and policies of the road.

The annual report of a year ago, covering the fiscal year ended June 30, 1905, is a severe arraignment of the management of the property under the voting trust. It must be remembered, however, in passing judgment on the previous control, that the road itself had scant funds available for maintaining the property, while, at the same time, it was by no means to the interest of many of the managers to lend their credit to obtain funds with which to build up the Kansas City Southern as a competitor to roads in which they were more directly interested. The road was found by the new officers to be in thoroughly bad shape, not only for economy in operation, but even for safety in carrying its regular traffic. Owing to bad conditions of roadbed and track, inadequate warehouses, yards, sidings, water stations and telegraph wires and insufficient number of locomotives and cars, a large proportion of which also were in bad repair. During the first six months of the calender year 1905 there were 715 wrecks and derailments important enough to cause serious loss and delay. Besides the destruction and damage to property thus caused, the delay to train service, with its resulting high expenses for extra fuel and overtime and the diversion of traffic, following the serious loss of confidence and good will of the public naturally gained under such a record of accidents, were serious losses to the road. The outbound freight house at Kansas City was an example of the poverty stricken condition of the property. This was a narrow open shed in poor repair with a small space at one end boxed in for the care of tools, contrasting with substantial modern warehouses owned by competing roads. Of the equipment, 25 per cent. of the locomotives were in bad order and from 35 per cent. to 50 per cent. of the freight cars required heavy repairs. Of the whole freight equipment 65 per cent. was unfit for use in transportation of freight which requires dry cars, such as grain and merchandise. Repairs had been improperly made with inferior materials, so that soon after being repaired cars were again in bad order. In a word, the road hastily built, with steep and frequent grades, insufficient cutting and ballasting and cheap construction in the first place, had been allowed to deteriorate to a point where operation was at once uneconomical and dangerous.

The Kansas City Southern has a main line 788 miles long

from Kansas City south to Port Arthur. Eleven miles of this near the Kansas City end are trackage rights over the St. Louis & San Francisco. The principal traffic of the road is raw materials, particularly lumber, originating in the center and on the southerly end of the line and destined for Kansas City and points beyond that gateway. It has a small return haul in grain and merchandise traffic south from Kansas City, much of which however instead of traversing the whole length of the line, leaves the road at Shreveport, La., to be carried to the Gulf at New Orleans by steamer on the Red and Mississippi rivers. It is particularly deficient in branch line mileage, having only 83 miles of feeders, of which the longest is a 32-mile branch operated separately by the Arkansas Western. It therefore has an unusually heavy freight density for a road in the Southwest, but most of its traffic is carried at low rates




Kansas City Southern.

and over expensive gradients. Grades of 1 per cent. or more are scattered over the 719 miles of line from Kansas City to DeQuincy, La., so that there is not a single low grade operating division on the road. For this reason, in spite of the heavy character of the traffic, the typical train carries only 15 loaded cars. The trainload is, therefore, only 289 tons of revenue and 327 tons of company freight, these figures being larger, one by 21 tons, the other by 38 tons, than in 1905. A thorough examination into the possibilities of grade reduction is now being made. This is one of the most important problems which is to be faced by the present management, as on account of the density of heavy traffic, a reduction of grades is necessary to efficient and economical operation.

The most fundamentally important step taken by the present owners, on assuming control, was the securing of new capital for improvements. Twenty-year improvement 4½ per cent. bonds to the amount of $10,000,000 were authorized on March 19, 1906. Of these, $6,000,000 were pledged as security for an issue of $5,100,000 5 p cent. six-year notes. Of the proceeds of this note issue, abo $2,200,000 has since been used in general improvements to the pr erty. New equipment has been obtained under two equipment trus of a total issue of about $2,000,000. Some 60 spur tracks have be or are being built or extended to better serve industries previous on the line. At the same time ordinary maintenance under op ating expenses has been liberally charged against earnings.

The cost of maintenance of way and structures per mile road was $1,185 in 1906 and $945 in 1905. Maintenance of equi ment was $2,850 per locomotive in 1906 against $2,895 in 190 $863 per passenger car in 1906 against $851 in 1905, and $65 p freight car in 1906 against $94 in 1905. A largely increased amou under this head was spent for repairs and renewals of shop m chinery and tools, against which was charged $575,000 in 1906 a $42,100 in 1905.

Along with the betterments to the property, both gross and n earnings showed increases during the fiscal year ended June 3 1906. Gross earnings were $7,568,000 against $6,894,000 in the pr ceding year, a gain of $675,000. Operating expenses increased $44 000, leaving net earnings of $2,036,000 against $1,800,000 in 190 a gain of $230,757, or 12 per cent. Even with the increases charges through the new interest payments on short term not and equipment notes issued during the year, net income was larg by nearly $200,000 than in the previous year.

Freight traffic density increased from 887,000 tons of revenu freight one mile per mile of road to 1,061,000. The ton-mile ra increased from 0.0729 cents in 1905 to 0.0679 cents. There wer 19 tons of revenue freight carried in each loaded car. The numbe of ton-miles of company freight increased nearly 100 per cen owing to the large amount of construction material which wa being moved. Freight earnings per mile of road were $7,204 again $6,469 in 1905.

Under the head of commodities carried there were importan increases in the tonnage of grain and petroleum and other oil both of which classes of traffic were larger by 100 per cent. tha in 1905 and in steel and iron products and miscellaneous tonnag On the other hand there were decreases in tonnage of cotton, coa stone and sand. Of the grain tonnage of 229,000 tons 206,000 ton originated on the Kansas City Southern.

The following table sums up the principal results of operatio for the Kansas City Southern, including the Texarkana & For Smith, comprising the lines in Texas:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 827 | 839 |
| Passenger earnings | $945,208 | $811,192 |
| Freight earnings | 5,958,153 | 5,427,507 |
| Gross earnings | 7,568,822 | 6,893,656 |
| Maint. way and structures | 981,104 | 800,693 |
| Maint. of equipment | 1,184,080 | 1,188,163 |
| Conducting transportation | 2,854,696 | 2,598,278 |
| Net earnings | 2,036,057 | 1,805,300 |
| Net income | 933,055 | 610,192 |

## Canadian Northern.

The Canadian Northern is probably the most rapidly growing railroad system in America. Starting some seven years ago with a small mileage, it sub-leased from the province of Manitoba the North ern Pacific lines in that province and has since, by rapid building extended its mileage in direct operation to 2,500 miles. At the same time in eastern Canada short railroads have been acquired or built and are now held by allied corporations. During the past year these subsidiary companies have been consolidated and unified, so that now the Canadian Northern interests in the East are comprised in three groups: the Halifax & Southwestern in Nova Scotia; the Canadian Northern Quebec Railway in Quebec, the nucleus of which is the former Great Northern Railway of Canada; and the Canadian Northern Ontario Railway, whose existing mileage is largely made up of the recently opened line of the former James Bay Railway between Toronto and Parry Sound. It will be seen from the accompanying official map that the plans of the Canadian Northern are most ambitious. Besides a line to Fort Churchill on Hudson's Bay, the first 100 miles of which are already under construction, a through line from the Atlantic seaboard in Nova Scotia and New Brunswick via Quebec, Ottawa, Sudbury, Winnipeg and Edmonton to the eastern boundary of British Columbia is indicated, with completion of one of the westernmost lines to the Pacific undoubtedly to follow.

The fiscal year ended June 30, 1906, was marked by the opening of the main line of the Canadian Northern to Edmonton, Alb., and also of the important branch to Prince Albert, Saskatchewan. Another line to Prince Albert was acquired in the Q'Appelle, Long Lake & Saskatchewan Railway, previously the Prince Albert division of the Canadian Pacific. In the East, the James Bay Railway was, on November 19, 1906, opened to regular train service between Toronto and Parry Sound; its extension to Sudbury is to be opened next year. The Canadian Northern Quebec Railway was consolidated with the Great Northern of Canada, the Chateauquay & Northern and the Quebec, New Brunswick & Nova Scotia.

With an average of 2,064 miles operated during the fiscal year,

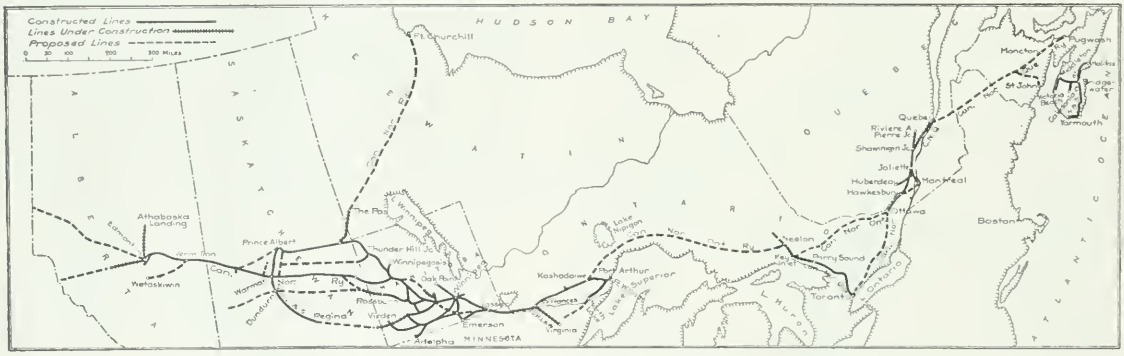
as against 1,586 during 1905, gross earnings were $5,900,000, against $4,190,000 in 1905. Operating expenses were larger by $1,000,000 than in the previous year, leaving net earnings of $2,200,000, against $1,500,000 in 1905. There was a striking gain in passenger earnings, which rose from $660,000 in 1905 to $1,060,000 last year, an increase of 60 per cent., these earnings being 18 per cent. of the total earnings against 16 per cent. in the earlier year. Freight earnings were larger by 43 per cent.; the tonnage moved was 1,727,002 tons, compared with 1,368,896 tons in 1905. Of the increase, grain and flour contributed 179,596 tons, logs and lumber 45,000 tons and general merchandise 99,000 tons. The report calls attention to the large increase in traffic throughout the year from movement of grain and cattle and from farming and immigration business. Referred to as the most noteworthy and particularly satisfactory development is the gain in coal, iron ore and other mineral traffic on all parts of the lines, particularly toward the end of the fiscal year. This is spoken of as an especial subject of congratulation, as it will enable the company in future to face years of poor crops, whenever they come, with equanimity. During the present fiscal year a movement of iron ore from the Atikokan range to Port Arthur is expected. A manufacturing plant is being built at Port Arthur, and it is also expected to market some of the ore in the United States. Attention is called to the fact that in the three months of July, August and September, 1906, since the close of the fiscal year, the gross earnings exceeded the figures for the same months of 1905 by $691,600.

The road traffic is classified under nine heads as follows: flour, grain, livestock, logs and lumber, firewood, fish, immigrants' effects, building materials and miscellaneous. There were 16,200,000 bushels of grain carried, as against 9,700,000 in 1905. More than twice as many head of livestock were carried. The rush of settlers to the rich grain growing districts tapped by the Canadian Northern's western main and branch lines is suggested by the fact that while in 1905 there were 1,558 cars of immigrants' effects hauled, last year there were 2,614 cars. Of building materials, 8,955 carloads were carried, as against 5,968 in 1905, another suggestion of the permanent settling of the new districts. Not only have the aggregate amounts of traffic and earnings been greatly increased during the year, but the earnings per train mile and per mile of road have increased. Passenger earnings per train mile were 22 per cent. and freight earnings per train mile, 8 per cent. larger than in the previous year. Gross earnings per mile of road show an increase of 8 per cent. and net earnings 11 per cent. At the same time, the amount required per mile of road to pay the first charges, including leased lines, shows an increase of 10 per cent. There was an increase of 30 per cent. each in the mileage of passenger trains and freight trains. It is interesting to observe, as an example of the low cost of maintenance of recently built lines mileage, that maintenance of way cost $391 per mile, against $351 in 1905.

The present strength and prosperity of the Canadian Northern are, of course, primarily based on the wonderful development of the western provinces of Canada, particularly Manitoba and Saskatchewan, in which two provinces most of its mileage is located. If the general estimates of the future possibilities of this region are accurate, the road has a splendid future from this part of its line alone. It is evidently the intention of its owners not only to secure the profitable local traffic thus obtained, but eventually to carry grain out to the eastern seaboard for export over their own rails. As a study in competitive railroad building, the development of the Canadian Northern, side by side with its two much stronger and more powerful competitors, will be exceedingly interesting to watch. Under present conditions of Canadian prosperity, and particularly with the favor from government bodies—a factor of great importance in Canadian railroad development—it seems entirely possible that the whole ambitious scheme of development may, within not so very many years, be carried out; for the present, certainly, the expectations of the promoters of the road have been most successfully realized.

The operating results for the past two years are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,064 | 1,586 |
| Passenger earnings | $1,062,639 | $633,936 |
| Freight earnings | 4,335,933 | 3,061,531 |
| Gross earnings | 5,903,756 | 4,190,212 |
| Maint. way and structures | 807,692 | 557,261 |
| Maint. of equipment | 585,602 | 410,707 |
| Conducting transportation | 2,072,057 | 1,515,300 |
| Operating expenses | 3,674,733 | 2,644,730 |
| Net earnings | 2,229,023 | 1,545,482 |
| Mileage worked (June 30) | 2,482 | 1,876 |




Canadian Northern System Showing Proposed Extensions.

## NEW PUBLICATIONS.

*Strength of Materials*, by Professors S. E. Slocum, B.E., Ph.D., and E. L. Hancock, M.S. Published by Ginn & Co., Boston.

The book is intended for use as a text for engineering students. Part I consists of an analytical treatment of the subject and Part II presents a review of the physical properties of the materials of construction. It also presents experimental data for the purposes of the student. The titles to chapters indicate something of the scope of the work; they are: Part I.—Elastic Properties of Materials; Fundamental Relation Between Stress and Deformation; Analysis of Stress in Beams; Flexure of Beams, Columns and Struts; Torsion; Spheres and Cylinders Under Uniform Pressure; Flat Plates; Curved Pieces; Hooks; Links and Springs; Arches and Arched Rabs; Foundations, and Retaining Walls. Part II.—Iron and Steel; Lime, Cement and Concrete; Reinforced Concrete; Brick and Building Stone; Timber; Rope, Wire and Belting.

The presentation of the subject of Hooks, Links and Springs is by a simple graphical method which has not before been published in this country. The chapters on reinforced concrete, timber, rope, wire and belting represents material which has been well selected from the vast amount of experimental data now available. The student is referred to original sources of information and problems are given to serve in testing his grasp of the text.

Professor Slocum is associated with the Department of Applied Mathematics of the University of Cincinnati, and Professor Hancock with the Department of Applied Mechanics of Purdue University at Lafayette, Ind.

*Proceedings of the Fortieth Annual Convention of the Master Car Builders' Association, Held at Atlantic City, N. J., June, 1906.* Published by the Association, J. W. Taylor, Secretary, Old Colony Bldg., Chicago, Ill. Half Leather; 6 in. x 9 in.; 670 pages.

This volume of the *Proceedings* is identical in form and arrangement with those of previous years and contains all of the committee reports, individual papers and the discussions on the floor of the convention. The text and drawings of the standards and recommended practice have been revised in accordance with the action of the Association during the last year. The most important and valuable of the reports include those on brake beams, brake shoes, cast-iron wheels and triple valves. The Association now has 631 members.

### The Bituminous Coal Carriers.

In the *Railroad Gazette* of June 1, 1906, a compilation and estimate was made, from the best sources then available, of the bituminous coal hauled by rail during 1905. The following table, compiled by Edward W. Parker, and published in the form of an advance chapter from the "Mineral Resources of the United States," under the direction of David T. Day, Chief of Division of Mining and Mineral Resources, United States Geological Survey, is more

*Shipments of Bituminous Coals over the Principal Railroad Lines and Systems of the United States.*

| State. | Pennsylvania.a | Baltimore & Ohio.b | Frisco.c | Norfolk & Western. | Ill. Central. | Chesapeake & Ohio. | Louisville & Nashville. | Southern. |
|---|---|---|---|---|---|---|---|---|
| Pennsylvania | 37,069,828 | 5,298,274 | ..... | ..... | 6,615,369 | ..... | ..... | ..... |
| Illinois | 875,995 | 881,893 | 3,420,428 | ..... | ..... | ..... | 458,256 | 790,728 |
| West Virginia | 233,745 | 7,994,392 | ..... | 8,739,077 | ..... | 8,792,671 | ..... | ..... |
| Ohio | 5,091,700 | 5,652,397 | ..... | ..... | ..... | ..... | ..... | ..... |
| Alabama | ..... | ..... | 1,567,049 | ..... | 65,696 | ..... | 3,125,792 | 2,454,782 |
| Indiana | 2,468,553 | 26,273 | 2,883,176 | ..... | 488,206 | ..... | ..... | 638,657 |
| Kentucky | ..... | ..... | ..... | 104,432 | 2,253,289 | 142,169 | 3,814,623 | 231,038 |
| Colorado | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iowa | ..... | ..... | ..... | ..... | 7,195 | ..... | ..... | ..... |
| Kansas | ..... | ..... | 2,286,631 | ..... | ..... | ..... | ..... | ..... |
| Wyoming | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Maryland | 3,446,722 | 445,603 | ..... | ..... | ..... | ..... | ..... | ..... |
| Tennessee | ..... | ..... | ..... | ..... | ..... | ..... | 632,269 | 2,312,761 |
| Missouri | ..... | ..... | 104,681 | ..... | ..... | ..... | ..... | ..... |
| Virginia | ..... | ..... | ..... | 983,483 | ..... | ..... | 148,099 | 317,258 |
| Washington | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Indian Territory | ..... | ..... | 51,038 | ..... | ..... | ..... | ..... | ..... |
| Arkansas | ..... | ..... | 86,455 | ..... | ..... | ..... | ..... | ..... |
| Total | 49,181,843 | 20,298,832 | 10,384,458 | 9,823,992 | 9,429,755 | 8,934,840 | 8,179,039 | 6,745,174 |

*a* Includes the Pennsylvania Company, Pennsylvania Lines West of Pittsburg, Terre Haute and Indianapolis, Vandalia, and other subsidiary companies.
*b* Includes the Baltimore & Ohio Southwestern.
*c* Includes the Chicago & Eastern Illinois.

*Shipments of Bituminous Coal Over the Principal Railroad Lines and Systems of the United States.*—(Continued).

| State. | Burlington.a | Wabash.b | Santa Fe. | Hocking Valley. | Missouri Pacific.c. | Pittsburg & Lake Erie. | Rock Island.d | Chicago & Northwestern. | Big Four. |
|---|---|---|---|---|---|---|---|---|---|
| Pennsylvania | ..... | 118,584 | ..... | ..... | ..... | 3,160,319 | ..... | ..... | ..... |
| Illinois | 2,756,229 | 2,812,260 | 494,508 | ..... | 922,566 | ..... | 686,956 | 1,280,874 | 1,923,031 |
| West Virginia | ..... | 1,533,706 | ..... | ..... | ..... | 49,294 | ..... | ..... | ..... |
| Ohio | ..... | 140,050 | ..... | 4,362,250 | ..... | 5,044 | ..... | ..... | 43,959 |
| Alabama | ..... | ..... | ..... | 775 | ..... | ..... | ..... | ..... | ..... |
| Indiana | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 410,649 |
| Kentucky | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Colorado | 151,564 | ..... | 557,867 | ..... | ..... | ..... | 15,865 | ..... | ..... |
| Iowa | 1,208,015 | 228,762 | ..... | ..... | ..... | ..... | 779,824 | 1,437,250 | ..... |
| Kansas | 22,649 | ..... | 2,340,929 | ..... | 928,956 | ..... | 22,648 | ..... | ..... |
| Wyoming | 1,081,990 | ..... | ..... | ..... | ..... | ..... | ..... | 54,744 | ..... |
| Maryland | ..... | 347,509 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Tennessee | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Missouri | 384,787 | 267,600 | 188,758 | ..... | 835,592 | ..... | 67,498 | ..... | ..... |
| Virginia | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Washington | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Indian Territory | ..... | ..... | 2,083 | ..... | ..... | ..... | 1,153,843 | ..... | ..... |
| Arkansas | ..... | ..... | ..... | ..... | 1,006,742 | ..... | 76,142 | ..... | ..... |
| Utah | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| New Mexico | ..... | ..... | 976,785 | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Michigan | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Texas | ..... | ..... | ..... | ..... | ..... | ..... | 40,850 | ..... | ..... |
| Total | 5,605,234 | 5,448,471 | 4,560,930 | 4,363,125 | 3,693,856 | 3,214,657 | 2,845,626 | 2,772,868 | 2,377,639 |

*a* Includes the Chicago, Burlington & Quincy, Burlington & Missouri River, Burlington & Western, Kansas City & Omaha, and other subsidiary lines.
*b* Includes the Wabash Pittsburg Terminal, Wheeling & Lake Erie, and West Virginia Central & Pittsburg.
*c* Includes the St. Louis, Iron Mountain & Southern.
*d* Includes the Choctaw, Oklahoma & Gulf.

*Shipments of Bituminous Coals over the Principal Railroads of the United States.*

| Railroad. | State. | Quantity, short tons. | Total. |
|---|---|---|---|
| New York Central & Hudson River.. | Pennsylvania .. | 6,307,762 | 6,307,762 |
| Buffalo, Rochester & Pittsburg..... | Pennsylvania. .. | 6,291,806 | 6,291,806 |
| Union Pacific | Colorado ..... | 61,282 | 4,345,174 |
| | Kansas ..... | 66,757 | |
| | Wyoming ..... | 4,166,852 | |
| | Utah ..... | 50,283 | |
| Denver & Rio Grande | Colorado ..... | 1,819,233 | 2,808,242 |
| | Utah ..... | 959,009 | |
| | New Mexico .... | 30,000 | |
| Chicago & Alton | Illinois ..... | 2,455,409 | 2,663,085 |
| | Missouri ..... | 207,676 | |
| Northern Pacific | Washington .... | 1,936,684 | 2,648,395 |
| | Montana ..... | 666,066 | |
| | North Dakota .. | 45,645 | |
| Colorado & Southern | Colorado ..... | 2,289,271 | 2,289,271 |
| Wheeling & Lake Erie | West Virginia .. | 4,022 | 2,260,841 |
| | Ohio ..... | 2,256,819 | |
| Missouri, Kansas & Texas | Kansas ..... | 774,131 | 2,153,344 |
| | Missouri ..... | 103,535 | |
| | Indian Territory | 1,193,936 | |
| | Texas ..... | 81,742 | |
| Kanawha & Michigan | West Virginia .. | 1,790,254 | 1,875,521 |
| | Ohio ..... | 85,267 | |
| Toledo & Ohio Central | Ohio ..... | 1,728,774 | 1,728,774 |
| Bessemer & Lake Erie | Pennsylvania ... | 1,584,619 | 1,584,619 |
| Erie | Pennsylvania ... | 1,247,909 | 1,494,743 |
| | Ohio ..... | 246,834 | |
| Cincinnati, Hamilton & Dayton | Illinois ..... | 169,754 | 1,491,340 |
| | Ohio ..... | 538,171 | |
| | Indiana ..... | 15,328 | |
| | Michigan ..... | 768,087 | |
| Evansville & Terre Haute | Indiana ..... | 1,415,236 | 1,415,236 |
| Nashville, Chattanooga & St. Louis.. | Alabama ..... | 14,672 | 1,087,791 |
| | Tennessee ..... | 1,064,537 | |
| | Georgia ..... | 8,582 | |
| Missouri & Louisiana | Missouri ..... | 529,332 | 944,718 |
| | Arkansas ..... | 415,446 | |
| Chicago, Milwaukee & St. Paul | Illinois ..... | 61,461 | 881,338 |
| | Iowa ..... | 819,877 | |
| Iowa Central | Illinois ..... | 383,221 | 839,040 |
| | Iowa ..... | 455,819 | |
| Great Northern | Montana ..... | 793,665 | 832,233 |
| | North Dakota .. | 38,568 | |
| Mobile & Ohio | Illinois ..... | 628,692 | 819,441 |
| | Alamaba ..... | 190,749 | |
| Cincinnati, N. Orleans & Texas Pac. | Kentucky ..... | 273,345 | 690,260 |
| | Tennessee ..... | 416,915 | |
| Kansas City Southern | Kansas ..... | 332,641 | 433,401 |
| | Missouri ..... | 17,140 | |
| | Indian Territory. | 83,620 | |
| Midland Valley. | Indian Territory | 39,399 | 219,317 |
| | Arkansas ..... | 179,918 | |

The shipments over the railroads which penetrate only one or two states, and which were less than 1,000,000 tons and over 100,000 tons in 1905, have been reported as follows:

| Railroad. | State. | Amount, short tons. |
|---|---|---|
| Alabama Great Southern | Alabama | 111,090 |
| Beech Creek | Penusylvania | 873,095 |
| Buffalo & Susquehanna | Pennsylvania | 438,161 |
| Central of Georgia | Georgia | 164,113 |
| Central Indiana | Indiana | 161,819 |
| Chicago Great Western | Iowa and Kansas | 293,303 |
| Chicago & Illinois Midland | Illinois | 226,396 |
| Chicago, Indianapolis & Louisville | Indiana | 224,589 |
| Chic., Peoria & St. Louis Ry. of Ill. | Illinois | 603,107 |
| Coal & Coke | West Virginia | 248,027 |
| Colorado Midland | Colorado | 282,706 |
| Colorado & Southeastern | Colorado | 704,556 |
| Colorado & Wyoming | Colorado | 100,921 |
| Columbia & Puget Sound | Washington | 654,693 |
| Denver, Northwestern & Pacific | Colorado | 178,339 |
| Des Moines, Iowa Falls & Northern | Iowa | 123,694 |
| Detroit, Toledo & Ironton | Ohio | 759,277 |
| East Broad Top | Pennsylvania | 143,952 |
| Elgin, Joliet & Eastern | Illinois | 964,430 |
| El Paso & Northeastern | New Mexico | 413,594 |
| Evansville & Indianapolis | Indiana | 157,172 |
| Fort Smith & Western | Indian Territory | 250,314 |
| Georges Creek & Cumberland | Maryland | 230,269 |
| Harriman & Northeastern | Tennessee | 308,315 |
| Huntingdon & Broad Top Mountain | Pennsylvania | 475,809 |
| Illinois Southern | Illinois | 173,045 |
| Indiana, Illinois & Iowa | Illinois | 215,523 |
| International & Great Northern | Texas | 148,193 |
| Iowa & St. Louis | Missouri | 256,154 |
| Kelly Creek | West Virginia | 229,426 |
| Lake Erie, Alliance & Wheeling | Ohio | 971,065 |
| Lake Shore & Michigan Southern | Pennsylvania & Ohio | 157,225 |
| Lick Creek and Lake Erie | Virginia | 440,185 |
| Litchfield & Madison | Illinois | 812,165 |
| Louisville, Henderson & St. Louis | Kentucky | 101,262 |
| Michigan Central | Michigan | 426,334 |
| Minn., St. Paul & Sault Ste. Marie | North Dakota | 110,428 |
| Monongahela | Pennsylvania | 351,719 |
| New Haven & Dunbar | Pennsylvania | 236,863 |
| Newton & Northwestern | Iowa | 214,702 |
| Peoria & Pekin Union | Illinois | 217,055 |
| Pittsburg & Castle Shannon | Pennsylvania | 101,267 |
| Pittsburg, Shawmut & Northern | Pennsylvania | 687,415 |
| Quincy, Omaha & Kansas City | Missouri | 288,053 |
| St. Louis & Belleville | Illinois | 299,723 |
| St. Louis & O'Fallon | Illinois | 408,300 |
| St. Louis, Troy & Eastern | Illinois | 956,468 |
| Seaboard Air Line | Alabama | 177,436 |
| Texas & Pacific | Texas | 573,656 |
| Toledo, Peoria & Western | Illinois | 189,199 |
| Toledo, St. Louis & Western | Illinois | 304,982 |
| Toluca, Marquette & Northern | Illinois | 173,753 |
| Virginia & Southwestern | Virginia | 333,588 |
| Western Allegheny | Pennsylvania | 564,154 |
| Zanesville & Western | Ohio | 738,938 |

complete. The table, of course, involves duplications, but it nevertheless shows that the railroads profited by the carriage, in total, of about 226,000,000 short tons of bituminous, exclusive of roads hauling less than 100,000 tons. The latter brought the total shipments up to a little over 255 million tons for the year. The number of carriers participating in the movement of 100,000 tons or over was 96, exclusive of the separate corporate companies included in the larger systems.

## Shop Betterment Work on the Santa Fe.

BY CHARLES H. FRY,
Associate Editor of the *Railroad Gazette*.

The occurrence of the machinists', boilermakers' and blacksmiths' strike of May, 1904, on the Atchison, Topeka & Santa Fe Railway System, was directly responsible for the inauguration by the management of a system of betterment work which marks the Santa Fe as the pioneer in incorporating into railroad practice methods for heightening operative efficiency, refining railroad mechanical practice, and harmonizing relations between employer and employee in the departments affected, which hitherto have been practically confined to commercial manufacturing concerns. The establishing of a movement so radical in character and so revolutionary, far-reaching and complex in many of its effects, on a railroad system the size of the Santa Fe, is a task of such magnitude that even now after two and a half years of wise, systematic and unremitting effort, the work may be said to be only fairly begun; for of the four great divisions of railroad operations it has been applied almost solely to the Maintenance of Equipment accounts, in a small degree to Conducting Transportation accounts, and not at all to the other two—Maintenance of Way and Structures, and General Expenses.

As a first step to getting an adequate idea of the magnitude of the undertaking, the accompanying map of the Santa Fe System should be studied, and its extent and general divisions noted. The System has a total of 8,500 miles. It owns 45,347 cars, of which 44,204 are freight, 995 are passenger, and 148 miscellaneous cars. The total number of locomotives is 1,633. The System comprises the Atchison, Topeka & Santa Fe Railway proper, divided into the Eastern and Western Grand divisions; the Atchison, Topeka & Santa Fe Railway Coast Lines, and the Gulf, Colorado & Santa Fe, or Gulf Lines. The mechanical department of the System is in charge of Mr. Alfred Lovell, Superintendent of Motive Power, and has five major divisions as follows:

| Name. | Extent. | Mechanical Supt. | Miles of road. | No. of locos. |
|---|---|---|---|---|
| 1. Eastern Grand. | Chicago to Newton | W. F. Buck | 2,600 | 584 |
| 2. Western Grand. | Newton to Albuquerque and El Paso | M. J. Drury | 2,650 | 430 |
| 3. Coast Lines. | Albuquerque to San Francisco | S. L. Bean | 1,800 | 367 |
| 4. Gulf Lines. | Shawnee to Galveston | P. T. Dunlop | 1,450 | 252 |
| 5. Topeka Shops. | General repair and manufacturing shops of System—John Purcell, Supt. | | | |

Each of the first four major divisions is, of course, divided into the usual smaller divisions, in charge of master mechanics. The Topeka shops are the largest on the System and their superintendent reports direct to the superintendent of motive power. The other shops are under the master mechanics of their respective divisions.

The credit for the introduction of this betterment work on the Santa Fe is due primarily and directly to Mr. J. W. Kendrick, Second Vice-President, and it is to his energy and interest and consistent support of the efforts of those having the work more immediately in charge that their success is due. As already mentioned, the movement was inaugurated during a strike which was characterized by great bitterness. The prime objects of the betterment work as undertaken have been stated to be, in the order of their importance:

(1) To restore and promote harmonious and cordial relations based on mutual respect and confidence between employer and employee.

(2) To restore the worker to himself by freeing him from the small and debasing tyrannies of petty and arbitrary officials on one side and from individuality-destroying, union domination on the other.

(3) To give the company better, more reliable and more trustworthy employees.

(4) To increase automatically and without fixed limit the pay of good men, this increase of pay depending on themselves, not on their immediate superiors.

(5) To increase the capacity of shops without adding new equipment.

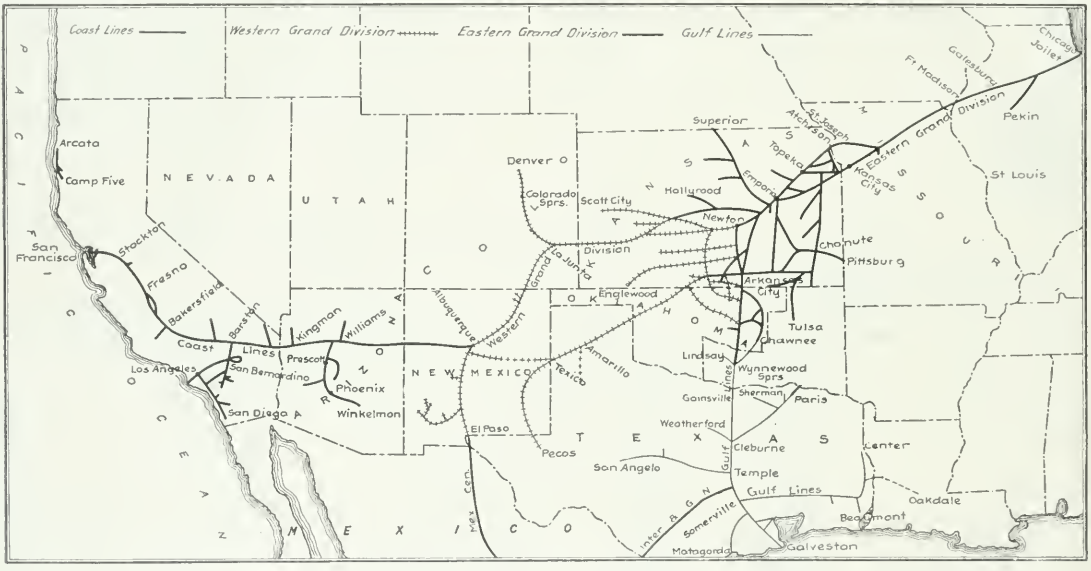



Fig. 1—Map of the Atchison, Topeka & Santa Fe Railway System.

(6) To increase the reliability of work turned out and the efficiency of operations performed.

(7) To do all these things not only without cost to the company but with a marked reduction in its expenses.

It was the belief that by increased supervision and special reward, efficiency could be increased and expenses lessened. Increased supervision was to be aided by more frequent and prompt tabulation of various performance records, by special expert investigations of every operation as to man, machine, methods and material, with consequent planning to eliminate wastes of every and all kinds. The work thus far has been limited to the maintenance of equipment accounts and to locomotive operation in its various phases, including repairs, roundhouse, supplies, fuel consumption, engine failures, lessening of delays at shops, adjustment of repair activity to traffic needs, etc. It can safely be said that the betterment work *has* resulted, as anticipated, in restoring harmony between employer and employee, in restoring self-respect to the latter, and increasing his efficiency and reliability. Also it has raised his wages 10 to 20 per cent. on the average. In addition, for every dollar of supervising and special expense incurred, the company has saved at least $10 in reduced costs.

The Shop Betterment Department of the Santa Fe was organized by Mr. Harrington Emerson, Consulting Engineer, who has done the general as well as much of the detail planning and is in supervisory charge of all of the work. He is also local resident for Topeka shops and Eastern Grand division problems. As indicated by the present extent of the work as outlined in the preceding paragraph, the departments through which it had been necessary

to work to introduce the system have been the mechanical, Mr. Lovell, Superintendent of Motive Power; the accounting, Mr. W. E. Bailey, General Auditor; the purchasing, Mr. W. E. Hodges, General Purchasing Agent, and the stores, Mr. N. M. Rice, General Storekeeper. The hearty co-operation of these officers has been an important factor in the success of the work; also that of the mechanical superintendent and the superintendent of shops at Topeka. Mr. Emerson's office assistant is Mr. Clive Hastings, formerly of the Northern Pacific. The special men reporting directly to Mr. Emerson are:

Mr. H. W. Jacobs (formerly of the Burlington and Union Pacific), territorially in charge of all betterment work on the Coast Lines, and functionally in charge of tools and machinery betterments.

Mr. J. E. Epler (formerly of the Burlington; Lackawanna, and N. Y. C. Lines), territorially in charge of Gulf Lines and functionally in charge of all car work.

Mr. S. D. I. Emerson (formerly accountant and manufacturer), in charge of betterment work on the Western Grand division. With him is associated Mr. W. J. Power (formerly of the Union Pacific). These two men were previously in charge of time studies and bonus schedules and of the introduction of individual effort methods at Topeka shops.

Mr. J. F. Whiteford (formerly of the Burlington and Union Pacific), in charge of all betterment work as applied to roundhouses.

Mr. Curtis B. Goode, in charge of power house economies; Mr. Thomas W. Neely, in charge of oil burning economies; Mr. F. L. Hutchins (formerly of the Boston & Maine), in charge of records and "graphs"; Mr. G. S. S. Playfair, in charge of road units records; Mr. E. K. Wennerlund, general assistant on the A., T. & S. F. proper. In addition, each of the above has his own assistants, the total number of men directly engaged on this work in October being 31.

As various facts indicating wastes or chances of improvement are reported to Mr. Emerson's office, all of the conditions are investigated and new methods are evolved and planned. If these involve other departments they are, as the case may require, considered in conference with either the general auditor, the general purchasing agent, the superintendent of motive power, the general statistician, the general storekeeper, the superintendent of shops and the mechanical superintendents, or the general managers. When an agreement has been reached and there is need for final authoritative action, the desired changes are submitted to the Second Vice-President for final approval. This adopts and incorporates the modifications due to the special work into the regular departments affected by these modifications. As examples of this co-operative work the following are cited:

(1) All mechanical pay-rolls and distribution are reported daily by the mechanical auditors.

(2) Specifications as to many supplies have been adopted by the general purchasing agent.

(3) The superintendent of motive power has approved recommendations for standardizing tools and engine parts, and innumerable other recommendations.

(4) The general statistician has put into effect a monthly report of locomotive performance; he has given valuable compilations and comparisons from other railroad systems.

(5) The general storekeeper has always adapted immediately his own department procedures and records to the ofttimes annoying experimental changes, and has directed all division storekeepers to co-operate in every possible way.

(6) The superintendent of Topeka shops, while never abdicating his position as head of these shops, has, after conference and mutual agreement, put into effect locomotive, gang and machine schedules, and has himself introduced the new methods into the blacksmith and certain other departments.

(7) The mechanical superintendents have co-operated as to roundhouse and car work, and as to the smaller shops.

(8) General managers have seconded efforts and carried out recommendations as to power house betterments and as to fuel and supplies for locomotives.

Records of pay-rolls, engine repairs, engine mileage, engine failures, engine tonnage, engine fuel consumption, engine supplies, tool and machinery repairs, and car detentions and repairs, are sent regularly to Mr. Emerson's office and there tabulated and graphed so as to show properly and in the plainest manner the general tendency over the whole System, enabling a comprehensive bird's-eye view of maintenance, shop, engine, car, fuel and supply conditions of the System, as well as of each individual point, to be gained almost at a glance. The method as a whole has been to collect facts, to investigate and to evolve remedies, and to adapt them in conference with regular officers, entrusting the application of remedies to these officers, occasionally, and then only temporarily, lending a hand. The regular graphed records permit of keeping in constant touch with what is going on. When vacancies have occurred and promotion was being considered, the graphical records of individual performance have been carefully considered. Three of the four mechanical superintendents have been promoted to their present positions since January, 1906, and in each case the promotion was made on records previously tabulated in graphical form. The records, had, in fact, selected these men for promotion before vacancies occurred.

The introduction of the betterment work had, of course, to be taken up gradually and locally, it not being possible to take up any branch of the work over the entire System at once. During the first fiscal year (June 30, 1904-5) and, in fact, until October, 1905, it was confined almost entirely to Topeka shops, and consisted in general betterment of shop conditions, etc., in concentration of the manufacture of material and of tools at Topeka, and in starting and establishing the individual effort reward system. The work was then extended as follows:

| | |
|---|---|
| To oil burning | March, 1905. |
| To general tool account for System | August, 1905. |
| To Topeka roundhouse | September, 1905. |
| To Albuquerque shops | November, 1905. |
| To Raton and Winslow shops | January, 1906. |
| To Shopton (Illinois Division shops) | January, 1906. |
| To San Bernardino ships (Coast Lines) | February, 1906. |
| To general roundhouse work | April, 1906. |
| To Cleburne shops (Gulf Lines) | May, 1906. |
| To car work on System | August, 1906. |

As examples of the gradual and local introduction of the work, the efforts on tool account, prior to its extension to the System in August, 1905, were at first confined to Topeka, Albuquerque and San Bernardino, and later were extended to The Needles, Ariz.; no work on oil burning on the Gulf Lines was begun until May, 1905, and car work was first undertaken at Cleburne and San Bernardino, simultaneously, in May, 1906. In what follows the work will be taken up in detail in the order of its introduction, as far as possible, and will therefore need to begin with the work at Topeka.

### THE WORK AT THE TOPEKA SHOPS.

The character of the work done at the Topeka shops has already been outlined, consisting of three principal branches: (1) getting

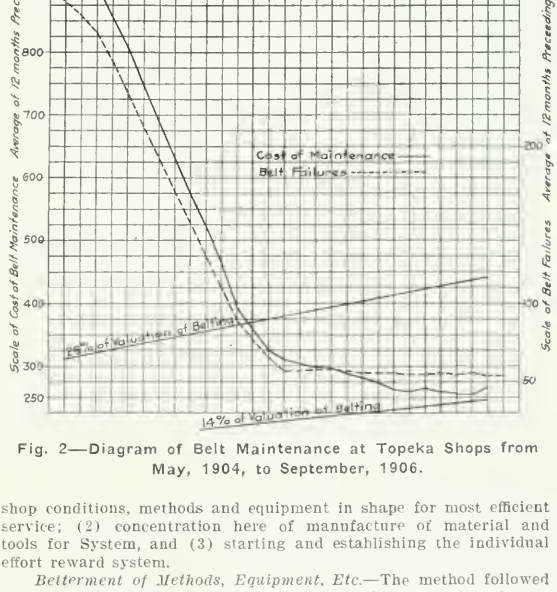

1904
1905
1906
Cost of Maintenance
Belt Failures
Scale of Cost of Belt Maintenance Average of 12 months Preceding
Scale of Belt Failures Average of 12 months Preceding
14% of Valuation of Belting
25% of Valuation of Belting

Fig. 2—Diagram of Belt Maintenance at Topeka Shops from May, 1904, to September, 1906.

shop conditions, methods and equipment in shape for most efficient service; (2) concentration here of manufacture of material and tools for System, and (3) starting and establishing the individual effort reward system.

*Betterment of Methods, Equipment, Etc.*—The method followed was to determine through specialists and special investigations, in conjunction with the regular shop officials, the best way of doing work, the investigations including man, machine, method and material. It will not be possible to take up here in detail the methods pursued and what was accomplished. The efforts were directed to developing all weak places in the operation as to equipment, power, line shafting, belting, cutting tools, patterns, blueprints, quality of material, delays in waiting for material, etc.; innumerable jigs and special devices for doing work quicker and better and more economically were designed; in short, everything possible was done by skilled specialists to better every shop condition making for improved efficiency.

As a sample of just one feature or item of this work and what was accomplished, a diagram is exhibited herewith (Fig. 2) of the cost of belt maintenance at these shops from May, 1904, to the present time. When the betterment forces took hold, the monthly cost

was $1,000 and the number of failures 300. A rate of $250 a month was set at that time as the ideal to which to work. As the diagram, or graph, shows, the actual expense has now been brought down to an average of $275 a month, all averages being for the 12 months preceding. Failures have fallen from 300 to 55. It should be mentioned that at the outset the figures on cost were for material only, as the labor cost was unknown, no record having been kept. The records now include labor and material. These results were secured by using the best quality of material, and putting its installation and maintenance in the hands of a specialist with instructions to *prevent* failures, not remedy them. A book of rules and instructions for belt repairmen was prepared by Mr. Emerson and distributed on the System; also a rigid set of specifications for belting was drawn up.

*Manufacture of Material and Tools for System.*—The Topeka shops are by far the largest shop plant on the System. The manufacture of large amounts of stock material for the other shops and repair points on all Santa Fe lines, as well as all firebox and heavy machine work for the Atchison proper, were done here prior to beginning the betterment work. With the introduction of the latter, the concentration of manufacture of finished material was made as complete as possible and, in addition, the policy of centralizing and standardizing tool manufacture at Topeka was inaugurated, with Mr. H. W. Jacobs in planning, directing and executive charge.

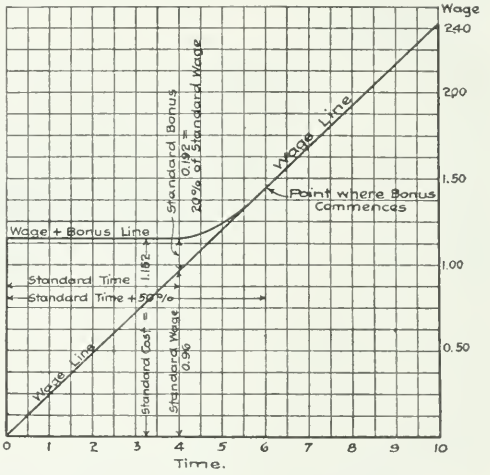
The economy and other advantages of manufacturing in quantities at one central point, suitably equipped, the material for a large railroad system are too well known to need re-statement here. The adoption of such a policy by a road like the Santa Fe not only secures great production economies, but by its intelligent and systematic application the amount of stock to be carried and its cost of handling are minimized, as well as the number of machines, tools and special appliances necessary to its preparation; shops and local repair points, by being furnished with repair parts nearly or entirely ready to apply, are able to make repairs in the minimum time, thus lessening the period of detention of equipment from service. This practice, of course, requires the full co-operation of stores and mechanical departments. To be properly effective, both departments should know well in advance what equipment is to be shopped and what repairs will be required by same, so that the material needed can be made ready. At the Topeka storehouse, where the general stores for the System are carried, is a large finished-material platform, designed and installed by Mr. Rice, the General Storekeeper, which is probably one of the most complete of its sort in the country. On it is carried a large stock of locomotive repair parts finished in whole or in part so that the least possible work needs to be done on them in applying. These parts are sent to all shops on the System as requisitioned. In connection with what was said in regard to minimizing the cost of handling stock under this system, it is of interest to know that the cost of this item at this storehouse is only 1½ per cent., claimed to be the lowest in the world.

Centralizing and standardizing the manufacture of tools at Topeka has been productive of important economies as well as of gratifying results in other ways. The saving on maintenance of tools and machinery account alone for the last fiscal year was $119,000. At the outset this item stood at $486,000 a year—over $40,000 a month. As with the belting account, an ideal for this expenditure was set, the amount being $25,000 a month. It has now been brought down to this figure, yielding the saving above noted, which at the end of a year will equal $180,000. In preparing for this work the requirements of every repair point on the System were carefully canvassed and its actual needs determined. From this, monthly allotments for all points were made up. Careful account is kept of the tools and special devices sent each point and if the allotment is exceeded, inquiry is made and explanation required. All standard tools have symbol numbers, by which all ordering is done.

A very simple but effective system of tool records is kept at Topeka. On the wall of the office of the man having the matter directly in charge is a board carrying three horizontal rows of cards, on hooks. One row of cards lists the standard tools on order in the shops, another the tools on hand in the storehouse, and the third the tools on requisition for outside points. Special devices are entered on separate cards and placed in suitable spaces below the standard tool cards. Record is also kept on the board of the amounts of tool steel on order. Upon removal from the board, all cards are preserved in a suitable filing case. A complete list of the standard tools thus centrally made will not be given, as they include everything from wrenches and chisels to reamers, milling cutters, flue expanders, drills and machine tools. As an example of the practice followed: blueprints showing the form and detail dimensions of every machine tool, with the various symbol numbers and their corresponding sizes, are given every shop and repair point, the tools for which can be obtained only from the general storehouse at Topeka. In ordering, as already explained, it is necessary to give only the symbol number.

*The Individual Effort Reward System.*—The introduction of the individual effort reward, or bonus system of stimulating employees to extra or unusual effort, and of compensating them suitably therefor, is probably the most important single feature of all of the betterment work, not so much because of its economic results as because of its moral and sociological aspects. These were referred to in the beginning of this article. Furthermore, it is the feature by which all of the improvements in methods and equipment are made to yield maximum results. It is not within the scope of this article to present a description in detail of this system and its benefits, and wherein it differs from piece-work, with which many confuse it, but for the benefit of the uninformed its essential features will be briefly outlined.

The prototype of the shop system of reward for extra effort is the similar system, long used, of rewarding engine crews for extra miles run. That is, engine crews have a given number of miles for a run and a schedule time in which to make it. Failure to make the schedule, through no fault of their own, entitles them to time pay. But if extra effort is made and more miles run than the schedule provides, they are paid for the extra miles. Similarly, for the machine shop a schedule is made out for each operation and a standard time set for doing same, but with this important difference as compared to the road scheme: For making standard time the worker is paid 20 per cent. above his hourly rate. Standard time has been defined as "that time which it ought reasonably to take to do the work without killing effort, but by eliminating every unnecessary waste." If more time than standard is taken for the work the bonus diminishes, until at 50 per cent. above standard time it merges into day rate. If less time than standard is taken, the bonus increases above 20 per cent. But the worker makes day wages in any event. This is all shown graphically in the accompanying diagram (Fig. 3):




| Standard time, 4 hrs. Wage rate = 0.24 | | | | 20 per cent. Bonus. Machine rate = 0.70. | | | |
|---|---|---|---|---|---|---|---|
| Hours to do job. | Wages. | Bonus. | Wages and bonus. | H'rly rate of man. | Machine cost. | Total cost ; job. | Total h'rly rate. |
| 10 | $2.40 | ..... | $2.40 | 0.24 | $7.00 | $9.40 | 0.94 |
| 9 | 2.16 | ..... | 2.16 | 0.24 | 6.30 | 8.46 | 0.94 |
| 8 | 1.92 | ..... | 1.92 | 0.24 | 5.60 | 7.52 | 0.94 |
| 7 | 1.68 | ..... | 1.68 | 0.24 | 4.90 | 6.58 | 0.94 |
| 6 | 1.44 | ..... | 1.44 | 0.24 | 4.20 | 5.64 | 0.94 |
| 5.8 | 1.39 | .002 | 1.392 | 0.24 | 4.06 | 5.452 | 0.94 |
| 5.5 | 1.32 | .010 | 1.330 | 0.242 | 3.85 | 5.180 | 0.942 |
| 5.2 | 1.25 | .025 | 1.275 | 0.245 | 3.64 | 4.915 | 0.945 |
| 5 | 1.20 | .039 | 1.239 | 0.248 | 3.50 | 4.739 | 0.948 |
| 4.9 | 1.18 | .049 | 1.229 | 0.251 | 3.43 | 4.659 | 0.951 |
| 4.6 | 1.10 | .084 | 1.184 | 0.257 | 3.22 | 4.404 | 0.957 |
| 4.3 | 1.03 | .130 | 1.160 | 0.269 | 3.01 | 4.170 | 0.970 |
| 4 | .96 | .192 | 1.152 | 0.288 | 2.80 | 3.952 | 0.988 |
| 3 | .72 | .432 | 1.152 | 0.384 | 2.10 | 3.252 | 1.084 |
| 2 | .48 | .672 | 1.152 | 0.576 | 1.40 | 2.552 | 1.276 |
| 1 | .24 | .912 | 1.152 | 1.152 | 0.70 | 1.852 | 1.852 |
| 0 | ... | 1.152 | 1.152 | Infinity. | ... | 1.152 | Infinity. |

**Fig. 3.—Bonus Curve, Santa Fe Method, with Typical Schedule and Table of Total Operation Costs.**

Assuming standard time to be 4 hours, bonus would begin at 6 hours. For the first hour it is practically insignificant, but the rate of increase is rapid, as both curve and table show. When standard time is passed, the increase in bonus is directly proportional to the reduction in time, and the wage-plus-bonus line becomes parallel to the base line. The sum of wages and bonus is termed the "standard labor cost," which becomes constant when standard time is reached.

As a preliminary to the installation of the bonus system a vast number of time studies had to be made and schedules prepared, as each operation to be bonused required the careful study of competent men to determine from the machine and other conditions the standard time. Up to the present time approximately 4,000 such studies have been made at Topeka shops, nearly all of which re-

ceived the careful personal consideration of the superintendent of shops. There are regular blanks or forms on which these studies are recorded and preserved. From the time study the individual effort schedule is made up on a form, likewise specially prepared for the purpose, having spaces to record the kind of operation, the kind of machine, hourly rate, standard cost, standard rate, standard time, standard bonus, and a schedule number which, according to the system adopted, indicates class of machine, location in shop, and number of the operation scheduled, each machine having, of course, a separate schedule for each different operation performed thereon. Below these entries is the schedule, which shows the wages and bonus for different times, as in the table in Fig. 3. It will be noted that fractions of hours are given in tenths. This practice is uniform throughout this work, as it simplifies greatly all computations involving time, and also insures accuracy. All schedules are officially checked by Mr. Emerson and the superintendent of shops and are approved by the superintendent of motive power. Schedules once prepared and approved are not by any means fixed and unchangeable, however. Should one prove to be unfair to the workman, or to the company, or if any change occurs in man, wage rate, machine, or method of doing the work, the schedule may be changed. But should a schedule prove somewhat high, it stands until the occurrence of some one of the other conditions above noted permits a change to be made. Furthermore, any reduction in time the workman is able to effect by exercise of ingenuity he is allowed the full benefit of, no matter if it yields him abnormally high bonus. The moral and stimulating effect of such policies is readily apparent.

Besides the individual or machine schedules there are gang schedules for all gang work. For an erecting gang, for example, the standard is the wage cost of a standard gang for a full week, for a standard number of engines. If either the gang cost is reduced or the output increased, the bonus to the gang is increased, the total amount being apportioned to the individual members on the basis of wages earned for the week. Reduction of gang cost means doing the work with a less number of men, of course; so that if a standard gang should be run with a reduced force and this reduced force produces standard ontput, they are bonused for reduced gang cost; if a standard gang exceeds standard output they are also bonused for this increase. The gang foreman is included as a member of the gang and draws his bonus in proportion to his pay; in addition, he is rewarded for getting the work out on or ahead of schedule; but on the other hand he is penalized or fined for delay, and a gang falling behind the schedule number of engines during any week must overcome the shortage before allowance is made for bonus on subsequent work. The system of account keeping is such that a foreman can find out each day what the previous day's gang costs were and be governed accordingly. Shop foremen are bonused or penalized on output and time of delivery, as the case may be.

Bonus slips, or individual effort checks as they are called, are distributed on the morning of each day to each man who earned bonus the previous day, showing the amount earned. This practice constitutes a prompt recognition of the effort and must undoubtedly have a constantly stimnlating effect, which would, at least, not be nearly so uniform were all recognition postponed until the 15th of the following month, when the pay checks are received. Furthermore, it enables the employee more readily to keep account of his bonus.

*Cost Accounting.*—In connection with the bonus system a complete system of cost accounting is in effect at these shops. By its use accurate record is kept of the cost of every operation, enabling the cost of any piece of work or manufactured article readily and accurately to be determined. As pointed out by Mr. Emerson in these columns last week, it is simply the application to railroad shop work of the methods of any properly administered manufacturing plant, and consists in adding to the cost of direct labor and material the proper surcharge or percentage of general expenses which should be assessed against the operation. In the method of determining this surcharge lies the success or failure of the system.

General expenses fall under the four heads of rent, supervision, maintenance and operation of equipment, and power (light, heat, water, etc.). From the subdivision and distribution of these expenses to the various shops and departments, and groups of men and machines, the man and machine surcharges are determined. The machine charge is reduced to an hourly rate and is ascertained by multiplying its inventory value by the per cent. of surcharge determined for that group and dividing by the number of honrs it is used in the year. Thus, in the table in Fig. 3 the machine rate is 70 cents and the machine cost added to the labor cost gives the total in the next to last column. On the average, it costs close to $1 an hour to operate a man and machine, whether he works slow or fast, therefore the economy of fast operation is apparent.

At Topeka, time distribution clerks enter on "distribution cards" each day complete information concerning each man, his machine, nature of work, material, schedule number, rate, time and bonus. This card is also the man's "clock" card, his time of registering in and out being automatically recorded on it. The cards are turned in nightly to the motive power accountant and from them the pay-roll and all other records are made up. One of these is the operation cost record—a card 5 in. x 8 in.—one of which is used for each schedule. On this card is set down all necessary information concerning the cost of any particular operation nnder the schedule in question, there being room on the card for 80 entries. The cards are filed under the machine and schedule numbers and enable close track to be kept of every kind of work being done.

Mechanical tabulation of records is also in practice. Hollerith tabulating machines are used, the essence of the system being "to make the record by means of punched holes in cards." There are three operations, requiring three different machines: (1) Punching records on cards; (2) sorting into groups, and (3) tabulating. Punching can be done by one man at the rate of 1,500 to 3,000 cards a day; sorting at the rate of 200 a minute, and tabulating at the rate of 40 a minute. One card is used for labor distribution and another for bonus earned, the two being made up from the daily time distribution cards. A great variety of facts, which cannot be enumerated here, can be determined from these cards quickly by means of the machines. But it is said with reference to their use, that if operations are not to be followed into details, if betterment by comparison is not to be consistently carried out, they are a useless expense.

*Shop Methods and Practices.*—In conjunction with the betterment work already described, the general method of handling locomotive repair work through the shops was revised in many respects and special features introduced to expedite work and enable careful supervision and full knowledge of progress and general conditions to be maintained.

Standard times for making the three classes of repairs were established, the periods being: General repairs, 26 days; heavy repairs, 15 days, and light repairs, eight days. Few light repairs are made at Topeka shops, such as are done being only of an emergency character; but all heavy and general repairs for the Atchison proper are made here. The practice of requiring from master mechanics notification well in advance, when possible, regarding equipment needing to be shopped, in order that the material may be got ready, as far as practicable, before the engines are withdrawn from service, has already been referred to. When the engine arrives on the hospital track the master mechanic's report of its general condition is in the hands of the superintendent of shops. As soon as the engine comes to the shops a special inspector who has charge of all such work, looks it over and makes a "condition" report, giving condition of firebox, flues, smoke-arch, driving-wheel centers, tires, frames, cylinders, cylinder saddles, crossheads and tender. The estimated cost of boiler repairs is also entered. When the engine is stripped, this inspector is present and makes up an itemized list of all repairs that are needed. These repairs are then apportioned to the proper departments and gangs, each receiving a slip stating just what work it should do. Carbon copies of these slips are bound together, forming a record in detail of all work done on the locomotive at this particular shopping. The first sheet of this packet gives time of arrival on hospital track, time taken into erecting shop, scheduled time out, name of foreman in general charge of the work, and a brief statement of the character of repairs to be made.

As soon as the inspector's list is made up, an expert estimator prepares from it an itemized estimate of the cost of the repairs, which is sent to the shop superintendent, and nothing more than appears on this list and estimate is permitted to be done to the engine except by direct authorization of this officer. This prevents the doing of any unnecessary work, promotes carefulness and stimulates efficiency. When the job is completed the actual costs are made up from the records and entered in a column parallel to the estimate, enabling comparison of the two to be made, and kept on record. It is interesting to know that these estimates now show an accuracy in their totals of within about 2 per cent. on an average. Individual items vary considerably, of course, but the totals agree quite closely in the majority of cases.

When these repairs are completed the engine is taken out for a trial run. From this run and a careful inspection, the engineman makes a report on what he finds still needs to be done, such as various small adjustments, etc., and not infrequently more important things, which were down on the inspector's list and the workmen failed to do. At the end of the trial run the engine is put in the roundhouse and the inspector goes over it again, adding to the engineman's list anything he may find the latter to have omitted. The foreman is then allowed five hours in which to do what is required, each gang foreman being held responsible for his part of the work. If more than five hours is taken, penalty is inflicted by deducting from the bonus on this engine, if one has been earned. If not, it is charged up, to be liquidated on other work.

In order that he may have constantly under his eye an accurate representation of the general shop condition, Mr. Emerson

devised a "locomotive board" for his office, from which he can tell at a glance what power is awaiting or undergoing repairs and the progress of the latter. The board has a series of small horizontal shelves carrying small cubical blocks, each of which bears the number of a locomotive. The six sides of the block are differently colored and the position of the block permits any one of 24 different facts or classifications to be presented. The board ruled vertically with lines to represent days, and the progress of an engine through the shop is indicated by moving the block bearing its number along the shelf a day at a time. The board is divided to correspond to the "east" and "west" shops, which is the way the longitudinal-track erecting shop is divided for convenience, each half being under a separate foreman. Each of these board sections is subdivided to correspond to the three classes of repairs, and also has subdivisions for the boiler shop and the hospital track respectively. A duplicate board is in the office of the general storekeeper. Mr. Purcell, Superintendent of Shops, has a locomotive board in his office which supplies much the same information, but on which he uses plugs inserted in holes, instead of shelves and blocks. On the circular top of the plug is pasted a piece of paper on which is written the essential information concerning the engine it represents.

*Despatching System.*—One of the most novel, ingenious and helpful of the various special schemes which have been devised in furthering the effectiveness of the betterment work in the shops is a "despatching" system, the idea of Mr. Hastings, Mr. Emerson's office assistant. Like the bonus system, the idea is taken from the similar feature in railroad operation and was worked out in practically the same way that a train schedule is prepared; the movements in this instance being those of pieces of work or material, instead of trains, and the "stations" being machine tools or workmen. The analogy is carried out to the point of having a central despatcher who has charge of the assignment of every job to the various machines or workmen, who knows as accurately as a train despatcher the location and progress of every such assignment, and who "favors" important jobs which for some reason may be delayed and are therefore off schedule just as delayed important trains are similarly favored. The operation of this unique scheme involves the use by the despatcher of a despatching board and a telephone system for issuing orders and receiving reports. Work of this character must, of course, be in thoroughly competent hands. W. J. Jury, formerly foreman of the east side machine shop, is despatcher and operates the system from his office.

The despatching board is the most important single feature of the system, but before describing it the "shop schedule board" should be explained. The despatcher and every gang foreman has one. On a board of a convenient size for handling is pasted a blueprint which is divided vertically into thirds for light, heavy and general repairs respectively, in parallel columns. It is ruled horizontally for days. In each of the three repair columns is listed in consecutive order the various operations to be performed on the engine by the different departments and gangs, with the proper number of day spaces intervening between the several groups of entries corresponding to the schedule time allowed for the performance of the work; the total times being those already given—eight, 15 and 26 days respectively. Between each pair of repair columns—that is, between light and heavy, and heavy and general—there is a narrow piece of cardboard arranged to slide vertically and ruled horizontally to correspond to the day lines of the schedule, and numbered for the working days of the month. When an engine enters the shop its number is set down on one of these strips alongside the number corresponding to the date of entry. Then by moving the strip so as to bring this date in register with the first line of the proper repairs column, which is marked "stripping"—the first operation to be performed, of course—the dates on which all subsequent operations must be finished can be read off at a glance. The sliding strips can be taken out quickly and replaced when they become filled up. This board enables the foreman and the despatcher to keep a check on the progress of each engine, noting whether or not it is keeping up to schedule.

The despatching board is, in fact, three large boards, corresponding to the three principal sections of the shop, each standing on an easel. The three are grouped immediately back of the despatcher's desk. A photograph of one of the boards is reproduced herewith (Fig. 4). Secured to the board by thumb-tacks is a sheet of paper practically as large as the board. Over this sheet is hung a light sheet-metal framework having ten vertical members, which divide the frame into nine sections. There are four horizontal sections formed by the light rods used to secure the frame to the board. The vertical members have their edges notched to form a series of clips for holding narrow cards. Each of the horizontal spaces has the foundation paper ruled by pencil into six spaces corresponding to the working days of the week. The vertical and horizontal divisions give the board here shown 36 subdivisions.

At the top of each subdivision is written the number of some machine in the shop, there being sufficient subdivisions on the three boards for all machines, benches, etc., to which assignments are made. When an assignment is made, the character of the work, engine or shop-order number, and number of machine to which assigned, are written on a small card, such as are seen on the board, and the card placed on the board under its correct machine number. Different classes of work are indicated by different colored cards, there being six, as follows:

White: Repairs for engines in the shop.
Blue: New material for engines in shop.
Green: Stop-order work for System. (Manufactured material to be shipped to other points).
Red: Emergency work; takes precedence over all other.
Pink: Repair work to tools and machinery in all departments of the shop.
Yellow: Special, for some new switch engines being built in the shops.

As will be noted from the number of cards in many of the subdivisions, most machines have a large number of assignments, each having several jobs ahead waiting to be done. The job being worked on has its card put at the top of the section just below the machine number. When a job is finished the entry on the card is transferred

Fig. 4.—Board Used in Shop Despatching System.

to the foundation sheet in the proper day space and the card thrown away. The workman must receive from the despatcher instructions as to which of his waiting jobs must be taken next, and the card for same is moved to the top of the row. The foundation or record sheet is renewed each week, the old sheets being preserved for record.

The despatcher has a list of the engines in the shop, with time in and scheduled time out, which is corrected daily from the shop superintendent's office. This is his primary guide in the assignment and apportionment of work. The initial step in the procedure under this system is the filling in by a gang foreman of a requisition for material he wants made, giving engine number or shop order number to which same is to be charged. This is delivered by messenger to the despatcher, who files it in a case on his desk along with numerous other similar requisitions which are coming in constantly, pending assignment to the machine which the despatcher will select for the work. When the assignment is made, the despatcher puts his "o.k." on the requisition together with the number of the machine, a card is made out for the board, and the requisition is sent to the machine whose number it bears. When the job is done the requisition is returned to the despatcher,

the card is removed from the board and the necessary notation made on the foundation sheet in the proper day space. Also the requisition is filed for record.

Reference has been made to the use of a telephone system. There are three independent telephone lines connecting central points in the three principal shop divisions with the despatcher's office, where there are three separate telephones. Timekeepers report over these telephones the exact time of completion of each piece of work and the time of beginning the next piece, stating nature of same. Foremen usually notify the despatcher by telephone somewhat ahead of the completion of each piece of work, so that instructions can be given for the succeeding piece and thus avoid delays between jobs.

For manufactured goods for stock, the store department sends its order to the despatcher. When he is ready to assign the work he makes out a requisition for the rough material, which he sends to the workmen selected for the work, just as with the foremen's requisitions.

It will be seen that the despatching system enables the man in charge to maintain a constant survey of all of the work subject to his orders. By looking over his board he knows in a moment exactly what job each machine is engaged on and what is waiting at that machine to be done. If one machine appears to have accumulated a large number of assignments and another similar machine has fewer, one or more jobs may be shifted; or if a machine is put out of service for some reason, its work is immediately reassigned if necessary. This also enables important jobs off schedule to be favored, as noted at the outset.

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Reference has been made to the variety of special devices, such as jigs, templets, etc., that have been devised to expedite work in the machine departments. Certain of the foremen and men have displayed great ingenuity in devising special appliances and processes to quicken and cheapen production; and, of course, the bonus system has had a stimulating effect on efforts in this direction. Notable among these is George Fraser, foreman of the blacksmith shop, who has done a great variety of work of this sort, much of it before the betterment work was ever thought of. As a single and interesting example of Mr. Fraser's ability in such things, he designed a brakeshoe-key forging machine, rebuilding an old bulldozer for the purpose, which turns out the keys in great quantities at little cost, 1¼-in. round scrap iron being used for the purpose. These keys were formerly made by hand. Another foreman who has been prolific in ideas of great merit and money value is G. Osman, of the brass department. Some of Mr. Osman's work, particularly in the matter of special forms of box and undercut tools, was described in these columns two years ago (*Railroad Gazette*, June 3 and September 2, 1904). Mr. Osman has continued the good work and further increased the already high efficiency of his department. H. I. Derby, foreman of the tool manufacturing department, also has produced interesting special tools to reduce operations and thereby save time and cost.

All of the locomotive department at the Topeka shops has not yet been put on the bonus system, although it is being extended as fast as practicable. At present the erecting floor is the only department altogether on a bonus schedule, the proportions in other departments being as follows: Machine shop, 65 per cent.; blacksmith shop, 75 per cent.; brass room, 70 per cent.; air pump and injector department, 50 per cent.; tin shop, 50 per cent.; tool manufacturing room, 5 per cent., but being increased. The boiler shop has not proved easy to schedule, and a very small percentage of the work is at present on bonus.

As would naturally be expected, the shop administration at Topeka is of high character. Graphical evidence of this is exhibited in the accompanying diagram, Fig. 5, which is the hourly payroll chart for the shops, based on total hourly rates, the uniformity of the lines throughout the several months charted being good evidence of the results of system. In strong contrast, as exhibiting the reverse conditions—that is, poor administration, lack of system—Fig. 6 should be noted. It records actual conditions at another shop on the System, much smaller than Topeka, as the hourly rates indicate, to which the betterment work has not yet been extended. The lines are a tangle and almost impossible to follow. It is an extreme case, of course, introduced to show what fluctuations actually do occur at some points where poor administration, perhaps combined with unsatisfactory labor conditions, produces results highly detrimental to efficiency and economy. Such points, of course, afford excellent opportunity to test the merits of the betterment work.

In these graphs the ordinates represent the hourly rates, and as noted under Fig. 5, the basis is 54 hours a week. This is not the actual number of hours worked each week, but an assumed working period of 9 hours for each work day. This was adopted to eliminate variations between short months like February, September and November, and long months like March, August and October.

*(To be concluded.)*

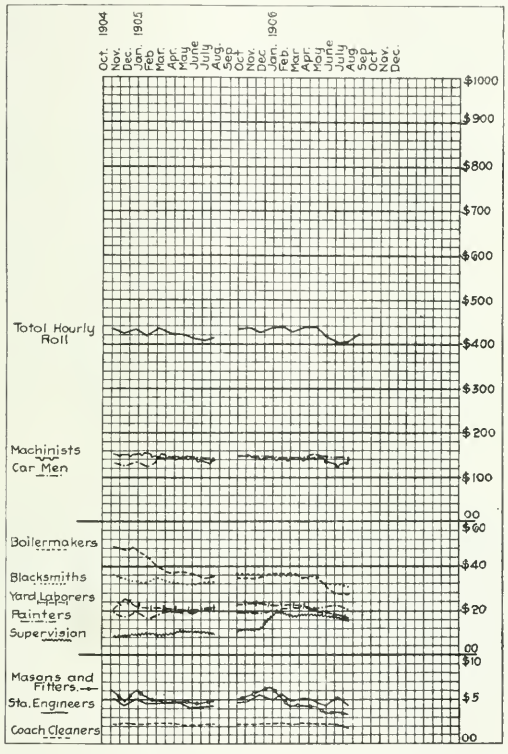


Fig. 5—Hourly Pay-Roll Chart for Topeka Shops (on the Basis of 54 Hours per Week.)

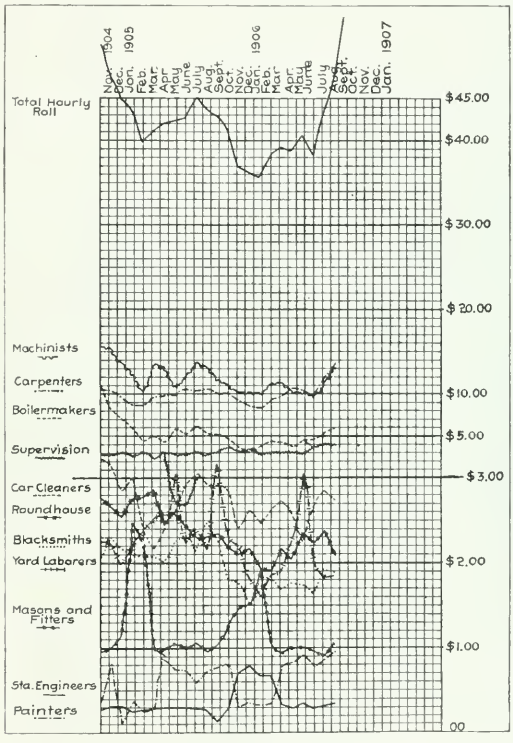


Fig. 6—Hourly Fay-Roll Chart of Shop Where Betterment Work Has Not Yet Been Introduced.

## The Railroad Gages of India.*

(*Concluded from page 458*).

It is hardly necessary in this institution to demonstrate the advantages of uniformity of gage, but it may not be out of place to mention the more important benefits to India that would result from uniformity. It would eliminate the troubles and expense of transhipment and the maintenance of the intricate tracks that are unavoidable where the two systems converge at the great centers of trade, the seaports and the coal fields. It would afford India a much wider field to draw upon for rolling stock when, as often happens, there is a glut of traffic in one particular area, such as may be occasioned by the natural effects of a normal rainfall producing heavy crops, or by a deficiency in the rainfall causing a famine; either of these causes results in abnormal movements of grain foods. Military concentration of troops, material and supplies has the same effect. In India the periods of trade and the movements to or from the seaboard are irregular, and the set of traffic frequently changes; for these reasons it is absolutely necessary to provide a full equipment of rolling stock to meet a maximum traffic for a short period, although the stock may not be fully employed throughout the year. It is evident that the distribution of rolling stock would be immensely facilitated, and the equipment more effectively and economically utilized, if the whole country were served by one gage. A good deal is done at present by mutual borrowing, when it happens that the movements of commodities on adjacent systems occur in different months; for example, the jute traffic from the interior to the seaboard takes place at a different time from the movement of grain and seed; and as these commodities are served by distinct railroad systems, the latter are able to use each other's rolling stock to mutual advantage. There is no private ownership of railroad cars in India. Some schemes have indeed been proposed, but as they have been based on a guarantee of traffic either from the railroads or from the government, they have not been favorably received. Still, it is obvious that, under the varying conditions of trade, the greater the area served by one gage, the greater will be the possibility of mutual accommodation.

Uniformity may be brought about by changing all meter-gage lines to standard gage, by changing all standard-gage lines to meter gage, or by adopting another intermediate gage, preferably the European gage of 4 ft. 8½ in. By adopting the first course, a change would be made from the less to the more efficient gage in respect of carrying capacity and speed, with considerable expenditure of money. The second course would provide a lower standard of carrying capacity, with a comparatively smaller outlay. The third course would be more costly and certainly more prolonged than either of the other two. In reviewing these three methods it may be assumed that the ultimate limit of capacity is proportional to the gage when that limit is reached; but until the volume of traffic has attained its ultimate limit on any gage there is no loss of power. The theory that the gage of a railroad is the fundamental unit of measurement to which all other dimensions should be proportional, ought to be governed by the foregoing qualifications. Now that the traffic of some of the single meter-gage lines has outgrown their carrying capacity, the question has arisen whether it would be better, in the present condition of the system of Indian railroads, to substitute a single standard-gage track or to double the meter-gage line. There is no doubt a great deal to be said in favor of a uniform gage of 3 ft. 3⅜ in., but the existence of 14,477 miles of standard-gage track against 11,421 miles on the meter-gage actually constructed, must greatly modify the aspect of the problem, although the conversion of the existing rolling stock from standard to meter gage is a much greater difficulty than the reverse.

While admitting the obvious advantages of uniformity of gage, there is an equal danger of purchasing it at too dear a price. On examination of Tables I. and II., the great difference in capital cost of the two gages—£11,775 per mile for the standard gage, and £4,700 per mile for the meter gage—is at once noticed. It must be remembered, also, that when the construction of railroads was begun, in 1845, on the standard gage, the cost was much higher than it was 30 years later. Very high rates had to be paid to contractors in order to induce them to undertake the risks attending novel works in a foreign country, where there was nothing to establish a precedent as regards cost of construction. There is also to be taken into account the fact that 9 per cent. of the standard-gage lines is double track; but, allowing for this, although the Government Administration Report on all the railroads in India gives the cost of the standard and meter-gage lines as £10,666 and £5,133 per mile respectively, the difference in capital cost affords ample justification for the early policy of adopting the smaller gage; had it not been allowed, about 5,000 miles of the present lines would probably not now be in existence. At no time has there been any serious attempt to lay down an inexpensive standard-gage line equipped with suitable light rails, rolling stock and station accommodations; and, indeed, the existence of a sanctioned narrow gage has prevented this from being done. Possibly, however, it may be argued that, had only the standard gage been allowed, this light system might have come into existence, although the severe conditions of equipment which obtain in India lead rather to the opposite conclusion.

It is interesting to note that the return on capital and the cost of working of the two gages are nearly alike. Incidentally it is significant that the smaller gage carried, in the year 1903, a larger average number of passengers per train than the standard gage; the difference in the average tonnage per train is accounted for almost entirely by the larger number of branches on the meter-gage lines, and by the coal fields being served almost entirely by the standard-gage lines. The difference in carrying capacity of the two gages may be taken from the statistics in a variety of ways, with considerable difference between the results. Table IV. shows the average speeds to be 23, 12 and 15 miles per hour on the standard-gage, as compared with 18, 10 and 13 miles per hour on the meter-gage lines, for passenger, mixed and goods trains respectively. Neglecting these small differences, and making the reasonable assumption that an engine of either gage will pull an equal number of vehicles or wagons, then, since a four-wheel standard-gage passenger vehicle will hold 60 passengers, and a four-wheel meter-gage coach only 40 passengers, and since a four-wheel standard-gage wagon will carry 16 tons and a four-wheel meter-gage wagon only 10 tons, the ratio of the passenger-vehicle capacity of the standard-gage to that of the meter-gage is found to be 1.5 to 1, and the ratio of the goods wagon capacities 1.6 to 1. Also, from the gross weight of a train, neglecting speed, the ratio of the train capacities is found to be 1.4 to 1 for passenger trains and 2 to 1 for goods trains. In the following table are shown, in addition to the foregoing, the ratios of the carrying capacities of the two gages, obtained by some of the other methods of comparison, compiled from the Railway Administration Report, but confined to the 16 lines which have been taken as examples:

| | | Ratio—Standard gage. | to | Meter gage. |
|---|---|---|---|---|
| Vehicle capacity only | Passenger | 1.5 | to | 1 |
| | Goods | 1.6 | " | 1 |
| The same, taking speed into account | Passenger | 1.9 | " | 1 |
| | Goods | 1.9 | " | 1 |
| Gross weight of trains. | Passenger | 1.4 | " | 1 |
| | Goods | 2.0 | " | 1 |
| The same, taking speed into accouut | Passenger | 1.9 | " | 1 |
| | Goods | 2.4 | " | 1 |
| Vehicle mileage, loaded and empty | Coaching. | 1.9 | " | 1 |
| | Goods | 2.8 | " | 1 |
| The same, taking speed into account | Coaching. | 2.4 | " | 1 |
| | Goods | 3.3 | " | 1 |
| On actual number of passengers carried. | 1 mile | 2.0 | " | 1 |
| On actual number of tons carried | 1 mile | 4.7 | " | 1 |

It will be observed that, whilst the benefit to be derived from conversion is greater for goods trains than for passenger trains, it may fairly be assumed that the general capacity of the standard gage is double that of the meter gage, under the conditions of speed, power of engines, and design of coaches and wagons at present obtaining in India. An independent check on the foregoing is afforded by the ton-mileage per engine. The engine of the principal standard-gage line (the East Indian) accomplishes on an average 7,838 thousand, and that of the principal meter-gage line (the Bengal & North Western) 3,962 thousand ton-miles. It may also be mentioned incidentally that the ratio of the total gross earnings derived from the goods traffic of both gages, to that from the passenger traffic, is 1.9 to 1, and of the total gross earnings derived from the whole traffic of the standard gage to that from the meter gage, 3.05 to 1.

In estimating the cost of converting from meter gage to standard gage, it must be remembered that the Indian government has laid down certain rules governing axle-loads on girder bridges and on rails; but the precaution is now to be adopted of renewing with standard-gage girders girders on meter-gage lines which may require doubling in the near future. This entails only a small addition to the cost, as the tendency is towards heavier engines on both gages. The actual cost of converting a meter-gage to a standard-gage line is not a matter of estimate, since particulars of the cost of conversions already effected are available. The figures for the Salt Branch of 50 miles of the North Western Railway were:

| | Rupees. | |
|---|---|---|
| Land | 32,000 | £2,150 |
| Formation | 70,000 | 4,650 |
| Bridges | 75,000 | 5,000 |
| Ballast | 1,90,000 | 12,650 |
| Permanent way (75-lb. flat-footed rails and 9 ft. wood sleepers for 41-lb. flat-footed rails and 6-ft. timber sleepers) | 10,35,000 | 69,000 |
| Stations | 1,40,000 | 9,350 |
| Plant | 8,000 | 550 |
| Rolling stock | 5,00,000 | 33,350 |
| General charges | 1,00,000 | 6,650 |
| Total | Rs.21,50,000 | £143,350 |

Equal to Rs. 43,000, or £2,867, per mile.

The cost of converting the Nagpur-Chattisgarh line, 145½ miles

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## Commissions, Take Notice!

The following extract is taken from an address recently delivered by President Arthur T. Hadley at the New York School of Philanthropy:

In the years immediately following the Civil War the whole system of American railroad rates was arranged on principles which a decently conducted store would have scorned to admit into its management. The restraints of competition had been done away with, and the managers did not see the necessity of substituting any other legal or moral restraint in its stead. In fact, they asserted a constitutional right to be free of all other legal or moral restraints. Of course this arbitrary exercise of power provoked a reaction. The state legislatures of the Mississippi valley passed the various Granger laws which were placed on their statute books from 1870 to 1875. These laws represented an attempt to reduce rates as unintelligent and crude as had been the attempts of the railroad agents to maintain rates.

Just when things were at their worst a really great man appeared on the scene of action in Charles Francis Adams, of the Massachusetts Railroad Commission. He promulgated an idea, essentially ethical in its character, which not only was of great service at the time but has been the really vital force in all good schemes of corporate regulation ever since. Mr. Adams' central principal was this: In the management of a railroad the temporary interests of the road and of its various shippers are often divergent; but the permanent interests of the railroad and of the various shippers come very much closer together than the temporary ones, and can almost be said to coincide. I cannot go into all the details of the application of this theory. Suffice it to say that during the comparatively short time when he was at the head of the Massachusetts Commission, Mr. Adams did in fact persuade not only the railroad men of that state, but the railroad men of a great many other states, to take this view of the matter; and that by his recommendation, made without any authority except the authority of common sense, he permanently removed more abuses in railroad management than all the various state statutes put together. And when the railroad commissions and other economic commissions of more recent years, disregarding the experiences of Mr. Adams, have besought over and over again for an increase of their power to make rates, and their power to prosecute offenders, and their power to keep the courts from reviewing their acts, I am reminded of the minister in the country church, who said, "O Lord, we pray for power; O Lord, we pray for power"; until an old deacon, unable to contain himself, interrupted, "'Taint power you lack, young man; it's ideas!"

## What Is an Engineer-Constructor?*

One prominent element of modern industrial life is bigness. We have large business corporations, combined railroad systems, extensive manufacturing concerns and comprehensive enterprises in all lines of commercial activity. Another dominant element is efficiency, which may be taken as the key word of modern business life and engineering practice. The constant aim is not cheapness in construction or equipment, but effectiveness, the greatest return for the outlay. These two elements chiefly have brought about a condition in which we have the necessity for a technical organization ready to produce large results in an effective way. Between the desire for bigness and efficiency, and its fulfilment, is the field of operation for the creative and constructive abilities of the engineer-constructor.

An engineer-constructor is an organization, and not an individual. It makes possible the most effective combination of technical theory with practical experience, and provides for the use of "team work" in connection with the designing and building of properties. Its aim is to attain the greatest economy in effort, time and money; its province is to "do" things in the most effective way. In its broadest development such an organization need not be confined to any one class of enterprise. Here is something to be built which requires for its completion a combination of conception, technical knowledge, construction experience and executive ability. Whatever it is, the engineer-constructor should be prepared to carry the proposition through from beginning to end without technical assistance from outside the organization. To be most effective, such an organization should have at its command the technical knowledge and experience of the past; the ability to analyze conditions, and discover the truth from conflicting testimony; the imagination to conceive unprecedented results and courage to overcome obstacles; the ambition to improve existing systems, and the honesty to spend money without favor or graft, and finally loyalty to itself and to its client, which will protect in every way the interests of all concerned. An engineer-constructor in training is nothing less than an ideal employee who has the best possible preparation, the widest experience and the natural aptitude to do in a large way the big things which the development of this country is constantly requiring. Such an organization substitutes for the isolated efforts of one or more individuals an effective combination of the aggregate abilities of a number of experts and adds the enthusiasm and inspiration which comes from the contact of fellow workers. . . .

We need for such an organization a civil engineer, electrical engineer, mechanical engineer, structural engineer, sanitary engineer, chemical engineer, gas engineer, fire protection engineer, hydraulic engineer, mining engineer, architect, industrial expert, statistician, purchasing agent, construction superintendent, operating engineer and an accountant.

An engineer-constructor is an organization in which a number of these candidates are fitted together as a mechanic would build a machine, and the efficiency of such an organization for the purpose for which it is created depends upon, (1) the perfection of its individual parts; (2) the skill with which these parts have been brought together, and (3) upon the absence of any unnecessary friction during operation. Such an organization should not be the maker or manufacturer of any equipment, nor be connected with the exploitation of any system of apparatus, nor interested in the introduction of any patented devices. In its highest stage of development it will not be connected, except in a technical way, with the financial interests which control the enterprise.

The carrying out of every big enterprise will entail nearly all of the following duties: Investigations and reconnaisance, preparation of preliminary reports, estimates of costs, estimates of probable earnings and operating expenses, surveys, preparation of plans and specifications, getting proposals and purchasing, letting contracts, field engineering, construction and erection, inspection, preparation of progress reports, record of costs, tests, operation, final reports and statistics and accounting.

Granted that such an organization of technically trained men can be brought together, what are some of the things which they may be called upon to do? A few of the things requiring such ability and experience in design and construction which occur are: Complete steam railroads, complete electric railways, electrification of steam roads, hydro-electric plants, transmission systems, power plants, gas works, electric lighting systems, industrial establishments, buildings for all purposes and public service works. In so far as an organization is prepared to effectively carry out any of these enterprises just that far will it approach its highest development.

To show the possibilities of such an organization, let us pick out a team for the building of some large proposition. Take, for instance, the design and construction of a steam railroad locomotive repair shop, involving the expenditure of from two to three million dollars. In deciding on our men, we will make a study of the qualifications of each one, and at the same time we must have a clear conception of the work each one must be familiar with in order that there be no weak spots in our line, or break in the organization. The selection of men with their chief duties will be as follows:

| | |
|---|---|
| Industrial Expert | Designing layout of shops.<br>Planning method of handling work.<br>Arrangment of tool and transportation equipmt. |
| Electrical Engineer | Providing power and lighting equipment.<br>Laying out transmission systems.<br>Planning telephone and signal systems. |
| Mechanical Engineer | Design of power plant.<br>Plan of heating and ventilating.<br>Laying out air, gas and steam systems. |
| Structural Engineer | Building foundations.<br>Designing steel structures.<br>In charge of reinforced concrete constructioon. |
| Architect | Designing building superstructure.<br>Choice of fixtures<br>Laying out landscape work. |
| Civil Engineer | Directing grading.<br>Testing of soil.<br>Construction of track. |
| Sanitary Engineer | Design of sewerage system.<br>Construction of water-works.<br>Choice of plumbing. |
| Purchasing Agent | Selecting markets for material.<br>Checking bills of material.<br>Arranging for delivery of material. |
| Constructing Superintendent | Organization of construction force.<br>Consideration of time element in construction.<br>Settling labor difficulties arising in connection with construction work. |
| Operating Engineer | Consideration of economies in operation.<br>Securing reliability in operation.<br>Insuring effectiveness in operation. |
| Accounting Department | Keeping payrolls.<br>Making record of costs.<br>Preparing progress reports. |

Let us watch the play. First will come a number of preliminary studies, showing the proposed sizes, designs and relative arrangements of the buildings. Next forthcoming is a carefully prepared report, showing the advantage of the finally selected arrange-

*Extracts from a paper presented before the Chicago Section, Western Society of Engineers, Nov 16th, 1906, by Gardner S. Bamon, Managing Engineer of The Arnold Company, Chicago.

## The Railroad Gages of India.*

(*Concluded from page 478*).

It is hardly necessary in this institution to demonstrate the advantages of uniformity of gage, but it may not be out of place to mention the more important benefits to India that would result from uniformity. It would eliminate the troubles and expense of transhipment and the maintenance of the intricate tracks that are unavoidable where the two systems converge at the great centers of trade, the seaports and the coal fields. It would afford India a much wider field to draw upon for rolling stock when, as often happens, there is a glut of traffic in one particular area, such as may be occasioned by the natural effects of a normal rainfall producing heavy crops, or by a deficiency in the rainfall causing a famine; either of these causes results in abnormal movements of grain foods. Military concentration of troops, material and supplies has the same effect. In India the periods of trade and the movements to or from the seaboard are irregular, and the set of traffic frequently changes; for these reasons it is absolutely necessary to provide a full equipment of rolling stock to meet a maximum traffic for a short period, although the stock may not be fully employed throughout the year. It is evident that the distribution of rolling stock would be immensely facilitated, and the equipment more effectively and economically utilized, if the whole country were served by one gage. A good deal is done at present by mutual borrowing, when it happens that the movements of commodities on adjacent systems occur in different months; for example, the jute traffic from the interior to the seaboard takes place at a different time from the movement of grain and seed; and as these commodities are served by distinct railroad systems, the latter are able to use each other's rolling stock to mutual advantage. There is no private ownership of railroad cars in India. Some schemes have indeed been proposed, but as they have been based on a guarantee of traffic either from the railroads or from the government, they have not been favorably received. Still, it is obvious that, under the varying conditions of trade, the greater the area served by one gage, the greater will be the possibility of mutual accommodation.

Uniformity may be brought about by changing all meter-gage lines to standard gage, by changing all standard-gage lines to meter gage, or by adopting another intermediate gage, preferably the European gage of 4 ft. 8½ in. By adopting the first course, a change would be made from the less to the more efficient gage in respect of carrying capacity and speed, with considerable expenditure of money. The second course would provide a lower standard of carrying capacity, with a comparatively smaller outlay. The third course would be more costly and certainly more prolonged than either of the other two. In reviewing these three methods it may be assumed that the ultimate limit of capacity is proportional to the gage when that limit is reached; but until the volume of traffic has attained its ultimate limit on any gage there is no loss of power. The theory that the gage of a railroad is the fundamental unit of measurement to which all other dimensions should be proportional, ought to be governed by the foregoing qualifications. Now that the traffic of some of the single meter-gage lines has outgrown their carrying capacity, the question has arisen whether it would be better, in the present condition of the system of Indian railroads, to substitute a single standard-gage track or to double the meter-gage line. There is no doubt a great deal to be said in favor of a uniform gage of 3 ft. 3⅜ in., but the existence of 14,477 miles of standard-gage track against 11,421 miles on the meter-gage actually constructed, must greatly modify the aspect of the problem, although the conversion of the existing rolling stock from standard to meter gage is a much greater difficulty than the reverse.

While admitting the obvious advantages of uniformity of gage, there is an equal danger of purchasing it at too dear a price. On examination of Tables I. and II., the great difference in capital cost of the two gages—£11,775 per mile for the standard gage, and £4,700 per mile for the meter gage—is at once noticed. It must be remembered, also, that when the construction of railroads was begun, in 1845, on the standard gage, the cost was much higher than it was 30 years later. Very high rates had to be paid to contractors in order to induce them to undertake the risks attending novel works in a foreign country, where there was nothing to establish a precedent as regards cost of construction. There is also to be taken into account the fact that 9 per cent. of the standard-gage lines is double track; but, allowing for this, although the Government Administration Report on all the railroads in India gives the cost of the standard and meter-gage lines as £10,666 and £5,133 per mile respectively, the difference in capital cost affords ample justification for the early policy of adopting the smaller gage: had it not been allowed, about 5,000 miles of the present lines would probably not now be in existence. At no time has there been any serious attempt to lay down an inexpensive standard-gage line equipped with suitable light rails, rolling stock and station accommodations; and, indeed, the existence of a sanctioned narrow gage has prevented this from being done. Possibly, however, it may be argued that, had only the standard gage been allowed, this light system might have come into existence, although the severe conditions of equipment which obtain in India lead rather to the opposite conclusion.

It is interesting to note that the return on capital and the cost of working of the two gages are nearly alike. Incidentally it is significant that the smaller gage carried, in the year 1903, a larger average number of passengers per train than the standard gage; the difference in the average tonnage per train is accounted for almost entirely by the larger number of branches on the meter-gage lines, and by the coal fields being served almost entirely by the standard-gage lines. The difference in carrying capacity of the two gages may be taken from the statistics in a variety of ways, with considerable difference between the results. Table IV. shows the average speeds to be 23, 12 and 15 miles per hour on the standard-gage, as compared with 18, 10 and 13 miles per hour on the meter-gage lines, for passenger, mixed and goods trains respectively. Neglecting these small differences, and making the reasonable assumption that an engine of either gage will pull an equal number of vehicles or wagons, then, since a four-wheel standard-gage passenger vehicle will hold 60 passengers, and a four-wheel meter-gage coach only 40 passengers, and since a four-wheel standard-gage wagon will carry 16 tons and a four-wheel meter-gage wagon only 10 tons, the ratio of the passenger-vehicle capacity of the standard-gage to that of the meter-gage is found to be 1.5 to 1, and the ratio of the goods wagon capacities 1.6 to 1. Also, from the gross weight of a train, neglecting speed, the ratio of the train capacities is found to be 1.4 to 1 for passenger trains and 2 to 1 for goods trains. In the following table are shown, in addition to the foregoing, the ratios of the carrying capacities of the two gages, obtained by some of the other methods of comparison, compiled from the Railway Administration Report, but confined to the 16 lines which have been taken as examples:

| | | Ratio—Standard gage. | to | Meter gage. |
|---|---|---|---|---|
| Vehicle capacity only | Passenger | 1.5 | to | 1 |
| | Goods | 1.6 | " | 1 |
| The same, taking speed into account | Passenger | 1.9 | " | 1 |
| | Goods | 1.9 | " | 1 |
| Gross weight of trains | Passenger | 1.4 | " | 1 |
| | Goods | 2.0 | " | 1 |
| The same, taking speed into account | Passenger | 1.9 | " | 1 |
| | Goods | 2.4 | " | 1 |
| Vehicle mileage, loaded and empty | Coaching | 1.9 | " | 1 |
| | Goods | 2.8 | " | 1 |
| The same, taking speed into account | Coaching | 2.4 | " | 1 |
| | Goods | 3.3 | " | 1 |
| On actual number of passengers carried | 1 mile | 2.0 | " | 1 |
| On actual number of tons carried | 1 mile | 4.7 | " | 1 |

It will be observed that, whilst the benefit to be derived from conversion is greater for goods trains than for passenger trains, it may fairly be assumed that the general capacity of the standard gage is double that of the meter gage, under the conditions of speed, power of engines, and design of coaches and wagons at present obtaining in India. An independent check on the foregoing is afforded by the ton-mileage per engine. The engine of the principal standard-gage line (the East Indian) accomplishes on an average 7,838 thousand, and that of the principal meter-gage line (the Bengal & North Western) 3,962 thousand ton-miles. It may also be mentioned incidentally that the ratio of the total gross earnings derived from the goods traffic of both gages, to that from the passenger traffic, is 1.9 to 1, and of the total gross earnings derived from the whole traffic of the standard gage to that from the meter gage, 3.05 to 1.

In estimating the cost of converting from meter gage to standard gage, it must be remembered that the Indian government has laid down certain rules governing axle-loads on girder bridges and on rails; but the precaution is now to be adopted of renewing with standard-gage girders girders on meter-gage lines which may require doubling in the near future. This entails only a small addition to the cost, as the tendency is towards heavier engines on both gages. The actual cost of converting a meter-gage to a standard-gage line is not a matter of estimate, since particulars of the cost of conversions already effected are available. The figures for the Salt Branch of 50 miles of the North Western Railway were:

| | Rupees. | |
|---|---|---|
| Land | 32,000 | £2,150 |
| Formation | 70,000 | 4,650 |
| Bridges | 75,000 | 5,000 |
| Ballast | 1,90,000 | 12,650 |
| Permanent way (75-lb. flat-footed rails and 9-ft. wood sleepers for 41-lb. flat-footed rails and 6-ft. timber sleepers) | 10,35,000 | 69,000 |
| Stations | 1,40,000 | 9,350 |
| Plant | 8,000 | 550 |
| Rolling stock | 5,00,000 | 33,350 |
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The carrying out of every big enterprise will entail nearly all of the following duties: Investigations and reconnaisance, preparation of preliminary reports, estimates of costs, estimates of probable earnings and operating expenses, surveys, preparation of plans and specifications, getting proposals and purchasing, letting contracts, field engineering, construction and erection, inspection, preparation of progress reports, record of costs, tests, operation, final reports and statistics and accounting.

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To show the possibilities of such an organization, let us pick out a team for the building of some large proposition. Take, for instance, the design and construction of a steam railroad locomotive repair shop, involving the expenditure of from two to three million dollars. In deciding on our men, we will make a study of the qualifications of each one, and at the same time we must have a clear conception of the work each one must be familiar with in order that there be no weak spots in our line, or break in the organization. The selection of men with their chief duties will be as follows:

| | |
|---|---|
| Industrial Expert | Designing layout of shops.<br>Planning method of handling work.<br>Arrangment of tool and transportation equipmt |
| Electrical Engineer | Providing power and lighting equipment.<br>Laying out transmission systems.<br>Planning telephone and signal systems. |
| Mechanical Engineer | Design of power plant.<br>Plan of heating and ventilating.<br>Laying out air, gas and steam systems. |
| Structural Engineer | Building foundations.<br>Designing steel structures.<br>In charge of reinforced concrete constructioon. |
| Architect | Designing building superstructure.<br>Choice of fixtures.<br>Laying out landscape work. |
| Civil Engineer | Directing grading.<br>Testing of soil.<br>Construction of track. |
| Sanitary Engineer | Design of sewerage system.<br>Construction of water works.<br>Choice of plumbing. |
| Purchasing Agent | Selecting markets for material.<br>Checking bills of material.<br>Arranging for delivery of material. |
| Constructing Superintendent | Organization of construction force.<br>Consideration of time element in construction.<br>Settling labor difficulties arising in connection with construction work. |
| Operating Engineer | Consideration of economies in operation.<br>Securing reliability in operation.<br>Insuring effectiveness in operation. |
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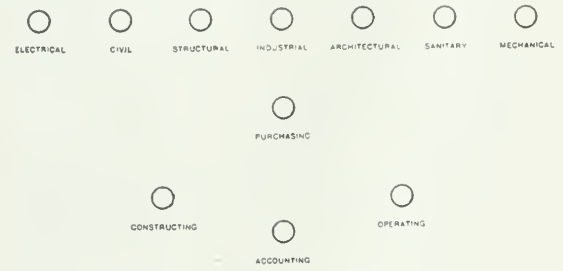
Let us watch the play. First will come a number of preliminary studies, showing the proposed sizes, designs and relative arrangements of the buildings. Next forthcoming is a carefully prepared report, showing the advantage of the finally selected arrange-

*Extracts from a paper presented at the Special Section, Western Society of Engineers, Nov 16th, 1906, by George F. Damon, Managing Engineer of The Arnold Company, Chicago.

ment, and the suggested construction of each of the buildings, together with a description of the equipment required. An important part of this preliminary report is an approximate estimate of cost, based upon a careful consideration of all the items involved in the construction. With the general layout and the preliminary report and estimate approved, the next move is to prepare the plans and specifications. . . . The plans should preferably be drawn upon one size of paper and every drawing should be numbered to correspond to the classification. A border and a standard title printed by a drafting room outfit gives a finished appearance to each drawing. Specifications can now be printed very quickly, and when at least 20 copies are required, they can be produced in this way as cheaply as by carbon copies, or the better method of blue printing from a typewritten record.

In purchasing, the engineer-constructor should find some advantage over an occasional buyer. He is in the market constantly,




Line-up of the Engineer-Constructor Team for Building a Railroad Repair Shop.

is favorably known by the manufacturers of standard equipment, and buys apparatus delivered f.o.b. cars, doing all erection work as far as possible with his own experts, and calling on the factory for assistance only when necessary. There should be the greatest unity between the engineering, the purchasing and the construction departments. It is always better to have the construction superintendent in the office while preliminary decisions are being made and bills of material are being prepared.

Throughout the entire progress of the work, systems are in use to keep all concerned informed as to each move. The construction office is advised by the home office as to the material ordered and as to the probable delivery of this material. The home office is advised as to the receipt of material on the job, as well as to the progress of the construction work, and any reports and advices as to the labor situation. To accomplish the former, copies of contracts for apparatus and orders for material are sent to the superintendent in charge of construction. Such reports and orders contain exact information as to the material covered by them, as well as to the time at which this material is expected to arrive on the work. A card system in which are entered all orders and contracts is used in the home office, and is designed to follow up and secure prompt delivery of all material and apparatus. In case of any changes in time of delivery of material, the construction superintendent is advised in advance, and is thus in position to make any alterations necessary in his programme. The importance of promptly delivering the material on the job cannot be overestimated, and the value of a system that will provide for the delivery of the materials in accordance with an approximate schedule previously arranged for will appeal to all interested in construction work.

Practically all of the material is ordered by the home office. In case, however, it is more advantageous to order small quantities at the seat of the work, such orders are issued by the superintendent, a copy of all such orders being sent to the home office, after which they are recorded and handled in all respects similar to orders issued from the office.

Records of all material received on the job are kept by the superintendent in the form of a material report. These reports are written out in a duplicate book as each shipment is received, and one copy is sent without delay to the main office. This serves to keep the home office very closely in touch with the field work, so far as the receipt of material is concerned.

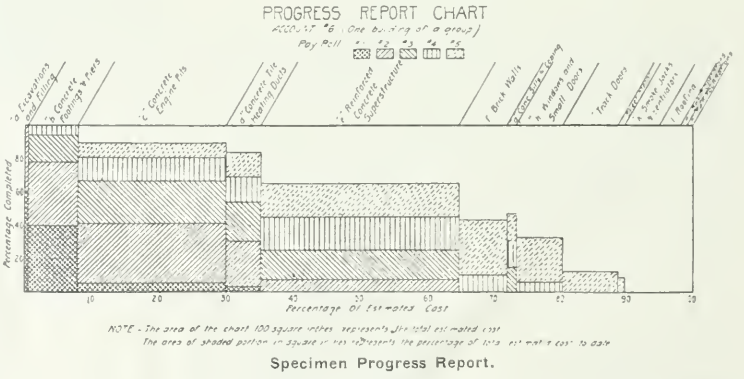
In construction work consisting of a great many items, such as will be found in railroad shops, it is very desirable to know with a fair degree of accuracy the exact progress of the work. Certain lines of the work, such as the delivery and installation of machinery, are dependent upon the progress of other work, such as the completion of the buildings and foundations. In order that this information may be always at hand, progress reports from the work are received at stated intervals, usually two weeks apart, giving in detail the progress of the work under each classification head. This information is kept in form for convenient reference, and is useful in a variety of ways. Not only do these reports keep the engineering force in touch with the progress of the work, making it possible to more efficiently insure the work coming in proper sequence, but they also provide the information necessary to make decisions as to changes in detail, in case such are found necessary after the work has been begun. These progress reports, together with a record of moneys expended for material and labor at any date, give timely information as to the actual cost of the work as compared to the estimated cost. As such reports are made on the work under each classification heading, any variation of the cost from the estimate is at once detected. This is of importance to the constructor who proposes to complete a certain improvement within a definite estimated cost, and to the client's official who may be charged with the responsibility of protecting a definite appropriation.

Progress photographs are taken of the work at intervals of about two weeks. These show at a glance not only the general progress of the work, but many construction details as well, which are of interest and value. Progress reports, charts and diagrams, while very easily obtained, and requiring but little work in their preparation, supply a great deal of valuable information, and are of worth far exceeding the trouble and expense contracted in securing them.

Although every facility is provided for keeping the main office and the construction office in close touch, it should not be understood that the engineering is done at arm's length, and that all plans and specifications are devised and completed by an engineering force in the office to be sent down to the construction superintendent on the job for his execution. A competent engineer is in charge of all construction work, and spends a certain amount of time in the field, thus putting him in close touch with the situation, and enabling him to more efficiently direct the detailed engineering work that is done in the main office.

It would be a big mistake to think that such an organization as we are outlining could be got together and perfected in its work in a short time. For our engineer-constructor it will probably take years, and it is evidently for this reason that this very inviting field is occupied by so few organizations who are really prepared to do the work justice.

If the duties of making a preliminary report, preparing a careful estimate, drawing up the plans and specifications, purchasing the materials, building the structures, erecting the equipment and installing the machinery is turned over to one reliable engineer-constructor organization on a "cost plus a percentage" plan with the privilege to the client of canceling the arrangement at any time, if the progress, quality or cost of the work should prove to be unsatisfactory, it is hard to conceive of a more effective way of getting results, and it is very probable that much of the important work of the future will be done upon this basis.




Specimen Progress Report.

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The Saxon State Railroads have established the nine hour day in their shops, 4¾ in the morning and 4¼ in the afternoon. The hours for opening and closing are fixed for each shop after consultation with the represeniatives of the workmen. Before the three great holidays of the year the shops will close two hours earlier than usual, while the pay will be for the full nine hour day. Men employed on indispensable work in these hours will receive overtime pay, and will also be granted extra time off on some other day.

## Steam Versus Electric Operation of Trunk Lines.

The following discussion of Mr. Mayer's paper, read before the American Society of Civil Engineers, on Steam versus Electric Operation of Trunk Lines (*Railroad Gazette*, Nov. 23), is contributed by Mr. Frank J. Sprague:

Not having until yesterday read Mr. Mayer's interesting paper, I find it difficult to discuss it as fully as I should like, and I shall not take up the mechanical theory of construction so ably worked out, because the paper as a whole is a plea for electric operation of a trunk line railroad by a specific method on the score of economy, and is based upon the assumption that the various claims made during the past six years for single phase operation have been justified by accomplished results, which up to the present is not a fact.

The arguments advanced seem to me somewhat vitiated by a number of statements concerning both direct current and single phase operation which will not bear critical analysis. I shall therefore content myself with some random comments on various points which have occurred to me in the preliminary reading.

First of all, let me say that I quite agree with Mr. Mayer in his general conclusion as to the necessity of higher potentials, but if his contention be that these can be effective only through the agency of single phase alternating currents, then I am quite at variance with that conclusion.

Perhaps I may be permitted to make reference to some remarks of earlier years.

*Early High Tension Proposals:*

In a paper before the Kansas City Electric Light Convention in February, 1890, I made the following statement: "As regards the potential, other things being satisfactory, whatever pressure is demanded in the interest of economical and effective service will be used; and means will be found, consisting mainly in care of construction, which will make its use for the purposes, and, as intended, safe and proper. We have, in these matters, to face the same questions that we have in the matter of steam pressure or of railway speed. To accomplish the larger engineering feats necessary to meet the demands of economy and commerce, we will be governed more by belief in our power to fully subordinate a good servant to our will than by our fears of its vagaries when allowed to become a master."

At the same time, to illustrate the possibilities of electric railway operation, I determined the potential necessary to handle the then existing passenger service on the Philadelphia division on the Pennsylvania Railroad, the service being rearranged so as to permit of the dispatch of cars every ten minutes. The supply was to be by direct current from a single overhead copper rod, one inch in diameter, over each track, with return through the rails. Among the solutions I found that with two stations forty-five miles apart, about only 1,800 volts motor potential was required.

It is a curious coincidence that now, sixteen years later, the proposal to use an overhead rod should be resuscitated, and also that my early proposal of a million circular-mil section of copper should be about the equivalent of the capacity of the special third rail now in use.

Mr. Mayer's proposal is, however, for a sectionalised soft steel overhead conductor, an inch and a quarter in diameter, and of a form absolutely the worst known for the transmission of alternating currents, for it offers the minimum area for unit cross section, an impedance fully nine times the resistance of the same rod to direct current, and probably eighty to ninety times that of a copper rod of the same size for direct current.

Since the date of the Kansas Convention, I have often advocated the necessity of higher potentials, and I am glad to say that not alone in alternating current work, but in direct current application, my early prophecies, repeated a year ago with an expression of readiness to undertake the responsibility of d. c. installation at 1,500 volts, even on a third rail, have, by virtue of the developments of recent months, now been brought within the reach of practical accomplishment. This would mean an increase under ordinary trunk line conditions of fully five times the distance between substations common with 600 volts, and often even the possibility of their entire elimination.

*Working Conductors:*

How many difficulties would disappear were we in a happy age of wireless power transmission! But we deal not with dreams but with practical realities, and among these is the physical means of getting electric energy from a central station to the moving trains. The choice is limited broadly to two general methods, the overhead system in some form, available for both alternating and direct currents, and the third rail, available ordinarily only for direct currents.

Mr. Mayer, after pointing out the shortcomings of present forms of trolley construction if used for high speed trunk line operation, somewhat naively remarks that: "As a very high and dangerous voltage must be used in the suspended conductor, it is essential to suspend it in such a way that it will never come down." I fear that we have not arrived at that millennium in railway operations when collisions, with rearing equipment, and derailments, with consequent destruction of upright structures, are no longer among the possibilities; nor are we beyond the reach of sleet formation, especially on rigid structures, or the ravages of storms of various kinds.

Of course, quite aside from the matter of expense, all conductors necessary for bringing current to a train are objectionable in many particulars, and the points with regard to each were recently well stated by Mr. Wilgus at a meeting of the Railroad Club.

The third rail offers certain hindrance to the ordinary maintenance of track, but overhead construction is inelastic, and the laying of additional tracks or changes in grade and alinement require radical and expensive alterations in permanent overhead structures.

Derailments will crush one form of conductor to the ground, but may equally well knock down the supporting structures of the other, and put all tracks out of service.

In wrecking, the third rail offers some obstruction to the throwing of the equipment to one side, but conductors overhead may interfere with the operation of crane booms.

With two or more tracks snow cannot well be piled up between them when the space is occupied by third rails, but on the other hand overhead conductors are a source of danger to trainmen, and subject to the troubles of sleet formation.

There has been a good deal of loose talk about third rail troubles with snow and sleet, complications at frogs and switches, difficulties of current collection, and the danger to employees and trespassers. Extended operation has proven that these objections are many of them largely overcome by a protected third rail properly designed with due regard to clearance lines of equipment. On the other hand, with an overhead 11,000 volt trolley there is certainly danger to the public at overhead street and highway bridges, in tunnels and at low bridges because of the possibility of rearing equipment in case of derailment or collision, and because of the frequent physical necessity of the trolley being brought within a short distance of the cars.

Then there is corrosion due to locomotive gases when steam and electric operation are maintained over the same tracks, and increased danger to men engaged in cleaning, painting, or repairing overhead structures in close proximity to high potential lines.

Again, and this seems important on high speed service, there is the possible interception of the train operator's view of the signals because dips in the railroad grade may bring overhead bridges in front of the semaphores, which likewise may be made less distinctive when having truss members for a background.

Nor can we ignore an increased element of danger to the men who have to maintain signal structures, nor the objections certain to be raised by city authorities to exposed high tension conductors.

*References to Contracts:*

References to contracts where single phase operation has been adopted are not always conclusive, and the inferences drawn are misleading unless the circumstances are fully known. Some of those mentioned in Mr. Mayer's paper come in this case. The Sarnia Tunnel offered an opportunity for a manufacturing company to make a demonstration of the possibilities of operation by single phase locomotives. I am quite sure it will not be claimed by engineer or manufacturer that this equipment was not well within the possibilities of direct current application, and it is certainly quite conceivable that the opportunity for first demonstration on a considerable scale had a financial value sufficiently tempting to the railroad company. As an offset to this, I can state that on a similar problem one set of absolutely comparative bids demonstrated for this particular work a marked disadvantage for the single phase equipment, both as to first cost and cost of operation.

On the London, Brighton & South Coast Road it is true that a short section is to be equipped with quite another type of single phase motor, but the reasons which have been publicly advanced, in so far as they are based on motor performance, are debatable, and if my information is reliable, the cost of installation will be a sorry criterion for comparison.

The New York & New Haven project represents a different class of installation, the replacing of steam passenger locomotives by single phase A. C. locomotives supplied from an 11,000 volt trolley line. The adoption of this equipment under the particular conditions which exist, especially the use of a common terminal with the N. Y. Central, which is to use another type of equipment, has been the subject of a good deal of discussion and some acrimonious comments, many of which had nothing to do with the system per se.

The locomotives on both these roads are of the gearless type, and within a few months there will be opportunity for making concrete comparisons of their performance, the New Haven representing the very latest single phase developments, and the Central the embodiment of D. C. plans formulated nearly three years ago, and under the then existing limitations of 600 volt operation instead of the much higher potential now practicable.

Among other comparisons will be that of the physical construction and cost of the working conductors, the former using a pro-

tected under-contact third rail, and the latter an overhead double catenary trolley carried on steel bridges spanning the tracks. Both are interesting in that they each represent construction of that type which must be adopted to come within the classification of permanent, that is, of character equal to the rest of the road. A comparison is in order, because the construction proposed by Mr. Mayer will be at least equally as costly as that adopted on the New Haven Road. An important fact is that the unit cost per mile of track for the overhead construction is fully equal to, if it does not exceed that for the third rail, despite the very high potential and the small size of the working conductor. It is proper to add that no matter how high this potential, the unit cost per mile of track for this class of construction will probably not be reduced.

Another feature of the New York Central equipment cannot be compared to a like equipment on the New Haven Road, because it does not exist on the latter, and that is the motor car service, considered by many railroad engineers and transportation officials, and applauded by Mr. Mayer as one of the indisputable good reasons for adopting electricity for suburban service.

The former road is also equipped with batteries, largely because of insurance, and not as actual necessity of operation. These could not be applied to a single phase equipment without the introduction of motor-generator sets of the full capacity of the battery discharge, as an essential of supply from the battery to the line, which in case of breakdown would eliminate the battery from use; whereas in the direct current system the intermediate machinery, that is the booster, is simply for regulation, and is of only differential capacity, hence a fraction the size of the others, and it is not essential to the supply of the current to the line in case of an emergency.

However, these two great systems will, of course, tell their own story, and after a reasonable length of service be influential in moulding decisions as to the future, but it is safe to say that however ardently the most enthusiastic engineer may preach the beauties of economy, no great trunk systems will, except for special reasons, as for example the urgent necessity of increasing capacity, adopt electricity to save money until after the tangible results have been measured on these two roads. In fact, the probabilities are that in any case it will, to quote the official of an English road, be a case of spending money, not to save it because of economy in power, but to make it.

*Reasons for Adopting Electricity:*

As I have often stated, there are but two broad grounds on which the adoption of electricity for trunk line operation can be justified: First, because of such demonstrated economy, due to the generation of power at large stations and reduction in the cost of locomotive upkeep, as will more than offset the interest and depreciation of that which is essential to electric operation; and, second, the possibility of an increased service of a character which cannot be gotten in steam operation—such, for example, as the handling of trains at increased speeds, or moving heavier trains at satisfactory speeds because of a greater concentration of power, or the operation of frequent motor car trains at high schedules in suburban districts and between important terminals.

But trunk line service presents peculiarities of its own, and its demands are responsible for the great awakening in the matter of higher potentials, which has led to many over-enthusiastic statements and much discussion as to the merits of single phase, polyphase, and direct current equipments.

One thing is certain, higher potentials are necessary and possible. Another is that both motor car combinations and locomotive-drawn trains must be used, the former necessarily, and the latter often under multiple unit control.

Capacity of equipment is essential, and that more than economy. How is it to be gotten? Naturally, first by increase of individual equipment, and then when this increase has reached its limit, by combining equipments. I will, therefore, briefly discuss the question of capacity.

*Limitations of Design:*

Neglecting for the moment the motor car, consider for a moment the simplest form of ordinary train operation. What is it that is to be replaced? Simply a steam engine, in other words a motor supplied by a local boiler, furnace and coal bin, by another motor supplied through a wire by a bigger boiler, bigger furnace and bigger coal bin. It isn't sufficient simply that these latter can be made of any desired size; in any case they are intended to supply a number of motors. What is essential, and in the last analysis vital, is that the new motor shall not only have certain mechanical advantages to the extent of eliminating the evils of reciprocating parts, but it must, above all, have capacity, measured not alone by torque or speed, but by both, and it must be of sustained character. Everything else is of tributary character.

The designer of all railway apparatus, whether for motor cars or locomotives, is handicapped by certain physical limitations which are not within his power to change. These are determined by the gage of the track, the size and number of drivers, the clearance under the motors, the length of rigid wheel base, the dead weight per wheel and the total weight per axle, to say nothing of such a trifling question as cost of construction; and it is his problem to provide within those limitations all the capacity possible.

And it is just in this particular that the single phase motor, despite an amount of experimental work, study and effort of the most persistent and able character, is sadly defective, and so far as any present knowledge goes, its defects, while not prohibitive to the extent of making an unworkable machine, are so inherent as to make it practically certain that when compared to other kinds of electric motors it is placed at a very serious disadvantage.

*Comparison of Motors:*

Of the three types of motors to-day in use in railway work, two, the direct current and the three-phase motors, have a continuous rate of energy input, while the single phase has an intermittent and variable rate. In the latter the attempt has been made to attain the results achieved by the variable speed direct current series commutator motor, despite the fact that there is combined in a single machine a motor and a transformer. And on the wings of high potential the advocates of single phase operation have soared to heights of eloquence from which it is necessary to descend to tangible facts.

And the first of these is, that the single phase motor, measured by identically the same rating and under like physical conditions, is only about half as good as the direct current motor, or to put it another way, the weight of the complete electrical equipment, including motors, regulators and transforming apparatus, and with like physical limitations, is fully twice that required for direct current, with, of course, a material increase in the mechanical equipment, so that the total weight of a single phase A. C. locomotive to do like service as a D. C. locomotive will easily run from 40 to 50 tons more. The reason is simple—because of the heat generated on account of lower electrical efficiency, and the impossibility of working the fields of the motors at over about one-half the magnetic flux.

Polyphase motors have the same advantage as direct current series motors in the matter of weight capacity, but are normally constant speed motors, although it is possible to arrange for half and full speed.

I have made, and so have others, many independent investigations on this subject, and the facts stated cannot be gainsaid in the present state of the art. I am, therefore, somewhat astonished to find Mr. Mayer saying that certain "locomotives use high voltage alternate currents, and have excellent speed regulations, giving practically uniform efficiency at any considerable speed, two advantages which far outbalance, especially for trunk line traffic, their inferiority in other respects," this latter being admitted as "great weight per unit of power, limited capacity, high cost, and only moderate efficiency at any speed."

This expression of inferiority is an unexpected indictment of the single phase motor, and considering a locomotive simply as a machine, he adds to this indictment by his criticism of the motor-generator type of locomotive, where a single phase motor receiving current from the trolley line drives a generator which in turn supplies direct current motors, concerning which he says, "its complications, moderate economy, inevitable high cost, and great weight are its serious drawbacks," in spite of its "excellent and economical speed regulation." As a matter of fact, the motor of such a combination can be directly supplied from a high tension line, and the weight of this type of equipment is almost identical with that of a single phase equipment, and has some possibilities which the latter has not.

A practical illustration of the bearing of this difference in capacity is the fact that although the essential weight on the drivers of the New York Central machines is about seventy tons instead of eighty-five, as on the New Haven, the individual capacity of the former is so much greater, that with equal ventilation fifteen of them will probably do the work of twenty-five of the latter.

Lack of capacity is, however, not the only feature wherein the single phase motor fails in comparison with the direct current machine. On large sizes, instead of two or four poles it has ten or twelve, and the series winding on the armature with two paths is replaced by one with as many paths as there are poles. The armature in machines of similar capacity has a large diameter and runs at a higher speed, and instead of two fixed sets of brushes there are as many movable sets as there are poles, to supply current to a commutator of larger size. The clearance between field and armature is about a quarter that of the D. C. machine, and the allowable bearing wear therefore much less. Finally, the New York Central type of machine, with its remarkable mechanical as well as electrical advantages, is impossible to direct A. C. construction and operation.

It is curious, despite frequent disproof, with what persistency certain well sounding statements reappear. Among these may be instanced that referring to possible economic variations of speed. The ordinary four-motor locomotive operated on direct current has, with proper control, three impressed electromotive forces, for each of which it has a wide automatic range of torque and speed far beyond the limits, as the sustained torque increases, of the single

phase motor, and for each of these established conditions there is a very considerable range of speed with the same torque, provided the motors are properly constructed and controlled. The result is that, as everyone of these speeds is an economic one, all variation essential for practical railroad operation is provided.

*Direct Current Motor Improvements:*

Comparing the present with the condition of the art about two years ago, three important and radical developments have taken place in direct current motor construction. The first is the use of the commutating pole, which has in a large measure, and certainly for any ordinary pressures, eliminated the much abused bug-bear of the commutator to such extent that, when properly constructed, it is impossible to tell by ordinary inspection whether a machine is running at high or low potential, or with large or small current, so absolutely free is it from sparking.

This has led to additional facilities in control, and the construction of motors for operation at from 1,200 to 1,500 volts, with the further possibility of operating two in series at double potential.

A third development is that illustrated by the New York Central gearless locomotives, in which the hitherto invariable practice of maintaining a fixity of relation between the armature, or rotating part, and the field magnet, or fixed part, has been abandoned, the armature being mounted directly on the axle, and the field magnets forming a part of the locomotive frame, supported by its springs, and hence movable with regard to the armature. In this construction, therefore, there are no armature or axle bearings. This machine is one of the most remarkable and satisfactory outcomes of recent work, and considering actual necessary electric additions to the mechanical equipment, it has, when designed for the conditions under which it should operate, probably the highest weight efficiency of any d. c. locomotive. Being of bi-polar construction, with a wide range of neutral brush contact, it runs practically sparklessly at all loads, is a natural 1,200 volt machine without commutating poles, and can easily be wound for a higher potential if using such poles.

Considering briefly the first cost of installation, I have shown that the weight and cost of motor equipment is much higher for the single phase a. c. system than for the d. c., and that the cost of permanent working conductors per mile of track is fully as high. The cost of central station will be somewhat greater because of the reduced capacity per weight of material of single phase generating apparatus. There remains the intermediary apparatus when extended systems are considered, namely, static transformers and rotaries for the direct current system and sub-station and car transformers for the a. c. system.

Unless there is material increase in efficiency and capacity of single phase motor equipments, it is quite likely that the interest on the increased cost of sub-stations of one kind over that of the other, and the losses in the rotaries, will be at least equaled, if not more than offset, by the increased first cost and cost of operation of the motor equipments on the a. c. system when each are installed with equal regard to permanency.

Every engineer of course hopes for, and will welcome actual advances in this art by whatever system—everything in fact which makes for increased economy, added reliability and reduced cost of operation, to the end that there may be a greater extension of electric opration, but it is absolutely essential to compare results accomplished, not merely promises of performance.

Such are some of the general facts which must be confronted in dealing with the question of electric operation of trunk lines. In conclusion, I may perhaps here quote a remark by Chief Engineer Kando, of the Ganz Company, of Europe, the advocates of polyphase motor operation, in a report recently made to his company after a trip in the United States. Referring to the question of equipment, he said: "That system will prove to be victorious which can present the most powerful locomotive, and the locomotive which will possess the greatest capacity for a given weight."

I might add to this, and say that it would seem that that type of locomotive must ultimately survive which not only has the greatest weight capacity, but also automatic response in torque and speed to the varying demands of grade and curvature.

## Thermit Welding.

Thermit welding was a subject of discussion at the last meeting of the Master Blacksmiths' Association. Referring to the reliability of the thermit weld it was stated that on one road, in the period of 17 months 33 welds of engine frames were made, and they were all in service. Of these 14 were over the driving boxes and six had to be rewelded after having been in service for from three to 12 months. The frames so repaired were all of wrought-iron with one exception. This was of cast-steel. In addition to these, there were five frames welded that were broken in service, rewelded and then broken again because they were fractured at a place where it was impossible to allow the thermit collar to remain. After the second weld broke a section was cut out and reinforced with a new one of wrought-iron. During this same period above referred to 16 welds were made on cast-steel driving wheels, all of which are still in service, together with a cast-steel ferry boat casting.

Tests made with the thermit metal show that it is up to good forged iron or steel, and compared favorably with some refined iron with which it has been tested. In one case a sprue was taken and drawn down into a bar $\frac{1}{2}$ in. square and tested in connection with pieces of $\frac{1}{2}$-in. and $\frac{5}{8}$-in. square refined iron. The thermit bar, with a length of $9\frac{1}{2}$ in. between the jaws of the testing machine, took on a permanent set at 12,000 lbs., or 48,000 lbs. per sq. in. It elongated $\frac{3}{4}$ in. and broke at 16,300 lbs., or 65,200 lbs. per sq. in. The bars of refined iron of the same length reached their limits of elasticity at 38,440 lbs. for the $\frac{1}{2}$-in. bar and 56,000 lbs. for the $\frac{5}{8}$-in., and broke at 53,360 lbs. and 90,680 lbs. with elongations of $2\frac{1}{4}$ in. and 2 in. respectively. In this the thermit was the superior in stiffness.

In a bending test the thermit was bent double cold with no sign of cracking, which the refined iron could not do. Observation seems to indicate that what is called thermit welding is not a true weld but a braze; and in doing the work the metal of a frame should be heated to redness before the metal is poured. The two parts should also be jacked from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. apart to allow the metal to flow freely into the fracture, and it must then be drawn together while the metal is in a liquid or very soft condition so that all air holes may be closed and the metal be made dense. In further preparation for the work the surfaces of the fracture should be cleaned and the adjacent parts with which the band is to come in contact should be made bright.

## High Steam Pressures in Locomotive Service.*

BY W. F. M. GOSS.

The Carnegie Institution of Washington, D. C., some three years since, became a patron of Purdue University for the purpose of promoting a research to determine the value of high steam pressures in locomotive service. The work outlined under these auspices has now been completed, and final report has been rendered the Institution. This report will soon be published. Meantime the Institution has given its consent to the publication of a preliminary statement concerning methods and results.

1. *The Tests.*—The tests outlined included a series of runs for which the average pressure was respectively, 240, 220, 200, 180, 160, 120 lbs., a range which extends far below and well above pressures now common in locomotive service. The tests of each series were to be sufficiently numerous to define completely the performance of the engine when operated at any speed and for all positions of the reverse lever possible with a wide-open throttle. So far as practicable, each test was to be of sufficient duration to permit the efficiency of engines and boiler to be accurately determined, but where this could not be done, cards were to be taken.

The first test was run February 15, 1904, and the last August 7, 1905. A registering counter attached to the locomotive shows that between these dates the locomotive drivers made 3,113,333 revolutions, which is equivalent to 14,072 miles. The completed record includes the data of 100 different tests.

2. *The Locomotive* upon which the tests were made is that regularly employed in the laboratory of Purdue University, where it is known as "Schenectady No. 2." The characteristics of this locomotive are rather generally known.

3. *Difficulties in Operating Under High Pressures.*—The work with the experimental locomotive has shown that those difficulties which in locomotive operation are usually ascribed to bad water, increase rapidly as the pressure is increased. The water supply of the Purdue laboratory contains a considerable amount of magnesia and carbonate of lime. When used in boilers carrying low pressure there is no great difficulty in washing out practically all sediment. The boiler of the first experimental locomotive, Schnectady No. 1, which carried but 140 lbs. and was run at a pressure of 130 lbs., after serving in the work of the laboratory for a period of six years, left the testing plant with a boiler which was practically clean. Throughout its period of service, this boiler rarely required the attention of a boilermaker to keep it tight. Water from the same source was ordinarily used in the boiler of Schnectady No. 2 which carried a pressure of 200 lbs. or more. It was early found that this boiler, which is of the same general dimensions as that of Schnectady No. 1, operating under the higher pressure frequently required the attention of a boilermaker. After having been operated no more than 30,000 miles, cracks developed in the side-sheets, making it impossible to keep the boiler tight, and new side-sheets were applied. In operating under pressures as high as 240 lbs., the temperature of the water delivered by the injector was so high that scale was deposited in the check valve, in the delivery pipe and in the delivery tube of the injector. Under this pressure, with the water normal to the laboratory, the in-

*A brief extract of a report submitted to the Carnegie Institute of Washington, Aug. 17, 1906. Read at the November meeting of the Western Railway Club.

(A) will cause the difference to disappear. As the curve B may be regarded as fixed, while A, through imperfect maintenance of boiler or engine, may fall, the argument is not strong in favor of increasing pressure, beyond the limit of 160 lbs.

Basing comparisons upon an initial pressure of 180 lbs. (Fig. 5), the advantage under ideal conditions of increasing the pressure as compared with that resulting from increasing the capacity, has a maximum value of approximately one-half of one per cent. In view of the incidental losses upon the road, the practical value of the apparent advantage is nil. In view of what has been said with reference to the stability of the curves A and B, Fig. 5, constitutes no argument in favor of increasing pressure beyond the limit of 180 lbs.

Basing comparisons upon an initial pressure of 200 lbs. (Fig. 6), it appears that under ideal conditions either the pressure or the capacity may be increased with equal advantage, which in effect is a strong argument in favor of increased capacity rather than of higher pressure.

Basing comparisons upon a pressure of 220 lbs. (Fig. 7), it appears that even under ideal conditions of maintenance, the gain in efficiency resulting from an increase of pressure is less than that resulting from an increase of capacity. In view of this fact, no possible excuse can be found for increasing pressure above the limit of 220 lbs.

8. *Conclusions.*—A summary of the whole work may be stated as follows:

1. Tests have been made to determine the performance of a typical locomotive when operating under a variety of conditions with reference to speed, power and steam pressure. The results of 100 such tests have been made of record.

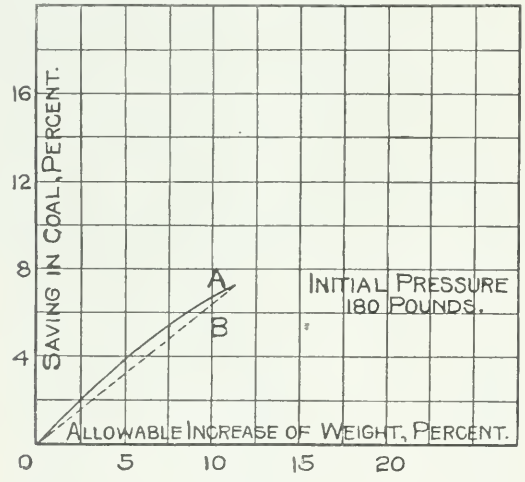


Fig. 5.

2. The results apply only to practice involving single expansion locomotives using saturated steam. They cover only such conditions as may be maintained with wide-open throttle. Pressures specified are to be accepted as running pressures. They are not necessarily those at which safety valves open.

3. The steam consumption under normal conditions of running has been established as follows:

| Boiler pressure. | Steam per H. P. hr. | Boiler pressure. | Steam per H. P. hr. |
|---|---|---|---|
| 120 lbs. | 29.1 | 200 lbs. | 25.5 |
| 140 " | 27.7 | 220 " | 25.1 |
| 160 " | 26.6 | 240 " | 24.7 |
| 180 " | 26.0 | | |

4. The results show that the higher the pressure, the smaller the possible gain resulting from a given increment of pressure. An increase of pressure from 160 to 200 lbs. results in a saving of 1.1 lbs. of steam per horse-power hour, while a similar change from 200 lbs. to 240 lbs. improves the performance only to the extent of .8 of a lb. per horse-power hour.

5. The coal consumption under normal conditions of running has been established as follows:

| Boiler pressure | Coal per H. P. hr. | Boiler pressure. | Coal per H. P. hr. |
|---|---|---|---|
| 120 lbs. | 3.84 | 200 lbs. | 3.40 |
| 140 " | 3.67 | 220 " | 3.35 |
| 160 " | 3.53 | 240 " | 3.31 |
| 180 " | 3.46 | | |

6. An increase of pressure from 160 to 200 lbs. results in a saving of 0.13 lbs. of coal per horse-power hour, while a similar change from 200 to 240 results in a saving of but 0.09 lbs.

7. Under service conditions, the improvement in performance with increase of pressure will depend upon the degree of perfection attending the maintenance of the locomotive. The values quoted in the preceding paragraphs assume a high order of maintenance. If this is lacking, it may easily happen that the saving which is anticipated through the adoption of higher pressures will entirely disappear.

8. The difficulties to be met in the maintenance both of boiler and cylinders increase with increase of pressure.

9. The results supply an accurate measure by which to determine the advantage of increasing the capacity of a boiler. For the development of a given power, any increase in boiler capacity brings its return in improved performance without adding to the cost of maintenance, or opening any new avenues for incidental

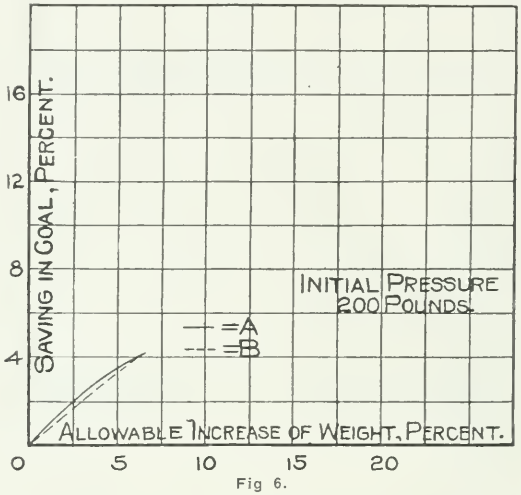


Fig. 6.

losses. As a means of improvement, it is more certain than that which is offered by increase of pressure.

10. As the scale of pressure is ascended, an opportunity to further increase the weight of a locomotive should in many cases find expression in the design of a boiler of increased capacity rather than in one for higher pressures.

11. Assuming 180 lbs. pressure to have been accepted as standard and assuming the maintenance to be of the highest order, it will be found good practice to utilize any allowable increase in weight by providing a larger boiler rather than by providing a stronger boiler to permit higher pressures.

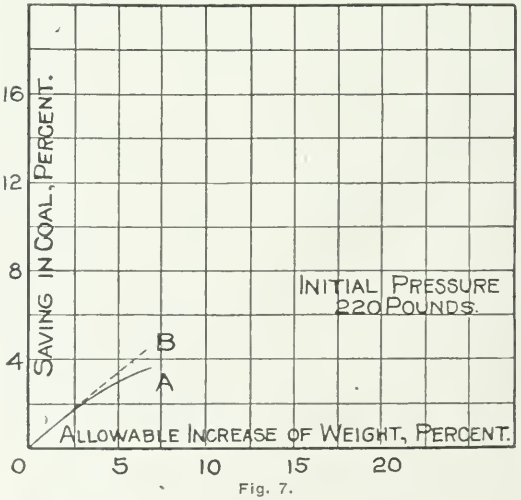


Fig. 7.

12. Wherever the maintenance is not of the highest order, the standard running pressures should be below 180 lbs.

13. Wherever the water which must be used in boilers contains foaming or scale-making admixtures, best results are likely to be secured by fixing the pressure below the limit of 180 lbs.

14. A simple locomotive using saturated steam will render good and efficient service when the running pressure is as low as 160 lbs.; under most favorable conditions, no argument is to be found in the economical performance of a machine which can justify the use of pressures greater than 200 lbs.

# RAILROAD GAZETTE

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VOL. XLI., No. 23. FRIDAY, DECEMBER 7, 1906.


A correspondent who has had the advantage of intimate acquaintance with Samuel Spencer's habits of thought and methods of work, discusses in detail his skill as a railroad organizer, his success at once as an operator and as a financier, and his fondness for an honest balance sheet. Apart from these things, testified to by a multitude of witnesses, it seems to us that Mr. Spencer has on two special counts left his impress on American economic history, first in his belief in the South, part of which he was, and second in his often expressed conviction that the best interests of the railroad and of the community were the same, perpetual and inseparable. Prior to Mr. Spencer's death there had been two empire builders in the railroad field, one with his thoughts and energies bent to the new Northwest; the other, to waken the older South from its lethargy, and build up a new South within and around it. Each stood for a sectionalism ardent, but not militant; each wrought miracles for a people slow to appreciate and quick to condemn. The Northwest still has James J. Hill, in the fulness of his works, but where is the South to find another Samuel Spencer?

The delay in moving grain from the Northwest has become so serious and is causing such loss to the farmers, that the Interstate Commerce Commission is going to investigate it. The trouble in the Northwest does not seem to be due directly to congestion at terminals; it is claimed that the elevators at Duluth, Minneapolis, Chicago and other lake ports have plenty of room for wheat, but the railroads are not hauling grain from the storage elevators along their lines. In many places the grain at primary shipping points is being piled on the ground, and because of these conditions some shippers have accused the railroad companies of purposely leaving the grain alone and hauling merchandise, because they are sure to get the grain traffic sooner or later. Some have even gone so far as to charge that there is an agreement between the granger roads not to carry grain until the end of the season of lake navigation, so as to give them the advantage of the long haul east by rail. While perhaps better explanations than this can be made of the congestion in particular districts, it is undoubtedly true that the fundamental reason for the car shortage all over the country is simply that there are not enough cars in existence to take care of the unprecedented traffic. In general, the equipment on hand is being worked to its heaviest capacity. An officer recently said that of 100,000 cars east of Buffalo one-third were moved every day. Yet on some of the best managed roads of the country when the traffic is normal a car on an average is earning money only one hour out of the twenty-four. The Lehigh Valley, the New York Central and the Erie are reported each short about 1,500 cars at Buffalo, where there is the greatest congestion in New York State. In the South, the scarcity of cars for carrying pig iron and coal to foundries has put up the price of the metal over 25 per cent. in certain places. The movement of coal is being hampered not only by the lack of cars, but by the difficulty of getting labor for loading and unloading them and by constant delays to coastwise shipping. In Texas, fire insurance companies recently threatened to cancel the insurance on exposed cotton during transit because of the great amount piled up on station platforms caused by the lack of cars to move it. A recent press despatch from an interior Texas town said that 500 steers were in the pens there, with snow on the ground, although cars had been ordered nearly a month before. It is probable that, in spite of the large number of new cars being delivered every day, the car shortage will continue well on into the winter. Just at present the usual movement of merchandise for the holiday trade is exceptionally heavy because of the great prosperity of the country, and this freight is naturally given precedence over low grade freight. Consequently, traffic that is ordinarily cleaned up in the early part of the winter is being held back and the movement of fall traffic seems likely to continue until the slack season gives the roads time to catch up.

The collision at Lawyer, Va., killing the president of the road on which it occurred, brings out an unusual flood of newspaper comments, but so far no new ideas. One of the most rational—though it is marred by some hysterical and ineffective beating of the air—is the editorial of the New York *Evening Post*, which says:

> The tragic death of Samuel Spencer, president of the Southern Railway, in the wreck of Thursday morning, should serve as a terrible warning to the officials of his and other southern railroads. . . . The comparative suddenness with which its prosperity came really swamped his railroad, as it has many others. Not even his practical experience could insure a well run railroad. *Whether this was because of his own limitations, or because he was more absorbed in questions of policy and finance, this is not the time to consider.* The tragic fact remains that his own lamentable death was caused by one of those needless and inexcusable accidents about which the southern press has of late been complaining with deep feeling. . . . Mr. Spencer's death would not have occurred if both the trains wrecked had not been hours behind their schedule. As now explained, the fault lay with the operator of a block signal station, but that not much reliance was placed upon the block operator appears from the fact that a brakeman was hastily sent back to flag the oncoming train. So serious have the delays become that the Georgia Railroad Commission has within a few days asked for more power to enable it to compel the railroads to maintain better schedules. The public, North and South, is fast reaching a state of mind where no amount of prosperity will condone inexcusable delays and needless loss of life. Fully 80 per cent. of the accidents are avoidable—some critics say 95 per cent. . . .

The query which we have italicized suggests two obvious truths, obvious to railroad men though they do not often formulate them in print. We have no special information concerning the Southern Railway or its officers concerning the question here suggested, but looking at large railroads generally we may say that important failures because brilliant men have only 24 hours a day in which to perform their complex duties are very common, and that absorption in questions of finance is only a phase of this condition of things. In other words, the great railroad man's task is far greater than he is. Any one of our strongest presidents will measure ten times the size of the average, let us say; but he undertakes to do twenty, fifty or a hundred times the average president's task. He can do this only by the aid of an army of competent lieutenants, and these he cannot get. He can get a few only. The rest are average men.

jectors often failed after they had been in action for a period of two hours. The loss of tests through failure of the injector, and through the starting of leaks at stayboits, as the tests proceeded, became so annoying that, as a last resort, a new source of water supply was found in the return tank of the University heating plant. This gave practically distilled water, and its use greatly assisted in running the tests at 240 lbs. pressure.

Probably some of the difficulties experienced in operating under very high steam pressures were due to the experimental character of the plant, and would not appear after practice had by gradual process of approach become committed to their use, but the results are clear in their indication that the problem of boiler, maintenance, especially in bad water districts, will become more complicated as pressures are further increased. Since, taking the country over, there are few localities where locomotives can be furnished with pure water, the conclusion stated should be accepted as rather far-reaching in its effect.

The tests developed no serious difficulties in the lubrication of valves and pistons under pressures as high as 240 lbs., though the lubrication could not be done with a grade of oil previously employed.

With increase of pressure, any incidental leakage either of the boiler or from cylinders becomes more serious in its effect upon performance. In advancing the work of the laboratory, every effort was made to prevent loss from such causes and results were frequently thrown out and tests repeated because of the development of leaks of steam around piston and valve rods, or of water from the boiler. Notwithstanding the care taken, it was impossible under the higher pressures to prevent all leakage and the best that can be said for the data under these conditions is that it represents results which are as free as practical from irregularities arising from the causes referred to; that is, so far as leakage may affect performance, the results of the laboratory tests may safely be accepted as the record of maximum performance.

In concluding this brief review of the difficulties encountered in the operation of locomotives under very high steam pressures, the reader is reminded that an increase of pressure is an embellishment to which each detail in the design of the whole machine must give a proper response. A locomotive which is to operate under such pressure will need to be more carefully designed and more perfectly maintained than a similar locomotive designed for lower pressure, and much of that which is crude and imperfect, but nevertheless serviceable in the operation of locomotives using a lower

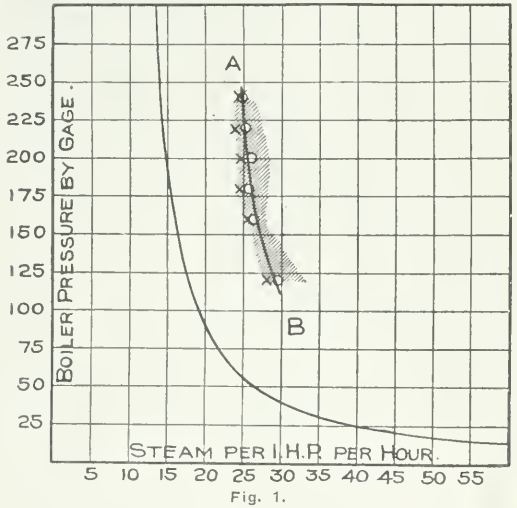


Fig. 1.

pressure, must give way to a more perfect practice in the presence of the higher pressure.

4. *The Effect of Different Pressures upon Boiler Performance* is summarized as follows:

1. The evaporative efficiency of a locomotive boiler is but slightly affected by changes in pressure, between the limits of 120 lbs. and 240 lbs.

2. Changes in steam pressure between the limits of 120 lbs. and 240 lbs. will produce an effect upon the efficiency of the boiler which will be less than 1-2 lb. of water per pound of coal.

3. The equation E = 11.305 — .221 H, in which E is the number of pounds evaporated from and at 212 deg. per pound of coal, and H is the pounds of water evaporated per foot of heating surface per hour, represents the evaporative efficiency of the boiler of locomotive Schenectady No. 2 when fired with Youghiogheny coal for all pressures between the limits of 120 lbs. and 240 lbs. with an average error for any pressure which does not exceed 2.1 per cent.

4. It is safe to conclude that changes of no more than 40 or 50 lbs. in pressure will produce no measureable effect upon the evaporative efficiency of the modern locomotive boiler.

5. *The Effect of Different Pressures Upon Smoke-Box Temperatures* was found to be as follows:

1. The smoke-box temperature falls between the limits of 590 deg. F. and 850 deg. F., the lower limit agreeing with a rate of evaporation of 4 lbs. per foot of heating surface per hour and the higher with a rate of evaporation of 14 lbs. per foot of heating surface per hour.

2. The smoke-box temperature is so slightly affected by changes in steam pressure as to make negligible the influence of such changes in pressure for all ordinary ranges.

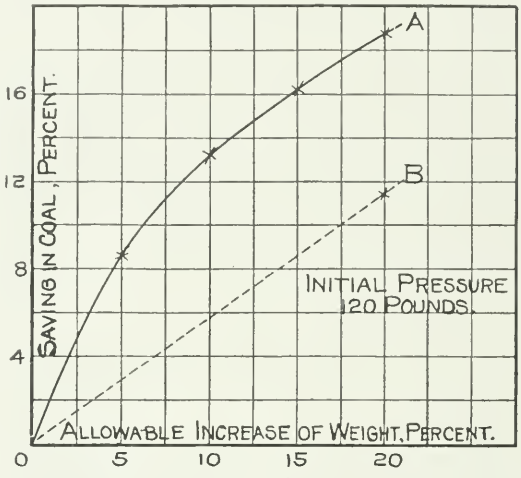


Fig. 2.

3. The equation T = 488.5 + 25.66 H, where T is the temperature of the smoke-box and H is the weight of water evaporated from and at 212 deg. per foot of heating surface per hour, possesses a high degree of accuracy for all ordinary pressures.

6. *The Engine Performance.*—The shaded zone upon Fig. 1 represents the range of performance as it appears from all tests run under the several pressures employed. It shows that the variation in performance for all conditions of running which are possible with a wide open throttle scarcely exceeds 5 lbs. For purposes of comparison, it is desirable to define the effect of pressure on performance by a line, and to this end an attempt has been made to reduce the zone of performance to a representative line. In preparing to draw such a line, the average performance of all tests at each of the different pressures was obtained and plotted, the results being shown by the circles on Fig. 1. Points thus obtained can be regarded as fairly representing the performance of the engine under the several pressures only so far as the tests run for each different pressure may be assumed to fairly represent the range of speed and cut-off under which the engine would ordinarily operate. The best results for each different pressure as obtained by averaging the best results for each speed at this pressure is given upon the diagram in the form of a light cross. These points may be regarded as furnishing a satisfactory basis of comparison in so far as it may be assumed that when the speed has been determined an engine in service will always operate under conditions of highest efficiency. Again the left-hand edge of the shaded zone represents a comparison based on maximum performance at whatever speed or cut-off.

In addition to the points already described, there is located upon the diagram Fig. 1 a curve showing the performance of a perfect engine with which the plotted points derived from the data of tests may be compared.* Guided by this curve representing the performance of a perfect engine, a line A. B. has been drawn proportional thereto, and so placed as to fairly represent the circular points derived from the experiments. It is proposed to accept this line as representing the steam consumption of the experimental engine under the several pressures employed. It is to be noted that it is not the minimum performance nor the maximum, but it is a close approach to that performance which is suggested by an average of all results derived from all tests which were run. Since its form is based upon a curve of perfect performance, it has a logical basis

*This curve represents the performance of an engine working on Carnot's cycle, the initial temperature being that of steam at the several pressures stated, and the final temperature being that of steam at 1.5 lbs. above atmospheric pressure. This latter value is the assumed pressure of exhaust in locomotive service.

l since it does no violence to the experimental data, it seems to justifiable.

7. *Coal Consumption.*—Accepting the curve A. B., Fig. 1, as rly representing the consumption of steam, the corresponding sumption of Yonghiogheny lump coal for the several pressures ployed is shown by Table I.

*Table I.*

| | Per I. H. P., per hour. | Coal Saved for each increment of pressure — Pounds. | Per cent. |
|---|---|---|---|
| lbs. boiler pressure.. | 3.31 | .... | .... |
| " " " | 3.35 | 0.04 | 1.2 |
| " " " | 3.40 | .05 | 1.5 |
| " " " | 3.46 | .06 | 1.7 |
| " " " | 3.53 | .07 | 2.0 |
| " " " | 3.67 | .14 | 3.8 |
| " " " | 3.84 | .17 | 4.4 |

The last two columns of the preceding table show the diminish-

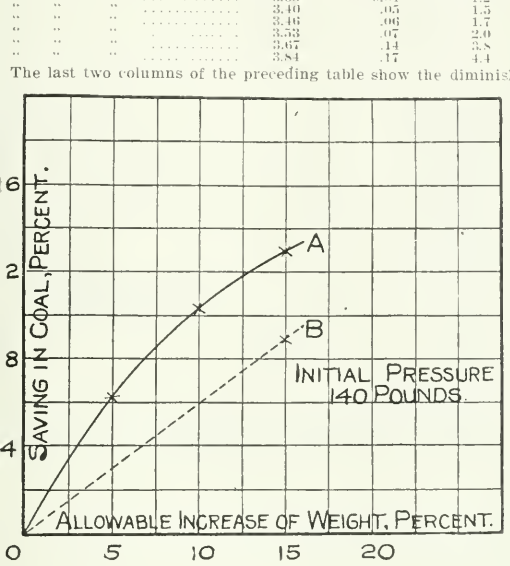



Fig. 3.

value of the fuel saving which results from a given increment pressure as the scale of pressure is ascended. For example, inasing the pressure from 120 to 140 lbs. results in a full saving 4.4 per cent., while a similar increment from 220 to 240 lbs. reits in a saving of but 1.2 per cent.

8. *Increased Boiler Capacity as an Alternative for Higher Pressres.*—Previous publications from the Purdue laboratory have own the possibility under certain conditions, of securing a subtute for very high boiler pressures in the adoption of a boiler of ger capacity, the pressure remaining unchanged. If, for example, designing a new locomotive, it is found possible to allow an rease of weight in the boiler as compared with that of some er type, it becomes a question as to whether this possible inease in weight should be utilized by providing a higher pressure for an increase in the extent of heating surface. The results of ts supplemented by facts concerning the weight of boilers dened for different pressures and for different capacities supply the a necessary for an analysis of this question.

The full report presents with great elaborateness the facts ich underlie the analysis. The results derived are well shown by gs. 2 to 7, inclusive, in which the full lines represent the gain ough increase of boiler pressure and the dotted line the corrending gain through increase of boiler capacity. It will be seen at starting with pressures which are comparatively low, the most nounced benefits are those to be derived from increments of pres-re. With each rise in pressure, however, the chance for gain ough further increase diminishes. With a starting point as high 180 lbs., the saving through increased pressure is but slightly eater than that which may result through increased boiler capac-. For still higher pressures, the argument is strongly in favor increased capacity.

The fact should be emphasized that the conclusions above deribed are based upon data which lead back to the question of l consumption. The gains which are referred to are measured terms of coal which may be saved in the development of a given ount of power. It will be remembered that conditions which rmit a saving in coal will, by the sacrifice of such a saving, open e way for the development of greater power, but the question as fined, is one concerning economy in the use of fuel. It is this estion only with which the diagrams, Figs. 2 to 7, deal.

There are other measures which may be applied to the perform-ce of a locomotive, which, if employed in the present case, would ow some difference in real values of the two curves (Figs. 2 to 5). The indefinite character of these measnres prevent them being directly applied as corrections to the results already deduced, but their effect may be pointed out. Thus, the extent to which an increase of pressure will improve performance has been defined, but the definition assumes freedom from leakage. If, therefore, leakage is allowed to exist, the result defined is not secured. Moreover, an increase of pressure increases the chance of loss through leakage so that, to secure the advantage which has been defined, there must be some increase in the amount of attention bestowed and this, in whatever form it may appear, means expense, the effect of which is to reduce the net gain which it is possible to derive through increase of pressure. Again, in parts of the country where the water supply is bad, any increase of pressure will involve increased expense in the more careful and more extensive treatment of feed-water, or in the increased cost of boiler repairs, or in losses arising from failure of injector, or from all of these sources combined. The effect of such expense is to reduce the net gain which it is possible to derive through increase of pressure. In view of these statements, attention should be called to the fact that the gains which have been defined as resulting from increase of pressure (Figs. 2 to 7) are to be regarded as the maximum gross; as maximum because they are based upon results derived from a locomotive which was at all times maintained in the highest possible condition, and as gross because on the road conditions are likely to be introduced which will necessitate deductions therefrom.

On the other hand, the relation which has been established showing the gain to be derived through increased boiler capacity is subject to but few qualifying conditions. It rests upon the fact that for the development of a given power, a large boiler will work at a lower rate of evaporation per unit area of heating surface than a smaller one. The saving which results from diminishing the rate of evaporation is sure, whether the boiler is clean or foul, tight or leaky, or whether the feed-water is good or bad, the reduced rate of evaporation will bring its sure return in the form of increased efficiency. An increase in the size of a boiler will involve some increase in the cost of maintenance, but such increase is slight and of a sort which has not been regarded in the discussion involving boilers designed for higher pressure. Remembering then, that as applied to conditions of service, the line A is likely to be less stable in its position than B, the facts set forth by Figs. 2 to 7 may be briefly reviewed.

Basing comparisons upon an initial pressure of 120 lbs. (Fig. 2), a 5 per cent. increase in weight when utilized in securing a stronger boiler will improve the efficiency 8.5 per cent., while if utilized in

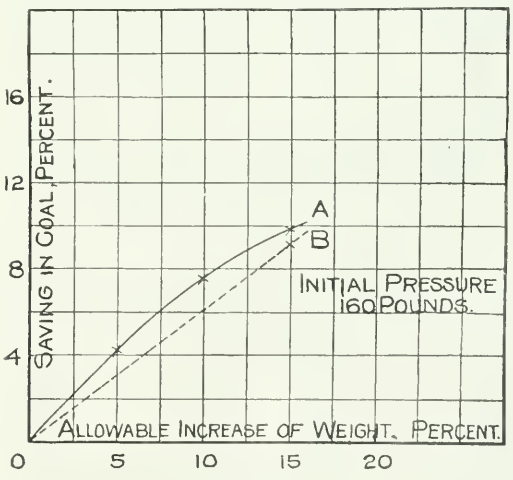



Fig. 4.

securing a larger boiler, the improvement will be a trifle less than 3 per cent. Arguing from this base, the advantage to be derived from an increase of pressure is great. If, however, the increase in weight exceeds 10 per cent., the curve A ceases to diverge from B and if both curves are sufficiently extended, they will meet, all of which is proof of the fact that the rate of gain is greatest for relatively small increments of weight.

Basing comparisons upon an initial pressure of 140 lbs. (Fig. 3), the relative advantage of increasing the pressure diminished though on the basis of a 5 per cent. increase in weight, it is still double that to be obtained by increasing the capacity.

Basing comparisons upon an initial pressure of 160 lbs. (Fig. 4), the advantage to be gained by increasing the pressure over that which may be had by increasing the capacity is very slight, so slight in fact that a little droop in the curve of increased pressure

Lieutenants fully competent can be had only by beginning five years or more in advance and training them; but this the railroads have not done. A few roads have made commendable progress in this training, but even these have put into the matter but a fraction of the energy and money that will be necessary if perfect and satisfactory railroad science is to be developed. Division superintendents, in some respects the most important officers in the railroad service, usually have twice the work that ought to be put upon them. A hundred superintendents to-day need a hundred bright young men for understudies at $2,500 a year. Because of somebody's "limitations" or absorption in questions of finance these understudies are not hired. They do not seem even to be sought after with any adequate persistency. When we speak of important failures we do not mean complete failures, of course, but failures in important affairs. Take, for example, the question of block signaling on the Southern Railway. How much time have its competent officers been able to give to the questions connected with the introduction of the system? In common with many other roads the Southern was years behind time in adopting it at all. Have these officers decided conclusively, and on impregnable grounds, that they should not have put in automatic signals (or automatic track-circuit control), thus doing away with such operators' errors or neglect as occurred at Rangoon? Or, if automatic signals were not to be used, did they go to the bottom of the question of operators' fallibility, their need of education, training and experience? Railroads everywhere are complaining of the poor quality of operators and the difficulty of finding recruits; must we accept this situation as incurable and interpret it in the only way that it can be interpreted—as meaning that the risk to passengers' lives from collisions is increasing? As already intimated, these questions do not apply to the Southern Railway alone; but the Southern will now be asked by the public to answer them.

Concerning the demand of the Georgia Railroad Commissioners for power to regulate train schedules the Commission is, no doubt, voicing a strong public sentiment, and the *Evening Post* is right in commending this sentiment; but it is a grave question whether the Commission can do any good in this direction, except to clearly set forth the facts, so that the public may know the situation in all its details and judge for itself. The making and management of train schedules is an intricate business that cannot be successfully dealt with at long range. That a railroad should, in the matter of its time-tables, be frank with the public and with itself, is as obvious as that honesty is the best policy in commercial dealings. If, after intelligent and persistent effort, a train cannot be run somewhere near its schedule time, the duty is plain to lengthen the time. An Atlanta paper recently gave a statement, said to have been compiled from the observations of its reporters, and covering a week or two, showing that the Southwestern Limited, the best train of the Southern Railway, arrived in Atlanta, regularly and without exception, from 40 minutes to two hours or more behind time. The average, if we remember correctly, was more than an hour late. The habitual treatment of passengers in this way may be looked upon as the same as delivering shipments of freight habitually in a damaged condition, yet not so seriously damaged as to warrant the consignees in expending time and effort to present and collect a claim for damages. Where this situation exists in the freight service, every freight officer is ashamed of it, and he would correct it if he could. In some respects it is incurable, and the only way of doing the consignee justice is to make his average rates low enough so that he can stand this petty bleeding. In the passenger service, however, the remedy is not so difficult. To run a train slower requires, usually, only the courage to meet the laughs of one's competitors. To put on another train is chiefly a question of accepting less profit on the business. The passenger problem being the easier, the duty of applying the remedy is the clearer, and the helplessness of the aggrieved passenger, in the matter of formulating and collecting his bill for damages, affords an added reason for doing everything possible to prevent the damage from accruing. One of the significant sentences in the *Evening Post's* article is that in which the editor observes that on the Southern Railway "not much reliance is placed on the signals." Unfortunately, this situation exists throughout the United States. How does a railroad manager feel to have his efforts at safety thus brought into contempt? This point was the subject of an article in the *Railroad Gazette* which was written just before the Lawyer collision and which appeared just after it. Another thing said by the *Evening Post* which the editor deems significant, but which is not so, is the implied statement that the fact of both trains being hours behind time was a contributing cause of the collision. How would the *Evening Post* apply this reasoning in the case of the trains on the express tracks in the New York City subway? Or on one of the main lines between Jersey City and Philadelphia, where trains must follow one another very frequently? Do we not want just as high a degree of safety between Lynchburg and Danville as between New York and Philadelphia?

Official statements issued by the two railroad companies, published in another column, show that on the days of the two big football games in the East this fall, there were handled, including travel in both directions, a total of about 76,000 passengers, of which undoubtedly all but a few went on account of the game. It will be remembered that in the *Railroad Gazette* of January 5, 1906, figures were given showing the number of one-way passengers carried during the past six years to the annual big games at New Haven. They showed that at New Haven the Harvard game brings heavier travel than the Princeton and that on the day of the Harvard contest in 1904, 32,529 one-way passengers were carried, bringing in passenger receipts of $53,666 to the New Haven road, a sum which very nearly equaled the daily passenger receipts on the whole New Haven system of over 2,000 miles of line. Unfortunately, the New Haven returns for this year show only the travel in one direction, but if we can judge from the Pennsylvania figures, the outgoing travel is about as large as the incoming, so that on this basis there were over 43,000 one-way passengers carried by the New Haven road this year. The largest previous figure was at the Yale-Harvard game in 1902, when 39,349 one-way passengers were carried. The figures given by both roads are especially interesting as showing the efficiency and promptness with which this heavy rush of travel was handled. In a sense the New Haven had the easier problem, for its heavy traffic was distributed among three different divisions with regular trains bringing in their passengers on three other smaller divisions. On the other hand, passengers were brought into and taken away from a city, while the Pennsylvania's passengers were taken to a country town. More than this, the operation of the New Haven road just east of the New Haven station is now under the handicap of the New Haven cut improvements and the road is still limited for that mile and a half of track to a two-track line. At Princeton, where in previous years there have been serious delays on the three-mile branch running from the main line at Princeton Junction, this has now been double-tracked and three yards built to handle a traffic which in its full volume comes only once in two years, on the day of the Yale game. Three yards were used, one for Philadelphia trains, one for trains to Trenton, Newark and Elizabeth and one for trains to New York. The distance from Jersey City to Princeton is 50 miles and from Philadelphia to Princeton 46 miles. It will be observed from the detailed statements showing the time of departure and arrival of the 58 extra trains run by the Pennsylvania on that day that 10-car trains carrying between 700 and 900 people made each of these runs, including the transfer from the main line to the branch at the rate of more than 40 miles an hour from stop to stop. When it is considered that this traffic is peculiarly difficult to handle on account of the fact that it comes almost entirely within the space of three or four hours, and that the road carried on that day 33,363 passengers, the success shown in handling its traffic can be better appreciated. A run of 50 miles in an hour and 10 or 15 or 20 minutes is not in itself remarkable, but when it is made by one after another 10-car train running at short intervals, it bears witness at once to an admirable roadbed and a high order of operating ability.

## THE "OVERCROWDING" OF PASSENGER TRAINS.

The alleged overcrowding of passenger trains on railroad lines of high passenger density and especially at terminals in great cities where passenger traffic is likely to be congested is a question which is always with us. We are able to present below some official figures bearing on the subject. They are taken from the returns of conductors on the New Haven road and refer to traffic on inward and outward trains at New York City for a whole day taken quite at random and which happens to be Thursday, October 11, 1906. Returns for all outward and inward passenger trains, numbering on that date 119, were examined. In general, from two-thirds to three-quarters of the seats in these trains were occupied. Out of the whole number we have selected 22 trains that seem to be of greater or less significance. In the subjoined tabulations they are lettered

from A to V inclusive, and show car by car the seating capacity and the number of passengers on each train.

| A. | | B. | | C. | | D. | |
|---|---|---|---|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 94 | 53 | 78 | 77 | 79 | 77* | 74 | 55* |
| 77 | 75 | 72 | 69 | 52 | 75 | 67 | 69 |
| 74 | 75 | 54 | 69 | 52 | 75 | 70 | 69 |
| 45 | 69 | 37 | 69 | 35 | 77 | 67 | 69 |
| 42 | 77 | | | 31 | 65 | 63 | 77 |
| 49 | 69 | 241 | 284 | | | | |
| 73 | 75 | | | 245 | 369 | 341 | 337 |
| 72 | 71 | | | | | | |
| 483 | 564 | | | | | | |

| E. | | F. | | G. | | H. | |
|---|---|---|---|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 61 | 61 | 66 | 61 | 57 | 53* | 62 | 75 |
| 62 | 77 | 71 | 69 | 68 | 73 | 70 | 75 |
| 69 | 75 | 74 | 75 | 41 | 75 | 33 | 75* |
| 69 | 75 | 60 | 75 | 47 | 75 | 69 | 75 |
| 50 | 69 | 56 | 75 | 70 | 75 | 67 | 75 |
| 29 | 75 | 68 | 69 | 63 | 69 | 62 | 66 |
| 69 | 69 | 74 | 75 | 71 | 69 | | |
| 68 | 69 | | | | | 423 | 441 |
| 477 | 576 | 469 | 505 | 417 | 489 | | |

| I. | | J. | | K. | | L. | |
|---|---|---|---|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 71 | 95 | 41 | 41 | 75 | 69 | 62 | 61* |
| 77 | 79 | 68 | 69 | 65½ | 69 | 74 | 77 |
| 66 | 69 | 93 | 75 | 67 | 69 | 65 | 69 |
| 66 | 69 | 75 | 73 | 60 | 69 | 62 | 75 |
| 25 | 75 | | | | | | |
| 305 | 353 | 277 | 258 | 267½ | 276 | 263 | 282 |

| M. | | N. | | O. | | P. | |
|---|---|---|---|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 71 | 75 | 14 | 20 | 51 | 61* | 71 | 75 |
| 58 | 75 | 33 | 40 | 51 | 69 | 76 | 77* |
| 58 | 75 | 30 | 34 | 66½ | 77 | 63 | 67 |
| 70 | 75 | 28 | 34 | 70 | 75 | 41 | 61 |
| 52 | 65 | 33 | 16 | | | 42 | 75 |
| 64 | 77 | | | 248½ | 282 | 33 | 75 |
| 72 | 70 | 138 | 144 | | | | |
| 64 | 65 | | | | | 326 | 430 |
| 70 | 69 | | | | | | |
| 73 | 69 | | | | | | |
| 652 | 715 | | | | | | |

| Q. | | R. | | S. | | T. | |
|---|---|---|---|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 60 | 77 | 67 | 75 | 70 | 75 | 55 | 69 |
| 53 | 69 | 61 | 66 | 70 | 75 | 54½ | 69 |
| 66 | 75 | 57 | 75 | 65 | 69 | 66½ | 69 |
| 70 | 75 | 60 | 75 | 72 | 73 | 69 | 60 |
| 90 | 77 | 63 | 77 | 90 | 90 | 75 | 75 |
| 67 | 69 | 59 | 75 | | | | |
| 47 | 77 | 60 | 60 | 367 | 352 | 320 | 342 |
| 453 | 519 | 427 | 503 | | | | |

| U. | | V. | |
|---|---|---|---|
| No. of pass'grs. | Car capacity. | No. of pass'grs. | Car capacity. |
| 62 | 67 | 71 | 69 |
| 64 | 69 | 71 | 75 |
| 49 | 69 | 71 | 75 |
| 60 | 75 | 72 | 75 |
| 64 | 69 | 73 | 77 |
| 43 | 41 | 69 | 69 |
| 342 | 390 | 427 | 440 |

*Smoking cars

In the foregoing tabulations smoking cars, so far as they appear in the conductors' sheets, are included and marked by an asterisk, many of the sheets omitting them. Parlor and sleeping cars are not marked and are included, while club and dining cars are excluded, no private cars appearing in the 22 trains. These trains are chosen from the 119 mainly as showing the heaviest train loads of the day in proportion to passenger seating capacity. In the general summary for the 22 maximum trains 7,909 passengers are to be set against a total train capacity of 8,851 passengers, or a little more than 89 per cent. Roughly stated one-tenth of the train —and car—capacity was unused. The average train load for the 22 trains was a little more than 359 passengers, a fact of some side interest in comparison and contrast with the average of 81 passengers per train retained by the New Haven company last year for its whole system in four states.

Analysis in more detail of the returns for the 22 trains brings out a number of points of interest. It will be noted that only three of the trains were overcrowded: Train D had an excess of 4 over capacity, train J had 19 and train S had 15, the total excess thus being 38. The overcrowding of particular cars when there was plenty of room in others is noteworthy in many cases. Thus in the train marked A two cars had more passengers than capacity, while three cars in that train had a total of 79 empty seats. The same feature in greater or less degree may be observed in trains B, D, F, G, H, I, J, K, L, M, Q, S and V; in other words, in all except eight of the 22 trains. The failure of passengers to distribute themselves at all evenly in many of the trains is very striking, a fact probably to be charged up partly to their own unwillingness to hunt up seats, partly to the negligence of the conductor and trainmen. The overcrowding of smoking cars will also be seen in the case of four out of the eight cars of the kind returned, the 93 passengers in the smoker (capacity 75) of train H being conspicuous. But has the passenger who smokes moral or legal right to demand an extra car to seat an overflow usually small and almost always transitory? The smoking car that leaves the big city terminal overcrowded is apt to thin out radically at the first stop.

The instance taken here is that of a road with immense passenger traffic subject to considerable variations, some of which cannot be foreseen. On a typical day operating 119 passenger trains in and out from a metropolitan terminal its overcrowding was represented by 38 passengers on three trains, this on a total volume of daily traffic of not fewer than 30,000 passengers. Such a condition of affairs hardly rises to the dimensions of a great public abuse.

## THE SANTA FE BETTERMENT WORK.

We are especially pleased to have the opportunity to present to our readers the review of the shop betterment work on the Atchison, Topeka & Santa Fe Railway System, the second and concluding instalment of which appears this week. Although the work has been in progress for nearly three years, the Santa Fe management wanted to be able to point to results, rather than theories, as material and indisputable evidence of the merit and justification of the undertaking, and until such results had been achieved beyond question, publicity was carefully avoided. It is, therefore, probably safe to say that the greater part of the railroad world has been in ignorance of the very existence of the undertaking, and therefore of the fact that certain important innovations were being incorporated into the practice of a leading railroad system. As pointed out in the article, the time that has thus far been expended in introducing the work, which is only in its beginnings as far as its ultimate scope is concerned, is some rough indication of the difficulties that have attended the efforts to put it into effect, largely because of its radical and revolutionary character. Those in planning and advisory charge had for the most part to blaze their way, with few precedents to guide them, and additional credit attaches to their efforts on that account.

That such an undertaking would be impossible of accomplishment except through the instrumentality of a corps of specialists such as have had charge of the Santa Fe work, is unquestionable. And in this statement there is no reflection on the ability or energy of railroad officers and men in general, or any intimation that they are satisfied to leave conditions as they are. It is simply that for reasons well known, few have the chance, whatever their inclination. The average railroad man is so completely occupied with the numerous pressing duties of the moment incident to the urgent and incessant need of keeping the transportation machine in motion, which require his entire time and attention, that there is no opportunity, no matter how great his desire, for planning and putting into execution radical methods and practices to improve efficiency and effect economies. And this is aside from the fact that special aptitude and training for work of this character is a primary and most important requisite, particularly where it is undertaken on a scale such as that described. New and unexpected conditions and problems which could not possibly have been foreseen are continually arising, and require the careful and intelligent analysis of one skilled in laying bare the essentials of such things, who has before him complete data to enable each question to be viewed from all angles and the probable results of any move to be pretty well known in advance. To do this he must be in possession of all the requisite information and records, so tabulated or graphically prepared as to present the situation plainly and comprehensively. This in itself requires qualifications of a special sort, the result of natural capacity reinforced by thorough training.

A vitally essential feature of such a system of betterment work as that of the Santa Fe is prompt rendering and complete and accurate keeping of records and accounts. This in itself is an important innovation in American railroad practice, the shortcomings and laxness of which have often been compared to commercial industrial concerns to the great disadvantage, if not actual discredit, of the former. And it is gratifying to observe that the progressive railroads are awakening to the possibilities that exist in adapting to their practice industrial ideas which can be utilized profitably, with resulting large economies and improved efficiency. Standardization of equipment, centralization of manufacture of material, and

systematization in the ordering, handling and distribution of supplies have accomplished results which produce substantial gains in the earnings account. The results thus far achieved on the Santa Fe indicate what possibilities still exist for the introduction of vast improvements in almost all departments, which would introduce economies in American railroad practice to a degree hitherto undreamed of.

One feature this work will include, mentioned in one of the outlines, but not referred to in detail in the article, is the adjustment of repair activity to traffic needs. After a period of unusually heavy traffic the power is generally in poor coudition, due to the severity of the service and the enforced neglect of any but such running repairs as are necessary to keep it going. At the expiration of such a period an extraordinary number of locomotives are usually dumped into the shop, generally without previous warning, overtaxing facilities, and detaining the power from service much longer than ordinarily. On a system like the Santa Fe, serving a vast territory with numerous diverse industries, certain portions of the system will be experiencing such a heavy traffic period at the same time that another portion will be having its lightest movement. Plotting the traffic movements for a given period, sufficiently long, for all of the separate divisions locates these times of light and heavy business on each, showing at once the relation existing between them, and furnishes a graphical record of the period or periods for each demanding the greatest repair activity. Since these periods vary considerably, not only as between grand divisions, but even between subdivisions of a grand division, this gives opportunity for making adjustments in the times for extraordinary shopping of power from the various divisions as should produce some approach to uniformity in the demands on the shop facilities. In fact, such a scheme perfected to a high degree would provide that each division have assigned to it, for using during a stated period, a given section of the erecting floor in the central repair shop to have its power put in shape for the year, and all preparations made in advance for handling these repairs.

Another interesting feature of the betterment work is the series of assumptions that have been made regarding work and its cost; assumptions which are quite radical, and are only partially in operation. The standard time and standard cost are determined before work is begun, as the article made clear. Since these times and costs are theoretical, as the men approach the time and the foremen the cost they are individually rewarded. This gives the absolute efficiency compared to the ideal for every man, foreman, gang and shop. The actual costs are the theoretical costs with the per cent. of efficiency of the previous month added. This per cent. of inefficiency is the *shop*, not the *operation*, inefficiency. By this system, if work on one axle, for example, takes one hour, costing $1—the standard, say—and another similar one ten hours, costing $10, the standard cost still remains $1 and the $9 of inefficiency is spread over all the shop. This enables the cost of every operation to be predetermined.

Another radical feature is the abolition of overtime. The theory underlying this is, that in the end, overtime not only fails to accomplish its purpose, but conduces to an actual loss in efficiency. A man is capable of just about so much good, conscientious, sustained effort. Compel him to go beyond that limit and there is a reaction of some sort. Either he lies off from work the day following, or if not, his work in all probability will not be up to his usual standard, either in quality or quantity. Let this occur often to a shopful of men and the effect is an appreciable impairment of the efficiency of the entire plant. On the other hand, if the men are worked only regular hours, and an incentive provided that stimulates them to put forth their best efforts during these hours, continuous maximum efficiency will be realized.

## Southern Railway.

The tragic death of President Spencer of the Southern Railway, who has been at the head of the company since its formation in 1894, makes a review of its operations of especial interest at this time. For the Southern Railway was the crowning life work and achievement of Samuel Spencer. His was the hand in control from the time the company was formed out of an aggregation of speculatively built and unprofitable railroads in the South up to the present year, which marks a new era in the company's prospects by its provision of suitable capital to take care of future needs through the recently authorized $200,000,000 bond issue.

On February 20, 1894, a modified plan of reorganization for the Richmond & West Point Terminal Railroad & Warehouse Company and its subordinate companies, including the Richmond & Danville Railroad Company and System and the East Tennessee, Virginia & Georgia Railroad Company and System, was issued by the reorganization committee. A previous plan of reorganization had been issued 10 months earlier, but the interval had been a specially disastrous period for railroads everywhere, and particularly in the South, so that a revised plan calling for certain temporary sacrifices not demanded in the original plan was made necessary in order that the new company might bridge over the difficulties of the immediate and dark-looking future. This was to be done largely by the funding of interest payments for a year or two into preferred stock. This detailed plan is most interesting to-day, both as an example of the methods of an exceedingly difficult reorganization and as a showing of the condition at that time of the component parts which make up the heart of the mileage of the Southern Railway to-day. In brief, the plan showed that there were large amounts of speculative bonds outstanding on a mileage of about 4,100 miles of line on which traffic was decreasing, and most of which was in exceedingly bad condition, maintenance charges having been cut to an extremely low level in the endeavor to obtain some net earnings. This was the situation even after excluding from the modified reorganization plan about 1,500 miles of the least profitable lines covered by the original plan on the ground that the new company, in view of the recent unfavorable developments, could not safely carry them.

The 4,100 miles still included earned in the year ended June 30, 1891, about $21,000,000 gross and $6,700,000 net; in 1892, $20,000,000 gross and $6,100,000 net, and in the year ended June 30, 1893, $19,000,000 gross and $5,300,000 net. It was predicted that under the extremely unfavorable conditions prevailing in the fiscal year 1894 about $17,500,000 gross and $4,250,000 net were the best that could be counted on, a prediction later verified by the facts. To provide for the unification of the various outstanding securities of the different roads and the carrying through of the reorganization, the new company issued $120,000,000 5 per cent. first consolidated mortgage and collateral trust bonds, $60,000,000 5 per cent. preferred stock and $120,000,000 common stock, this last being looked on at the time as furnishing a somewhat humorous side to the transaction.

The progress of the reorganized company (the Southern Railway) since that time can best be summed up in the words of Mr. Spencer when submitting to the voting trustees of the road on February 1 of this year a statement in respect to the future financial requirements necessary to properly provide for the rapidly growing traffic and for future development of the property with regard both to further increase in earnings and greater economy in operation—these results to be gained by a new issue of $200,000,000 50-year development and general mortgage 4 per cent. bonds. This statement is as follows:

"In 1894, when the Southern Railway was organized, and the first consolidated mortgage for $120,000,000 was created, the financial requirements were estimated for a system of only about 4,100 miles. In the more than 11 years which have elapsed since organization only $15,100,000 of the consolidated bonds available for improvements and additions have been used, $2,100,000 of which were issued for acquisition of a majority of the stock controlling the Alabama Great Southern. In addition to the proceeds of the remaining $13,000,000, there has been spent in improvement of the property, exclusive of equipment, and charged against income about $5,000,000. Of the consolidated bonds $4,900,000 still remains unsold, but it is evident that this amount is inadequate for the future requirements of the enlarged system.

"Without the use or aid of any first consolidated mortgage bonds the system has been enlarged through purchase, construction, lease and trackage rights by acquisition of railroads aggregating 3,523 miles. In addition the company has acquired a large majority of the stock and of the general mortgage bonds of the Mobile & Ohio Railroad, a one-half interest in a majority of the stock of the Chicago, Indianapolis & Louisville, a one-half interest in a majority of the stock of the Cincinnati, New Orleans & Texas Pacific (Cincinnati Southern), a one-half interest in the stock of the Birmingham Southern, furnishing important terminal facilities in and through Birmingham and the surrounding district, and a one-third interest in the Kentucky & Indiana Bridge & Railroad Company, furnishing the only entrance into Louisville, and the bridge across the Ohio river, connecting the St. Louis and Louisville divisions.

"It has acquired valuable terminals also at 16 of the principal cities of the South—Atlanta, Augusta, Birmingham, Charleston, Chattanooga, Columbia, Durham, Jacksonville, Louisville, Meridian, Mobile, Nashville, New Orleans, Norfolk, Savannah and St. Louis, and since June 30, 1895, it has increased its equipment, including that under contract for delivery during this year, as follows:

| | | | | | | |
|---|---|---|---|---|---|---|
| Locomotives ..... | From | 623 | to | 1,541, | an increase of | 918; or 147 per ct. |
| Passenger train cars. | " | 487 | " | 1,000, | " " | 513; " 105 " |
| Freight train cars... | " | 18,924 | " | 57,929, | " " | 39,005; " 206 " |
| Roadway cars ..... | " | 283 | " | 1,102, | " " | 819; " 289 " |

Being an total increase of..... 203 per ct.

"This equipment addition has been made largely by the issue

of $38,357,590 of equipment trust obligations, of which $26,769,128 are still outstanding and will mature during the next 15 years. Of this total of more than $38,000,000 only about 60 per cent., or $22,971,240, has been, or is to be, charged to capital, while the balance of original cost, $15,386,350, as well as all expense of keeping up the full quota of both old and new equipment, has been or will be charged against income.

"These several acquisitions have been made in accordance with the provision of the consolidated mortgage, authorizing the company

"by the employment of its credit, or of funds not derived from any use of such reserved bonds, or their proceeds, to construct or acquire other lines of railroad, or other branches, extensions, stocks, bonds, or other property, or interests therein, and to create liens thereon, and on the franchises appurtenant thereto, and on the rents, income and profits thereof, which liens, as to all such property, *may be made superior and prior to all liens* thereon by virtue of this indenture."

"Disregarding the Mobile & Ohio, the Alabama Great Southern, the "Monon," the C., N. O. & T. P., the Kentucky & Indiana Bridge & Railroad and the Birmingham Southern, all of which necessarily must be operated and financed separately, on December 31, 1905, the Southern Railway System consisted of lines:

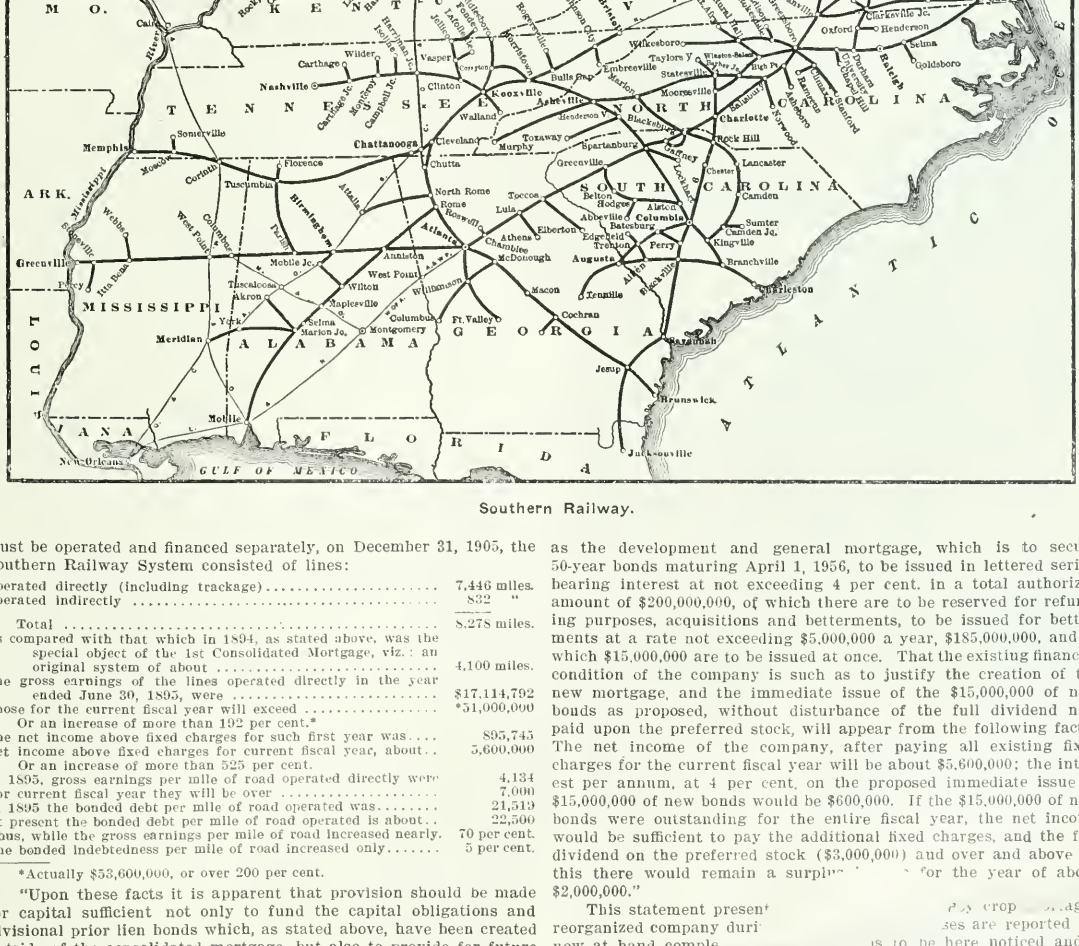
| | |
|---|---|
| Operated directly (including trackage) | 7,446 miles. |
| Operated indirectly | 832 " |
| Total | 8,278 miles. |
| As compared with that which in 1894, as stated above, was the special object of the 1st Consolidated Mortgage, viz.: an original system of about | 4,100 miles. |
| The gross earnings of the lines operated directly in the year ended June 30, 1895, were | $17,114,792 |
| Those for the current fiscal year will exceed | *51,000,000 |
| Or an increase of more than 192 per cent.* | |
| The net income above fixed charges for such first year was | 895,745 |
| Net income above fixed charges for current fiscal year, about | 5,600,000 |
| Or an increase of more than 525 per cent. | |
| In 1895, gross earnings per mile of road operated directly were | 4,134 |
| For current fiscal year they will be over | 7,000 |
| In 1895 the bonded debt per mile of road operated was | 21,519 |
| At present the bonded debt per mile of road operated is about | 22,500 |
| Thus, while the gross earnings per mile of road increased nearly | 70 per cent. |
| The bonded indebtedness per mile of road increased only | 5 per cent. |

*Actually $53,600,000, or over 200 per cent.

"Upon these facts it is apparent that provision should be made for capital sufficient not only to fund the capital obligations and divisional prior lien bonds which, as stated above, have been created outside of the consolidated mortgage, but also to provide for future additions and for improvements and betterments on the entire system. The large growth of traffic on all lines for the last few years, and the rapid development of the entire South, necessitate improvements and extensions on a scale much larger than heretofore, in the form chiefly of double track, revision of grades and curvature, block signals, additional shops, enlarged yards and other terminals for passengers and freight, additional equipment and the construction of branch lines and feeders. Many of these improvements should be contracted for now if the property is to continue to share in, and to induce, the general development of the South, and thus participate in the resulting prosperity and increased earnings which may be reasonably expected.

"The Board of Directors therefore has determined that in accordance with the policy and purpose of the first consolidated mortgage, as quoted above, there should be created a new mortgage which is to be a prior lien upon certain additional properties already acquired, and is to make provision to fund the existing divisional prior lien mortgages not provided for by the consolidated mortgage, thus in due course becoming a prior lien on the properties covered by those mortgages also, and which will be a general lien upon all of the system now subject to the consolidated mortgage, so as to provide for the proper development thereof.

"It is proposed, therefore, to create a new mortgage to be known as the development and general mortgage, which is to secure 50-year bonds maturing April 1, 1956, to be issued in lettered series, bearing interest at not exceeding 4 per cent. in a total authorized amount of $200,000,000, of which there are to be reserved for refunding purposes, acquisitions and betterments, to be issued for betterments at a rate not exceeding $5,000,000 a year, $185,000,000, and of which $15,000,000 are to be issued at once. That the existing financial condition of the company is such as to justify the creation of the new mortgage, and the immediate issue of the $15,000,000 of new bonds as proposed, without disturbance of the full dividend now paid upon the preferred stock, will appear from the following facts: The net income of the company, after paying all existing fixed charges for the current fiscal year will be about $5,600,000; the interest per annum, at 4 per cent. on the proposed immediate issue of $15,000,000 of new bonds would be $600,000. If the $15,000,000 of new bonds were outstanding for the entire fiscal year, the net income would be sufficient to pay the additional fixed charges, and the full dividend on the preferred stock ($3,000,000) and over and above all this there would remain a surplus [illegible] for the year of about $2,000,000."




Southern Railway.

This statement present[illegible] crop [illegible]age a[illegible]ses are reported in t[illegible] now at hand comple[illegible]s is to be here noticed and w[illegible] mileage operated [illegible] the practice of including statistics of commo[illegible] miles a year prenual report has this year been discontinued, an unf[illegible] of the eastern to be taken by any railroad management. The form

Harriman, Tenn., with branches, 206 miles. On this road the Southern Railway and the Illinois Central jointly obtained a three-year option in July, 1905, the road being, for operating purposes, divided at Nashville, the Illinois Central taking the western portion and the Southern the eastern portion, thus giving each system direct access to the city of Nashville. Another acquisition was the Transylvania Railroad, which runs from Hendersonville, N. C., to Lake Toxaway, 42 miles, which was leased on January 1, 1906. The Cumberland Railroad and the Delta Southern, controlled companies, each built 11 miles of line during the year. An important acquisition to the general traffic of the system, not included in the 321-mile increase of mileage, was the purchase of the Virginia & Southwestern, which has about 125 miles of line in the coal fields and iron districts of southwestern Virginia, to which it gives the Southern Railway entrance. The increase in average miles operated during the year was 175 miles.

Gross earnings were $53,600,000, a gain of $5,500,000 over 1905; operating expenses increased $4,500,000, leaving net earnings of $15,367,000—larger by nearly $1,000,000 than in 1905. There was a balance after dividends on the preferred stock, equal to nearly 2 per cent. on the common. From this about $1,000,000 was appropriated for improvements.

The total cost of new equipment contracted for during the year was $13,800,000, of which $1,685,000 was paid in cash and equipment obligations issued for the balance of over $12,000,000, a striking exhibit of the betterment of the property in one important department. The Southern is weak in its way and roadbed department. Considerable improvements have been under way, mostly building of short strips of second main track and revision of grades and curvatures. There were 67,947 tons or 542 miles of new 75-lb. or heavier rail laid during the year, as compared with 45,840 tons, or 372 miles during the previous year. At the same time a more extensive programme for future work of this sort is outlined in the report. A large number of new stations are now under construction and also large improvements to the company's shops.

The records of the industrial department are interesting as reflecting the tremendous growth in prosperity now under way in the South. There were put in operation during the year 34 textile mills, 257 lumber mills, 95 stone quarries and coal mines, 48 wood-working plants, 27 furniture factories, 34 iron industries, 12 fertilizer works, 58 brick works, 2 tanneries and 499 miscellaneous smaller industrial plants, besides 454 additions and enlargements to existing plants and 162 new and additional industries in course of construction at the close of the year. One problem which this industrial development has brought before the South, which is being met by the Southern Railway, is the need of labor from outside regions. This difficulty is to be overcome through the attraction of immigration both from Europe and from other parts of the country to southern territory.

From this brief review of the history and present condition of the Southern Railway it is evident that Mr. Spencer had brought the property to a period of great prosperity, and also that his work was brought to a close at a time when large new problems of utmost importance are confronting the road. There has been an increase of traffic so great that the originally poorly constructed roads, which make up a large part of the system, even with the improvements which it has been possible to make with the funds available, have been entirely inadequate to handling the present traffic. For this reason there have been grave delays to freight traffic and accidents of more or less seriousness have been common. It is possible to lay the cause of the accident in which Mr. Spencer met his death to the crowded condition of the system. The Southern is now at a point where a broad programme of general improvements must be carried out. Various parts of the system must be double-tracked, there must be new and longer sidings throughout the lines and grades and curvature, now in many instances excessive, must be cut down to a point compatible with efficient operation. More than this, and we should judge to be drawn as the most striking lesson of Mr. Spencer's death, the block system must be installed and strengthened throughout the lines. The work of the past 12 years is the work of a railroad genius; the necessities of the next 12 years would seem to require equally high ability. Fortunately, the way has been paved for the success of the improvement programme by the comprehensive bond issue planned by Mr. Spencer.

The principal statistics of the last two years' operation are as follows:

| | 1906 | 1905. |
|---|---|---|
| Mileage worked | 7,374 | 7,199 |
| Passenger earnings | 13,341,181 | 12,657,195 |
| Freight earnings | 36,141,547 | 31,773,326 |
| y its provision Earnings | 53,641,439 | 48,145,108 |
| reugh the recently way and structures | 7,122,355 | 6,458,850 |
| On February 20, 1894, a ment ... ion | 8,588,452 | 7,456,736 |
| hmond & West Point Terminal Railroad & Wa | 20,810,240 | 18,195,504 |
| d its subordinate companies, including the Richmo | | 33,700,714 |
| | | 14,744,394 |
| | | 5,151,632 |
| | | 1,056,549 |
| | | 1,095,083 |

## Missouri Pacific.

The Missouri Pacific is the heart and center of the Gould system, which is reaching out both east and west for a through trans-continental line under one management. The Missouri Pacific is made up, territorially, of two parts, separated in general by a line drawn southwest from Kansas City. North of this imaginary line are the lines of the Missouri Pacific proper, including the Kansas & Colorado Pacific and the Central Branch, as the two next important roads of the group. South of the imaginary line are the St. Louis, Iron Mountain & Southern lines, which include, besides that road, a number of short independent lines not operated by the larger corporation, but separately, paying their own expenses, surplus earnings, if any, being passed in the form of dividends to the Gould ownership in control. In the northern group there is a through line from St. Louis to Kansas City and from Kansas City to a connection with the Denver & Rio Grande at Pueblo, Colo., a line from Kansas City northwest to Omaha and from Kansas City south to Coffeyville, Kan., where an Iron Mountain line from the southeast makes connection, together with a large mileage of long and short branches, mainly in Kansas, but also in southeastern Nebraska and western Missouri. The southern group includes the old St. Louis, Iron Mountain & Southern main line from St. Louis to Texarkana, Tex., with numerous branches, and is coming to include a second north and south line from St. Louis, along the Mississippi river, to New Orleans, the last 200 miles of this line being over the Texas & Pacific from Ferriday, La., south. There are also two connections with the Missouri Pacific lines proper—the one already mentioned at Coffeyville, the other the recently completed White River division at Carthage, Mo., which is near the southeast corner of Kansas.

The Missouri Pacific system, as a whole, has been developing and rounding out in the past few years, the White River division and the River and Gulf low-grade line being the most important items. The White River division has been under construction since June, 1901. The whole 300-mile line from Diaz, Ark., on the main line of the Iron Mountain, northwest to Carthage, was opened at the beginning of the current year. It cost about $10,000,000. This is a well-built line, with satisfactory grades and curvature, which were obtained partly through building a half-mile tunnel, and part of it laid with heavy rail. Besides the connection which it gives with the Missouri Pacific lines another connection is to be obtained by construction of a line shown on the map from Eldon, Mo., on the branch running southward from Jefferson City to Springfield, Mo., to connection with a branch of the White River division already built.

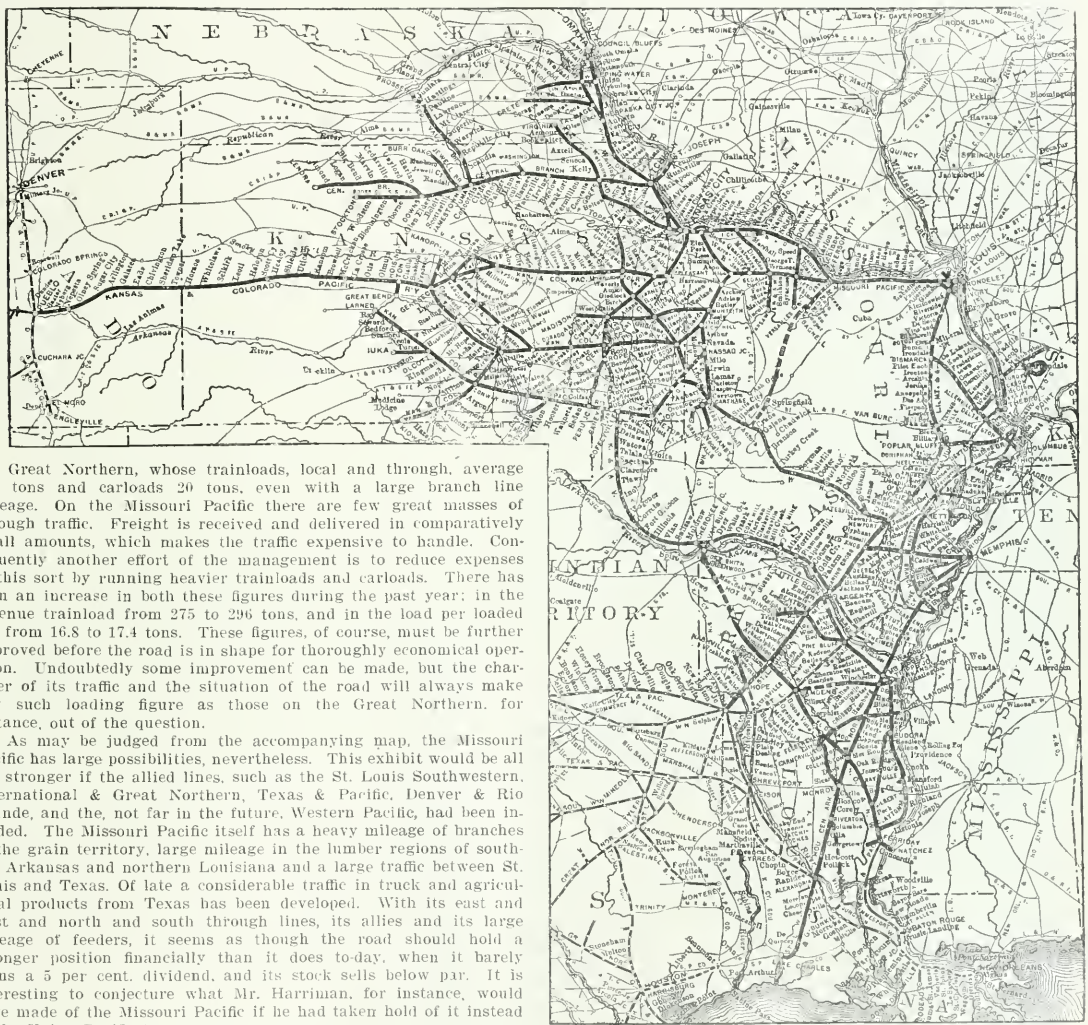
The River and Gulf division is at present made up of a low-grade line from East St. Louis along the east bank of the Mississippi river to Thebes bridge, across this bridge and south 110 miles by trackage rights over the St. Louis Southwestern, a Gould road, to Paragould, Ark., thence south over Iron Mountain lines via Wynne, Marianna, McGehee, Lake Village and Eudora, Ark., and Clayton, La., to Ferriday, where the Texas & Pacific line is met. Parts of the through line which is planned have still to be built, the most immediate construction building being a connection from Marianna, on this through route, northwest to Memphis. In carrying out this plan for a low-grade line between St. Louis and New Orleans via Thebes bridge, extensive improvements have been made. On the Memphis division terminal yards have been built at Paragould and Lexa, Ark., grades reduced, alinements changed, bridges added and strengthened, 85-lb. rails laid, passing tracks built and other work done to prepare that section of the line for heavy traffic.

Another new line which is to shorten this through route to the Gulf is projected from Eudora, Ark., southwest to Gilbert, La., 77 miles. Of this 37 miles is graded and 12 miles of 85-lb. rail is laid south from Eudora. Under the name of the Gurdon & Fort Smith and the Gurdon & Fort Smith Northern railroads a cut-off is being built from the point where the Iron Mountain line northeast to Coffeyville, Kan., crosses the Indian Territory-Arkansas state line to a connection with the Texarkana main line and thence to the low-grade line to the Gulf. Work is under way on this cut-off, but it will not be finished for some time. When completed it will considerably shorten the Missouri Pacific line from Kansas to the Gulf. Except for some connecting up of branches these projects represent the new construction work of the system.

It will be observed that the object in each case is not, primarily, to develop new territory, although the new lines do this to a greater or less extent, but to unify the system by bringing its various points into more direct connection with one another. The Missouri Pacific has been a disjointed system with roundabout routes for a great deal of its through traffic. It has a great quantity of branch line mileage, but has lacked efficient through lines. In consequence the effort is now being made to weld together the separated parts into a complete whole, and along with this process to develop new and shorter through routes, particularly for traffic from all points on lines in the northern group south to the Gulf. This Gulf traffic, together with a large local business, makes up the larger part of the road's freight. The drawback to the Gulf business is that it is always highly competitive. With its not specially efficient lines to

the southward the Missouri Pacific has in the past, although carrying at times a remarkably large proportion of the traffic, obtained a low proportion of net return from this competitive business. At one time the road was able to obtain a large southbound traffic only by cutting rates on grain to the Gulf to 9 cents from Kansas City. Since this export grain does not carry high rates, largely because there are so many hands stretched out to grasp it, the necessity of developing economical and efficient lines to the south has been a strong one, and is the backbone of the construction policy which we have outlined.

Another reason why operating efficiency must specially be considered is the local character of a great part of the traffic. The Missouri Pacific is the greatest sort of a contrast with a road like the Great Northern, whose trainloads, local and through, average 530 tons and carloads 20 tons, even with a large branch line mileage. On the Missouri Pacific there are few great masses of through traffic. Freight is received and delivered in comparatively small amounts, which makes the traffic expensive to handle. Consequently another effort of the management is to reduce expenses of this sort by running heavier trainloads and carloads. There has been an increase in both these figures during the past year; in the revenue trainload from 275 to 296 tons, and in the load per loaded car from 16.8 to 17.4 tons. These figures, of course, must be further improved before the road is in shape for thoroughly economical operation. Undoubtedly some improvement can be made, but the character of its traffic and the situation of the road will always make any such loading figure as those on the Great Northern, for instance, out of the question.



Missouri Pacific.

As may be judged from the accompanying map, the Missouri Pacific has large possibilities, nevertheless. This exhibit would be all the stronger if the allied lines, such as the St. Louis Southwestern, International & Great Northern, Texas & Pacific, Denver & Rio Grande, and the, not far in the future, Western Pacific, had been included. The Missouri Pacific itself has a heavy mileage of branches in the grain territory, large mileage in the lumber regions of southern Arkansas and northern Louisiana and a large traffic between St. Louis and Texas. Of late a considerable traffic in truck and agricultural products from Texas has been developed. With its east and west and north and south through lines, its allies and its large mileage of feeders, it seems as though the road should hold a stronger position financially than it does to-day, when it barely earns a 5 per cent. dividend, and its stock sells below par. It is interesting to conjecture what Mr. Harriman, for instance, would have made of the Missouri Pacific if he had taken hold of it instead of the Union Pacific ten years ago.

The present report is the first full statement of operations issued for 18 months. Owing to a change in the fiscal year, an absurdly brief statement covering operations of the calendar year 1905, was issued to the stockholders in April of this year. This showed that the 2½ per cent. dividend for that period was not earned by $18,000. The poor showing was, according to the report, due to a number of unfortunate circumstances—the yellow fever epidemic, a shortage in the cotton crop and severe floods. Last year a better showing was made; gross earnings were $44,500,000, an increase of $3,500,000 over the fiscal year ended June 30, 1905. Operating expenses increased $2,250,000, leaving net earnings larger by $1,250,000 than in that year, while net income was larger by $896,371 than in 1905. It is to be observed at this point that net income for both years was bolstered up by the payment of the first and second dividends ever paid on Central Branch stock, which is all owned by the Missouri Pacific. These amounted to over $1,000,000. Owing to the fact that in order to harmonize dividend payments with the changed fiscal year, three dividends (7½ per cent.) were charged against the income of the 12 months, the surplus after dividends was $492,710 against $1,541,310 in the previous corresponding year. It must be borne in mind, however, that since from the income of the six months, January-June, 1905, during which time no dividend was charged, there was a net income of $991,899, there remained, after paying the three dividends of 2½ per cent. each, a surplus from the earnings of the 18 months, January, 1905, to June, 1906, of $1,484,608. Therefore, looking at the 18-month period as a whole, by calling on the surplus earnings of its subsidiary, the road came through with a small but reasonably safe margin above dividend requirements.

Passenger earnings were $30,000 smaller, as compared with the preceding and corresponding 12 months, which, however, included the last five months of the St. Louis Exposition. In these five months of 1904 passenger earnings increased $1,320,000 over the corresponding five months previous. It is on this account that the present year's passenger earnings, which, for the first six months of 1906, increased $956,720 over the same period in 1905 when conditions were normal, show a decrease. The report draws attention to the fact that the introduction of train auditors has proved very satisfactory in its results. An indication of the growth of normal passenger traffic is the increase of 1,382,665 local passengers carried for the year.

Freight earnings increased $3,300,000, or 11 per cent. With the exception of cotton traffic, which was affected by crop shortage and yellow fever in Louisiana, substantial increases are reported in the principal commodities carried. It is to be here noticed and with disappointment that the practice of including statistics of commodities in the annual report has this year been discontinued, an unfortunate step to be taken by any railroad management. The former

reports, which have been in many ways very unsatisfactory, have contained this table, which is perhaps of greater importance than any other single set of facts in determining the real condition of a railroad, and particularly of a railroad like the Missouri Pacific, with its large local traffic, most of it originating on its own lines. On the other hand the report has, for the first time, been brought somewhere nearly in harmony with the Interstate Commerce Commission classification of expenses, so that there is a chance to separate to some degree the maintenance of equipment and conducting transportation accounts, which formerly both shared in the expense classification, "motive power." Nor was a detailed table of expenses given under the old system.

On account of this change in accounting method, no comparison with the previous year is available in the detailed expense accounts for 1906. It is possible to compare the unit maintenance of way charge, however, which was $857 per mile against $782 in 1905. Last year maintenance of equipment cost $2,840 per locomotive, $625 per passenger car and $51 per freight car. These are, on the whole, fairly satisfactory figures, although the maintenance of way figure seems rather small, even with the large amount of branch line mileage and its considerable increase over 1905. Conducting transportation required $17,142,000, or 57 per cent. of the total $30,282,000 operating expenses.

There was an increase of 19 per cent. in the number of passengers carried, a decrease of 12 per cent. in the number of passengers carried one mile, and a decrease of 26 per cent. in the average distance each passenger was carried. These three facts sum up the increase in general passenger traffic and the loss in the long distance traffic in 1905, due to the Exposition. Ton-miles of revenue freight increased 17 per cent. and tonnage 12 per cent. There was an increase of 4 per cent. in the number of loaded cars and a decrease of 6 per cent. in the number of empty cars per train mile, this, with the increase in the train- and carload already mentioned, showing better efficiency.

The industrial department has been active during the year. There were established 457 industries on the line, employing $24,834,000 capital, and pledged to deliver annually for shipment 190,980 carloads of freight. These industries were of 33 classes, including saw-mills, furniture and vehicle factories, cement and brick plants, coal mines, zinc and lead smelters, foundries and machinery factories, cotton gins, compressors and oil refineries, stone quarries, glass factories, flour mills and elevators, creameries and canneries. The mineral district opened up along the White River line has begun to produce high grade ores. There are as yet undeveloped in the country tributary to the lines in Kansas, Missouri and Arkansas, deposits of granite, lime stone, marble, onyx, fullers earth, barytes, asbestos, asphalt and other clays and minerals. Special attention has been given to promoting scientific agriculture along the lines in co-operation with state agricultural colleges and experimental stations and the Federal department of agriculture.

The Little Rock & Monroe, a line 43 miles long from Felsenthal, Ark., south to Monroe, La., was acquired and its construction finished, so that it was open for operation November 1, 1905. A terminal yard with 38 miles of track is now under construction at Dupo, on the Illinois division, opposite Carondelet, Mo., to provide a terminal on the east side of the Mississippi river and to facilitate the interchange traffic over the Ivory Ferry Transfer. At Kansas City, Mo., a large classification and division yard has been built in the East Bottoms.

To secure more efficient operation the lines have been divided into three grand districts, the northern, southern and central districts, each in charge of a general superintendent. The northern district comprises the main lines from St. Louis to Pueblo and line lying to the north; the southern district the main line, St. Louis to Texarkana, and lines lying to the east, and the central district the divisions lying between these main lines. Three new operating divisions were created during the year, the Northern Kansas, Memphis and Wichita. Floods and damage to tracks and bridges during the year to the amount of $211,000 caused serious interruptions to traffic, particularly between St. Louis and Kansas City, where through traffic was suspended for one week in September and one week in October, 1905. High water and washouts also occurred between St. Louis and Texarkana and on the Joplin, Omaha and Central Kansas divisions.

The principal statistics of operation for the year ended June 30, 1906, for the Missouri Pacific, including the St. Louis, Iron Mountain & Southern and the Central Branch are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 6,276 | 6,205 |
| Passenger earnings | $8,753,141 | $8,783,054 |
| Freight earnings | 32,563,507 | 29,261,894 |
| Gross earnings | 44,566,821 | 41,067,282 |
| Maint. way and structures | 5,378,125 | 4,852,580 |
| Maint. of equipment | 5,781,533 | 4,479,340 |
| Conducting transportation: | | |
| Operation | 16,070,829 | ..... |
| Traffic | 1,071,155 | ..... |
| Total | 17,141,984 | 16,977,765 |
| Operating expenses | 30,282,405 | 28,031,892 |
| Net earnings | 14,284,416 | 13,035,391 |
| Net income | 8,329,015 | 5,432,178 |
| Dividends | 5,836,305 | 3,890,868 |
| Surplus after dividends | 492,710 | 1,541,310 |

## NEW PUBLICATIONS.

*Railroad Location, Surveys and Estimates.* By F. Lewis. New York: The Myron C. Clark Publishing Co. 270 pages, 6 in. x 9 in.; 73 illustrations. Price, $3.00.

Once in a while a scientific book appears that combines the threefold elements of mastery of the subject, clearness of expression and elegance in the use of English, a combination as rare as it is attractive. The book at hand, on the apparently dry subject of railroad location and surveys, is of this sort, and the interest of the reader or student is held through every line of the text, and page after page is turned with no more thought of effort than in an interesting story. Aside from this characteristic feature the reader is impressed by precept upon precept with the necessity of combining, in all railroad surveys, thoroughness and an eye to the commercial necessities of avoiding unnecessary refinements, and again and again throughout the work is the call for the use of a well-trained and mature judgment to determine to what extent this thoroughness and refinement of the work shall be carried. The end to be aimed at is to obtain the best line the country affords at a minimum of expense, not only for surveys and construction but in operation, later, and the idea of a proper capitalization of these expenses is kept constantly in view.

First of all, it is urged that the locating engineer must be more than familiar with the country; he must be steeped in its peculiarities and possibilities so that he is able to consider the line, not only in the broad and general features which it must possess but in the details of each and every station. This can only be done by careful reconnaissance and by freeing the chief of the party from the details of the instrument work and the personal guiding of the men in the duties of the day, which should be left to the assistant. All through the book the value of careful topographical work is insisted upon and a high estimate is put upon this department. At the same time there is the feeling of the drive behind the workman and that speed, speed, speed is of prime importance and yet everything must be accurate, and accuracy is never to be sacrificed at any place for any consideration. There is a "genius who, disdaining plats, approaches the hillside boldly line in hand, takes a glance at the point of curvature and the degree of the curve that will fit the hill comfortably, and at the proper point on the curve sails off on a tangent that will strike the bull's-eye two miles away. Nothing would be more dangerous than to encourage the idea that such things are possible; once in a great while the genius might hit the bull's-eye; but nine times out of ten the man in his tent at night with his map and all his facts before him, and by all means the most important, thoroughly familiar with the ground, will be fitting in tangents that will do away with the curves of the 'genius' and hit the bull's-eye every time."

While the book gives a broad and comprehensive idea of the scope and method of doing the work, details are by no means neglected. One feels that it would be very easy to organize, equip and guide a party in the field, so minute and interesting are the instructions that are given, from the number and duties of the men, the means of getting them into the field, the camp, its pitching and moving and the management of its supplies, to the equipment and care of the instruments, the clothing, shoes and personal belongings of the party. Special attention is given to the sanitary precautions to be taken to keep all in health, for a railroad survey "is no place for a weakling." And through it all we are told of the value of courtesy; courtesy to the men that their loyal and earnest support may be obtained, and courtesy to the residents along the line, that the road may be built among its friends, and those friends may be willing to furnish the engineer with invaluable information regarding characteristics of the country, such as floods and natural phenomena that mean so much in time and money, not only in the rapidity and economy with which the survey can be made but also in the operation of the road when it is completed. Systematic work, especially in keeping notes, is insisted upon: notes that are not only intelligible to the man who made them on the morning after, but to the stranger who may have occasion to use them ten years later. For this, pages of notes from the books of the transit man, leveller and topographer are given in full so that the student can take them and plot the work that they refer to.

With such intensely practical instructions along the whole line of the location, it is not strange that the man who is working for rapidity and accuracy without needless refinement and an eye to commercial results should place a rather low estimate upon the value of higher mathematics, and in this he but follows in the lead of other successful engineers. After referring to certain calculations regarding the relation of the projected location to the preliminary lines and noting that the curves will take care of themselves if the tangents are in the right place, the author says, "in view of the fact that from time to time it has seemed necessary to exploit special solutions of so-called difficult curve problems in the technical journals, the writer would wish to impress on the many young men who are first beginning on any curve problems, the fact that he has never yet had occasion to use in the solution of any curve problems which he has encountered in actual railroad prac-

tice, any other mathematical knowledge than a good working acquaintance with geometry and the ability to solve plain triangles by trigonometry, but would impress on all of them the necessity of having these at their fingers ends and as readily available as the multiplication table."

The book has a constant eye to cost, not only in the discussion of the broad work in rough and unsettled countries, but especially in the chapter on suburban rapid transit railways, where attention is called to the sometime necessity of ignoring the natural topographical features of the country on account of the avoidance of grade crossings, expensive buildings and artificial obstructions which would be expensive to remove.

This review should not close without a reference to the exceedingly interesting chapter on surveys in tropical countries, in which the author has surpassed himself in the conciseness and clearness of his statements as to what should be done, and what should be expected in the prosecution of work. There is nothing that is not apropos to a strictly scientific statement of the subject in hand and yet it reads with the interest of a novel. Finally the interest is kept up even in the usually dry methods of making estimates and determining warranted costs, all of which are outlined with great clearness and thoroughness. In fact, the only portion of the book that is not replete with interest is the tabular matter of tangents and externals and the geometrical formula at the close, and the reader is quite apt to swing into these with an entirely different feeling from that with which such data are usually approached; while the astronomical information in the appendix for the determination of location is clear in the extreme. In short, the book is one of those rare productions in which there is not a wasted word and whose scientific value is high in that it tells clearly and concisely just what every student and engineer should know. The reader, however, must have some knowledge of the subject, for no attempt has been made to give instructions in such details as the manipulation of the instruments or "the running or calculating of curves, as men on whom these duties devolve on a locating party should have learned them elsewhere."

# CONTRIBUTIONS

## Safety at Meeting Points Under the Standard Code.

Ruby, S. C., Nov. 26, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note the following particulars in the statement of F. C. Batchelder, Superintendent, respecting the Woodville disaster. That a heavy storm of wind and snow was raging, and that under these circumstances the crew of a heavy freight train had no other means of learning that a heavy passenger train running in opposition to them was in two sections instead of one than that of seeing signal lights on the first section as it passed them.

That seems to be the only possible meaning of the terms of Mr. B.'s statement as given, in apparently literal repetition, in some papers. It seems almost incredible that the facts should be as stated. It also seems highly discreditable—a transparent absurdity if nothing worse—to attempt to confine the "responsibility" or blame to the two train crews.

There is something radically wrong in a system of rules, or the mode of handling them, which would suspend the possibility of such an accident as occurred in this case on so slender and brittle a thread and send two such immense forces, freighted with such vast possibilities of pain, agony and death to human beings towards each other with such slight safeguards as this.

It would certainly seem that from a system that takes so little account of weather and other unfavorable conditions certain to occur, the idea of the "factor of safety" that the engineer has to use in constructing his bridges is entirely omitted; and that it is high time that something like it was introduced into railroad operation.

CHAS. H. SCOTT, C.E.

[It is not exactly fair to say that there is no factor of safety. It is true that a second class train waiting on a side track at a non-telegraph station for a first class train has no means of knowing how many first class trains there may be on a certain schedule, except by what can be learned by looking at the engine of the first passenger train. But the conductor and the engineman of the second class train both are bound by a strict rule that if (at night) they do not see the lights on the engine, or do not see the front of the engine clearly enough to assure them that no lights are there, they must keep their train on the side track. They have no right to occupy the main track without knowing that a first class train passing them is the last one running on that schedule. On most roads there is another factor of safety. The engineman of the first class train, when displaying signals for a following train of the same class as his own, is required to sound his whistle, as a means of calling the attention of the men in charge of any inferior train standing on any side track. The engineman on the side track must, in response, sound the whistle of his engine; and if this response is not given, the engineman of the first train must stop and find out what is the matter. From the reports thus far received, it appears that failure in this last particular was the main element in the cause of the collision at Woodville. It is said that the engineman of the passenger train sounded his whistle, but failed to receive a response; and then did not stop to learn the cause of the failure. It is obvious, of course, that the two factors of safety named must be supplemented by a third factor—careful and vigilant men, well trained to strict compliance with rules. It is true that this factor is absent in many cases. A high standard of efficiency in this feature of train management seems to be lacking on many roads. Many roads have adopted the block system as the only practicable cure for this kind of error.—EDITOR.]

## Disastrous Collision at Lawyer, Va.—President Spencer Killed.

In a rear collision of passenger trains on the Southern Railway near Lawyer, Va., 11 miles south of Lynchburg, on the morning of November 29, the rear car of the leading train, occupied by Mr. Samuel Spencer, President of the road, and a party of guests, was completely wrecked; and Mr. Spencer, Gen. Philip Schuyler, one of his guests, a telegraph operator, a porter and another employee in this car were killed, and Mr. Merrill, private secretary of the President, was injured. One passenger and a fireman were also killed, and several passengers in other cars were injured. Southbound passenger train No. 33 passed Rangoon at 6.06 a.m., but appears not to have been reported by the block signal operator to the operator at Lawyer, the next block station to the south. The train was stopped a mile short of Lawyer, in consequence of the breaking of the knuckle of the coupler on the front end of the leading car of the train. While the coupler was being repaired the train was run into at the rear by train No. 37, which passed Rangoon at 6.14 under a clear signal. The operator at Lawyer, being ignorant of the presence of train No. 33 in the block, made no objection to the admission of train No. 37. The operator at Rangoon, G. D. Mattoax, disappeared about one hour after the collision, and it was reported that he had absconded; but on Saturday, two days after the collision, his brother came out with the statement that he had been at his home, within a mile of the wreck, all the time, and had not tried to evade the officers of the law, who, it was said, had been searching for him. The brother said that the reason train No. 33 was sent forward without notice was the inability of Mattoax, at Rangoon, to raise the operator at Lawyer.

It is said that the flagman of train No. 33 went back promptly, but no accurate information has been given as to the time or the distance. The superintendent of the road is reported as saying that the flagman did his whole duty.

## Washington Correspondence.

WASHINGTON, Nov. 27.—Since the Hepburn law became effective the Interstate Commerce Commission has received a large number of informal complaints of through rates that are higher than the sum of the local rates between the same points, some of the complainants suggesting a general order reducing all such through rates to the sum of the locals. The commission has taken the ground that it is not empowered to make such an order and can only act after full hearing on a formal complaint as to specific rates. It has announced, however, that a through rate which is higher than the sum of the locals between the same points will be considered *prima facie* unreasonable and that the burden of proof will be upon the carrier to defend the higher rate and establish its reasonableness.

This is expected to lead to the filing of formal complaints as to certain rates that have been complained of informally and to decisions that will show what are the conditions that in the opinion of the commission will justify a higher through rate. It is probable that the roads will contend that such rates are justified where local rates are kept down by independent competition on one or both sides of an intermediate point, while there is no competition for the through traffic, and, also, where local rates have been reduced to an unreasonably low level by a state commission. It can be contended that to allow a state commission to force the reduction of interstate rates by reducing local rates within the state would give the state power to regulate interstate commerce. There have been cases in the past in which state commissions have virtually controlled the fixing of interstate rates by using or threatening to use their power over state rates, and it is probable that, sooner or later, the question of whether interstate rates can be controlled by state action will be threshed out thoroughly in the United States courts.

A striking illustration of an attempt by a state commission to control important interstate rates may be afforded by the action of the Georgia commission within the next few months. One of the principal issues in the political campaign in that state was the question of freight rates from the Georgia ports to Atlanta, and it is expected that the new governor will appoint a commission that

will order reductions in those rates. Though a shipment by water to a Georgia port and thence by rail to Atlanta is an interstate shipment it is doubtful whether it can be brought under the jurisdiction of the Interstate Commerce Commission and whether the carriers can be sustained in making a higher charge for such a shipment than the sum of the water rate to the port and the rail rate to Atlanta. Yet, unless this can be done, the action of the Georgia commission would control not only the rail-and-water rates to Atlanta but the all-rail rates as well, and would thus open the broad question as to whether interstate rates can be regulated by state authority. J. C. W.

## Football Travel on the Pennsylvania and the N. Y., N. H. & H.

The following tables give detailed statements of the passenger travel on the days of the Yale-Princeton football game at Princeton on November 17, and the Yale-Harvard game at New Haven on November 24. The statement showing this traffic on the Pennsylvania includes both incoming and outgoing travel; the New Haven's statement shows only the travel *to* New Haven. It will be observed that, on the assumption that twice as many passengers were handled as the total travel to New Haven, as it appears from the summary of the travel to Princeton can be with fair accuracy assumed, the New York, New Haven & Hartford carried some 43,000 passengers as against 33,363 carried by the Pennsylvania.

STATEMENT OF TRAVEL TO AND FROM PRINCETON, ACCOUNT YALE-PRINCETON FOOTBALL GAME, AT PRINCETON, NOV. 17TH, 1906.—PENNSYLVANIA RAILROAD.

*From Jersey City.*

| Train. | Leave Jersey City. | Arrive Princeton. | Total cars. | Passengers. |
|---|---|---|---|---|
| Extra 317 | 8:47 a.m. | 10:05 a.m. | 10 | 574 |
| " 683 | 9:24 " | 10:34 " | 9 | 411 |
| " 676 | 9:39 " | 11:06 " | 10 | 544 |
| " 81 | 9:43 " | 11:12 " | 10 | 684 |
| " 2095 | 9:52 " | 11:15 " | 10 | 448 |
| " 95 | 9:56 " | 11:20 " | 10 | 522 |
| " 2037 | 10:12 " | 11:27 " | 10 | 486 |
| " 1046 | 10:37 " | 11:55 " | 10 | 822 |
| " 2221 | 10:43 " | 12:02 p.m. | 10 | 602 |
| " 904 | 10:51 " | 12:09 " | 10 | 609 |
| " 963 | 10:52 " | 12:12 " | 10 | 684 |
| " 1072 | 10:56 " | 12:21 " | 4 | 101* |
| " 3153 | 11:05 " | 12:25 " | 10 | 797 |
| " 612 | 11:46 " | 12:30 " | 10 | 749 |
| " 2771 | 11:24 " | 12:37 " | 10 | 782 |
| " 1408 | 11:34 " | 12:49 " | 10 | 813 |
| " 2444 | 11:43 " | 12:54 " | 10 | 810 |
| " 820 | 11:53 " | 1:03 " | 10 | 518 |
| " 2038 | 12:05 p.m. | 1:21 " | 10 | 419 |
| " 2216 | 12:52 " | 1:59 " | 10 | 362† |
| " 642 | 11:29 a.m. | 12:46 " | 10 | 332‡ |
| " 1232 | 11:55 " | 1:13 " | 10 | 182‡ |
| Total...22 trains. | | | 213 | 12,058 |

*From Princeton.*

| Train. | Leave Princeton. | Arrive Jersey City. | Total cars. | Passengers. |
|---|---|---|---|---|
| Extra 1406 | 3:58 p.m. | 5:11 p.m. | 10 | 768 |
| " 2221 | 4:02 " | 5:15 " | 10 | 748 |
| " 904 | 4:06 " | 5:19 " | 10 | 656 |
| " 3153 | 4:08 " | 5:22 " | 10 | 697 |
| " 612 | 4:13 " | 5:35 " | 10 | 706 |
| " 2771 | 4:18 " | 5:49 " | 10 | 730 |
| " 2444 | 4:22 " | 5:58 " | 10 | 675 |
| " 820 | 4:28 " | 6:03 " | 10 | 870 |
| " 2038 | 4:32 " | 6:09 " | 10 | 754 |
| " 2216 | 4:37 " | 6:13 " | 10 | 716 |
| " 965 | 4:49 " | 6:27 " | 10 | 823 |
| " 2517 | 4:55 " | 6:31 " | 10 | 782 |
| " 483 | 5:02 " | 6:49 " | 10 | 784 |
| " 1072 | 5:17 " | 6:58 " | 4 | 106* |
| " 2995 | 5:15 " | 6:53 " | 10 | 783 |
| " 676 | 5:16 " | 6:51 " | 6 | 696 |
| " 95 | 5:54 " | 7:39 " | 10 | 455 |
| " 683 | 6:22 " | 7:50 " | 1 | 10 |
| " 1158 | 6:54 " | 8:15 " | 10 | 265 |
| " 2037 | 7:12 " | 9:09 " | 10 | 222 |
| " 1046 | 9:42 " | 11:10 " | 10 | 244 |
| Total...21 trains. | | | 191 | 12,401 |

*From Philadelphia.*

| Train. | Leave Philadelphia. | Arrive Princeton | Total cars. | Passengers. |
|---|---|---|---|---|
| Extra 3155 | 8:23 a.m. | 9:48 a.m. | 10 | 259 |
| " 937 | 10:00 " | 11:05 " | 4 | 61§ |
| " 3148 | 10:09 " | 11:13 " | 10 | 709 |
| " 3158 | 10:26 " | 11:45 " | 12 | 473 |
| " 2775 | 11:03 " | 12:35 p.m. | 12 | 683 |
| " 2991 | 11:42 " | 1:10 " | 12 | 631 |
| " 2992 | 11:56 " | 1:20 " | 10 | 174 |
| Total... 7 trains. | | | 70 | 2,990 |

*From Princeton.*

| Train. | Leave Princeton. | Arrive Philadelphia. | Total cars. | Passengers. |
|---|---|---|---|---|
| Extra 184 | 4:06 p.m. | 5:13 p.m. | 10 | 659 |
| " 551 | 4:15 " | 5:30 " | 12 | 460 |
| " 1223 | 4:24 " | 5:40 " | 12 | 803 |
| " 290 | 4:37 " | 5:52 " | 10 | 415 |
| " 2217 | 4:45 " | 6:57 " | 12 | 670 |
| " 937 | 5:12 " | 6:34 " | 4 | 64§ |
| " 2215 | 5:40 " | 7:02 " | 10 | 539 |
| Total... 7 trains. | | | 70 | 3,610 |

*From Trenton.*

Extra 3155, Trenton, 12:10 p.m. Princeton, 12:54 p.m. 10 cars. 412 passengers. Returned on Philadelphia trains.

SUMMARY

*To Princeton.*

| | | | | |
|---|---|---|---|---|
| From Jersey City | 22 | Special trains. | 213 cars. | 12,058 passengers. |
| " Jersey City | .. | Regular " | ... " | 495 " |
| " Philadelphia | 7 | Special " | 70 " | 2,990 " |
| " Philadelphia | .. | Regular " | ... " | 716 " |
| " Trenton | 1 | Special " | 10 " | 412 " |
| Total | 30 | | 293 " | 16,671 " |

*From Princeton.*

| | | | | |
|---|---|---|---|---|
| To Jersey City | 21 | Special trains. | 191 cars. | 12,101 passengers. |
| " Jersey City | .. | Regular " | .. " | 293 " |
| " Trenton | | | | |
| " Philadelphia | 7 | Special " | 70 " | 3,610 " |
| " Philadelphia | .. | Regular " | .. " | 388 " |
| Total | 28 | | 261 " | 16,692 " |
| Grand total. | 58 | | 554 " | 33,363 " |

*Yale team.
†Relief to regular train No. 81.
‡Newark and Elizabeth.
§New York Division Special.
‖Pennsylvania R. R. officials.

STATEMENT OF TRAVEL TO NEW HAVEN, ACCOUNT YALE-HARVARD FOOTBALL GAME AT NEW HAVEN, NOV. 24TH, 1906. NEW YORK, NEW HAVEN & HARTFORD.

*To New Haven.*

| Train. | From | Leaving time. | Arrive New Haven. | Equipment. | Passengers. |
|---|---|---|---|---|---|
| Extra 811. | New York..... | 7:55 a.m. | 9:55 a.m. | 12 coaches. | 349 |
| " 830. | " " .... | 9:00 " | 11:00 " | 12 " | 819 |
| " 831. | " " .... | 9:25 " | 11:20 " | 12 " | 834 |
| " 835. | " " .... | 9:50 " | 11:47 " | 12 " | 740 |
| " 819. | " " .... | 10:04 " | 11:54 " | 5 coch. 2 parlr. | 295 |
| " 844. | " " .... | 10:07 " | 12:02 p.m. | 12 coaches. | 744 |
| " 834. | " " .... | 10:15 " | 12:15 " | 12 " | 345 |
| " 814. | " " .... | 10:25 " | 12:25 " | 10 parlors. | 448 |
| " 842. | " " .... | 10:30 " | 12:17 " | 10 " | 349 |
| " 829. | " " .... | 10:35 " | 12:30 " | 10 " | 263 |
| " 843. | " " .... | 10:43 " | 12:33 " | 12 coaches. | 503 |
| " 840. | " " .... | 10:45 " | 12:40 " | 10 parlors. | 271 |
| " 818. | " " .... | 10:52 " | 12:45 " | 10 " | 377 |
| " 836. | " " .... | 11:08 " | 1:02 " | 10 " | 226 |
| " 1206. | Stamford ..... | 9:35 " | 10:49 a.m. | 10 coaches. | 396 |
| " 1205. | Stamford ..... | 10:50 " | 11:55 " | 10 " | 646 |
| " 1206. | Bridgeport .... | 12:32 p.m. | 1:00 p.m. | 10 " | 473 |
| " 804. | Boston ..... | 8:15 a.m. | 12:20 " | 10 parlors. | 321 |
| " 803. | " ..... | 8:20 " | 12:27 " | 10 " | 291 |
| " 806. | " ..... | 8:25 " | 12:58 " | 10 " | 284 |
| " 829. | " ..... | 8:35 " | 12:52 " | 12 coaches. | 844 |
| " 828. | " ..... | 8:40 " | 12:57 " | 12 " | 183 |
| " 1512. | " ..... | 8:30 " | 12:30 " | 5 " | 325 |
| " 1513. | " ..... | 8:32 " | 12:47 " | 5 " | 427 |
| " 1253. | " ..... | 8:01 " | 12:04 " | 7 " | 335 |
| " 1202. | Springfield. ... | 9:25 " | 11:20 " | 10 ch, 1 private. | 550 |
| " 1250. | Hartford ..... | 10:20 | 11:14 | 10 coaches. | 625 |
| " 1212. | *B.& A., Spgfld. | 10:43 " | 12:46 p.m. | 9 " | 464 |
| " 1252. | Hartford ..... | 10:56 " | 11:56 a.m. | 10 " | 475 |
| " 1211. | *B.& A., Spgfld. | 11:24 " | 1:07 p.m. | 10 parlors. | 252 |
| " 813. | *B.& A., Spgfld. | 12:04 p.m. | 1:33 " | 9 " | 295 |
| " 1251. | Hartford ..... | 12:15 " | 1:14 " | 9 coaches. | 265 |
| Total for 32 trains ..... | | | | | 13,967 |

*From Boston, via Boston & Albany Railroad.

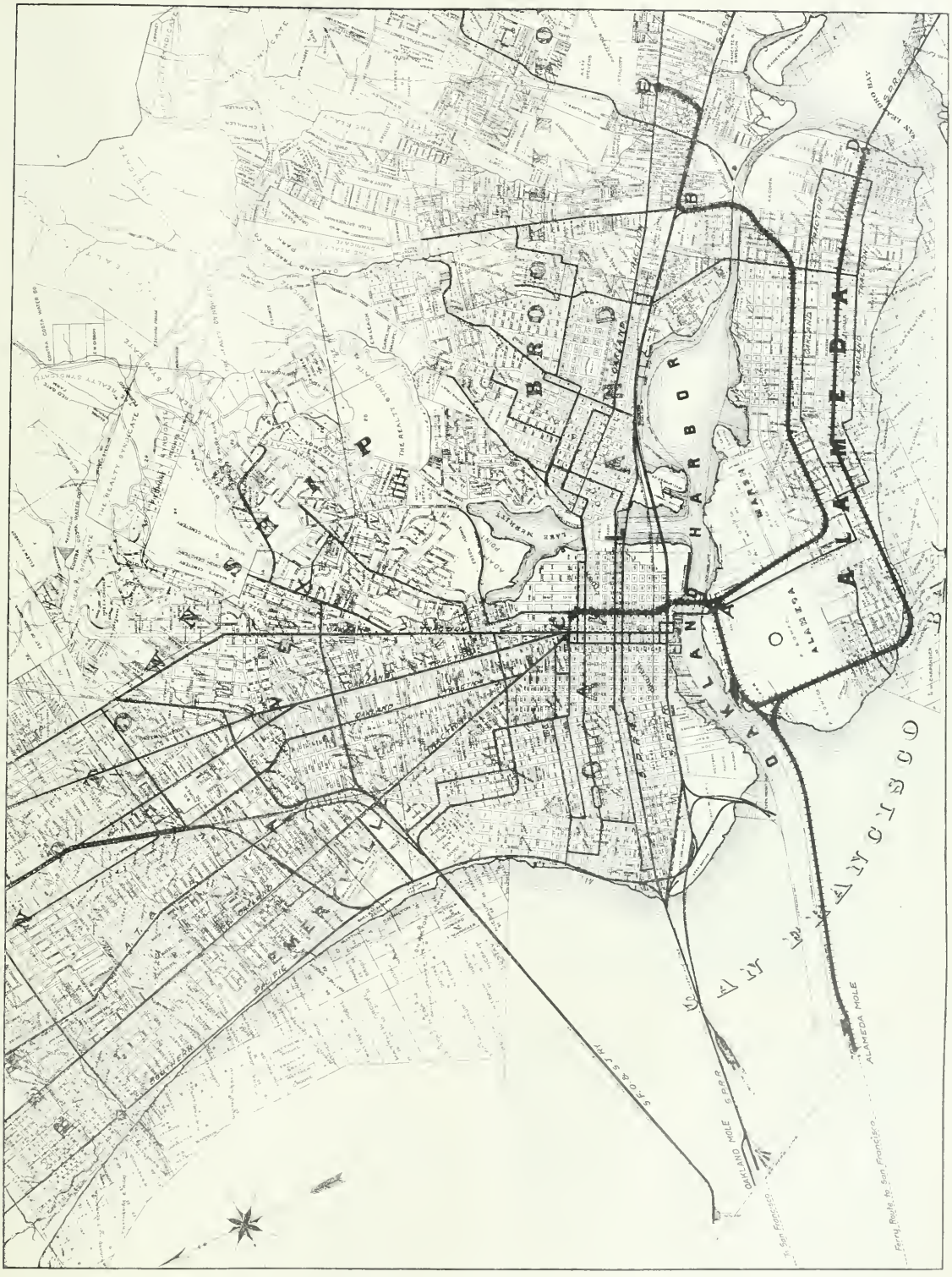
SUMMARY.

| | Trains. | Cars. | Passengers. |
|---|---|---|---|
| New York Division—Through | 14 | 151 | 6,606 |
| New York Division—Local | 3 | 30 | 1,425 |
| Shore Line Division—Through | 8 | 71 | 3,010 |
| Hartford Division—Through | 4 | 39 | 1,561 |
| Hartford Division—Local | 3 | 39 | 1,365 |
| Total on Extra Trains. | 32 | 330 | 13,967 |
| Regular Trains to New Haven, 9 a.m. to 1:33 p.m... | 28 | .. | 7,561 |
| Grand total, inbound, handled in 4 hrs. 33 mins. | 60 | .. | 21,528 |

## Electrification of Southern Pacific Local Lines at Oakland.

Southern Pacific officials at San Francisco are now making active preparations to change about 20 miles of the company's local steam lines, extending from the ferry terminal to Alameda and Oakland into an electric railway. The plans recently received include the installation of an electric generating station at Alameda Point and the construction of an overhead trolley system. The present tracks will be utilized. An appropriation of $1,126,695 is understood to have been made for the work, which will probably require about a year to execute. All of the local lines converging at the company's Alameda Mole will be electrified. One of these extends to High street, Alameda, after branching off from the mole line. A second line crosses the Estuary and terminates at Fourteenth and Franklin streets, near the business center of Oakland. It is reported unofficially that the portion of this road now traversing Webster street will be moved one block further west and follow Franklin street. Also that an extension will be made so that this line will terminate at Twentieth and Franklin streets. The third division of the electric road will extend to Melrose via Alameda and Fruitvale. Heavy electric coaches, seating 84 passengers each, will be operated in solid trains, with 500-volt d.c. motors. It is not the present intention to do away entirely with steam local trains, which will be useful during the heavy rush hours of ferry traffic between San Francisco and suburban points.

The accompanying map shows the track arrangements at Oakland. It will be seen that the mileage is in the hands of four companies, the Southern Pacific, Santa Fe, San Francisco, Oakland &




Electrification of Southern Pacific Local Lines in Oakland, California.

*Heavy cross-hatched line shows parts to be electrified immediately.*
*A and B—New curves to be put in for electric lines. C—14th and Franklin Streets, Oakland terminal. D—Alameda, High Street terminal. E—Melrose terminal.*

San Jose and Oakland Traction Consolidated. The last two operate by electricity. Apart from the traction company, the San Francisco, Oakland & San Jose, locally known as the Key Route, operates a 20-minute-interval ferry service between San Francisco, Berkeley, Piedmont and Oakland, and also 30 miles of connecting electric railway.

After completion of the electrification now on hand, it is understood that the Southern Pacific will continue it along the local lines extending through Oakland to Fruitvale and the line running via Sixteenth street station, Oakland, to Berkeley, with a branch to West Oakland. It is probable that the electric district on the coast will soon have the form of a horseshoe belt line operated around the bay from San Francisco to Oakland, via San Jose.

## Shop Betterment Work on the Santa Fe.

BY CHARLES B. FRY,
Associate Editor of the *Railroad Gazette*.

### II.

### ROUNDHOUSE WORK.

As with the shop betterment work, improvement of the roundhouse situation was first undertaken at Topeka. The schedule of extension of the betterment work given at the beginning of this article shows the roundhouse work to have been begun in September, 1905, and system work to have been undertaken last April.

Complete schedules covering all operations in roundhouse work on all classes of locomotives were prepared by thorough time studies, involving an immense amount of detail work. The following items are taken at random from these schedules to indicate their general character; they also convey an idea of the great number of such items the schedules must necessarily include.

*Sample Items from Roundhouse Schedule.*

| Subject. | Schedule No. | Description of work. | No. of men. | Classes of engs. | Time, hrs. |
|---|---|---|---|---|---|
| Wiping..... | 0074 | Wiping tank frame and trucks complete ..... | 1 | All. | 0.4 |
| | 0068 | Wiping machinery below running board inside of frames, including engine trucks, &c.* | 1 | A B C D<br>F U<br>S T | 0.6<br>1.0<br>0.8 |
| Governor ... | 0130 | Overhauling air-pump governor complete ..... | 1 | All. | 0.5 |
| Rocker boxes. | 1244 | Tightening rocker box..... | 1 | All. | 0.3 |

*Including engine trucks, eccentrics, blades, straps, motion work and axles, inside surfaces of frames, rocker boxes, cylinders, saddles and brake rigging, also guides, rods and cross-heads of balanced compound engines, lower parts of jackets, and all parts between frames not specified.

The letters in the next-to-last column for the second item refer to groups including certain classes of engines. The time given is in hours or fractions thereof. The wording and numbering of each schedule is common to all roundhouses on the System, which permits accurate comparison on all detail work between any and all points.

To permit greater elasticity in handling repairs—since roundhouse work necessitates more or less shifting of men and to permit the men to profit by such benefits as might be derived by carrying on several jobs at one time, a collective feature was introduced where the total work performed during any one day is grouped, and the total standard time of all operations taken as the standard time for the collective schedule, for the calculation of bonus.

Roundhouse expenses are divided into two classes: Handling expenses and repair costs. The handling expenses are classified into "direct" and "general"; the former including the wages of hostlers, wipers, boiler-washers, flue-borers, etc., and the latter, the wages of foremen, clerks, callers and sweepers. In comparing the handling expense at different points, the average cost per engine handled is not an accurate comparative basis, since more work is necessary on engines at one point than at another. To provide a more accurate method of comparison, a "unit allowance" for each of the 14 operations which may be performed in connection with the handling of engines at terminals was adopted, this unit allowance being equal to the cost of the operation in cents, as determined by the time studies. An engine is counted "handled" each time any one or more of these operations are performed. The total unit allowance for direct expenses is ascertained from a complete record of all these operations performed during a month at each point. A similar allowance for general expenses was arbitrarily fixed at 30 per cent. of the unit allowance for direct expenses. By dividing the total unit allowance into the total actual expense, a cost per 100 units of work is determined, and since the ideal cost is $1 per 100 units, this report forms an immediate basis for comparing the different roundhouses with their previous records and with other houses.

The effects of this system during the short time it has been in operation are indicated by figures taken from the January and September, 1906, reports on the Atchison proper:

| | Total Engs. handled. | Total Cost. |
|---|---|---|
| January ..... | 24,627 | $57,858 |
| September ..... | 25,849 | 47,263 |

With a slight increase in total engines handled, there was a reduction in total handling cost for September of something over $10,000, or about 18 per cent., much of which is due to improved supervision. On the basis of the September results the yearly saving would amount to $120,000.

The bonus system is in operation at about 65 per cent. of the main roundhouses and the weekly reports from these points contain a summary showing:

The average number of men working on schedules.
The average number of men earning bonus.
Total work units.
Total wage cost.
Work unit efficiency (in per cent.).
Total bonus earned.
Per cent. of bonus.

The body of the report gives the figures for these items by days.

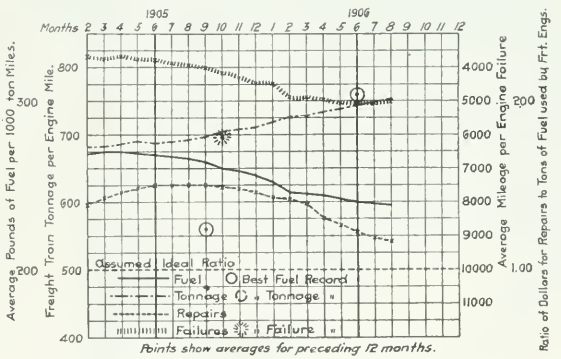

1905
1906
Months 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Average Pounds of Fuel per 1000 ton Miles.
Freight Train Tonnage per Engine Mile.
Average Mileage per Engine Failure.
Ratio of Dollars for Repairs to Tons of Fuel used by Frt. Engs.
Assumed Ideal Ratio
Fuel
Best Fuel Record
Tonnage
" Tonnage "
Repairs
Failures
" Failure "
Points show averages for preceding 12 months.

*Fig. 7.*

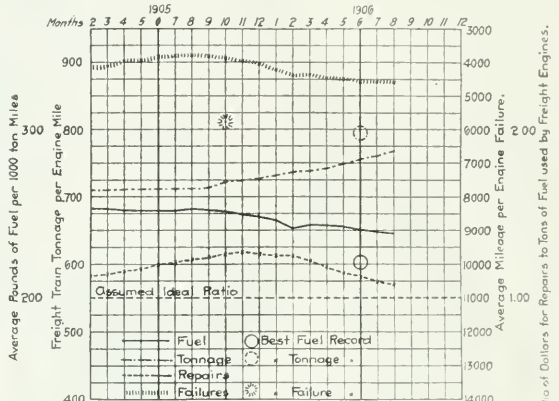

1905
1906
Months 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Average Pounds of Fuel per 1000 ton Miles.
Freight Train Tonnage per Engine Mile.
Average Mileage per Engine Failure.
Ratio of Dollars for Repairs to Tons of Fuel used by Frt. Engs.
Assumed Ideal Ratio
Fuel
Best Fuel Record
Tonnage
" Tonnage "
Repairs
Failures
" Failure "
Points show averages for preceding 12 months.

*Fig. 8.*

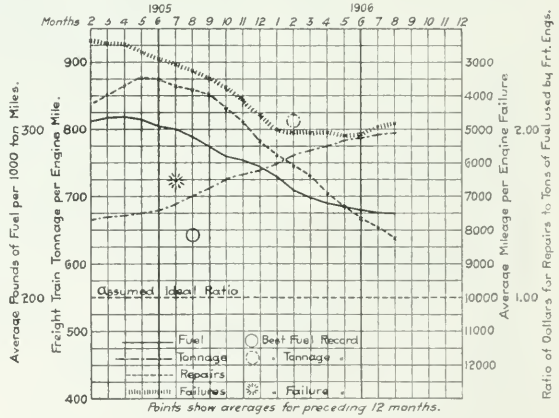

1905
1906
Months 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Average Pounds of Fuel per 1000 ton Miles.
Freight Train Tonnage per Engine Mile.
Average Mileage per Engine Failure.
Ratio of Dollars for Repairs to Tons of Fuel used by Frt. Engs.
Assumed Ideal Ratio
Fuel
Best Fuel Record
Tonnage
" Tonnage "
Repairs
Failures
" Failure "
Points show averages for preceding 12 months.

*Fig. 9.*

**Figs. 7, 8, 9—Performance Graphs for the System, the Atchison Proper, and the Coast Lines, Respectively.**

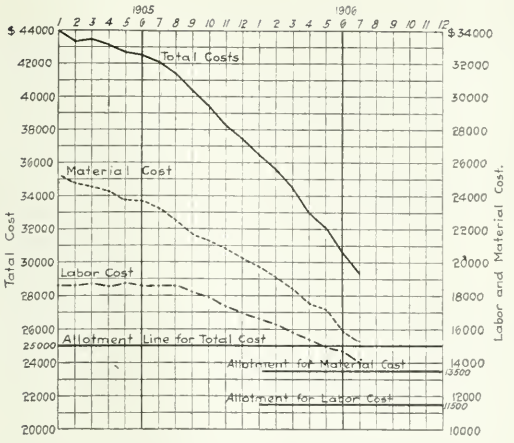



*Fig. 10—System.*

In handling the repair work, a system was adopted where an operation costing $1, when work is done in standard time, is established as a "work unit." Therefore, to determine the total work units a man delivers, the time-study or standard times for various operations are multiplied by his rate of pay. This, it will be understood, is regardless of the actual time taken for the work. Knowing the total work units delivered by a man and the total wage cost, his work unit efficiency may be determined. For 100 per cent. efficiency—that is, where the work units equal the wage cost—the bonus rate is 20 per cent. Greater or lesser efficiencies are bonused, relative to the standard, in the same proportion as in the shop reward system.

In one respect the roundhouse bonus system differs materially from the shop system, and that is in the payment for overtime. In the shop work all bonus schedules lapse where overtime is paid, the purpose being to eliminate overtime work completely. This is based on the theory that working men overtime results in an actual loss in efficiency and less is accomplished in the end than when their efforts are confined to regular hours only. But in the roundhouse this would work a hardship in many cases. Work here cannot always be confined to regular hours, it often being imperative to carry it to completion without delay, in order that the power may not be unduly detained from service. Under the shop provision, if a man worked six hours on a job, five of which were regular time and only one hour of overtime, he would forfeit all of the bonus he may have earned in the first five hours. This feature was therefore modified in the roundhouse system to allow bonus for the full time worked. However, if a job is begun on overtime, the right to bonus

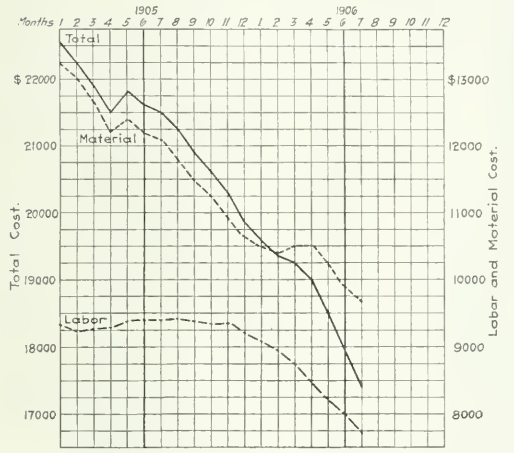



*Fig. 11—Atchison, Proper.*

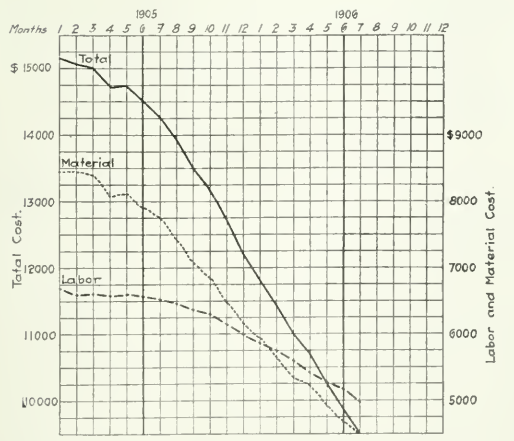



*Fig. 12 Topeka Shops.*

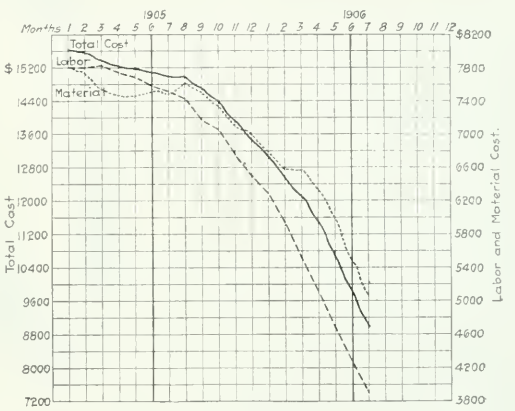



*Fig. 13—Coast Lines.*

*Fig. 14 Gulf Lines.*

Figs. 10-14—Graphic Representation of Expense of Shop Machinery and Tools.

is forfeited. This is to minimize the amount of overtime work done, reducing it to what is only actually necessary.

POWER HOUSE WORK.

The work on power house economies has been limited to efforts to stop leaks; or, in other words, to secure the most economical conditions of operation possible with existing equipment. To improve the fuel record, power house engineers are bonused on coal consumption, the system being similar to that used in rewarding engine crews for like savings.

CAR WORK.

Car work has only just been taken up, the time given in the schedule of extension of the work being August of this year. Little can therefore be said regarding it at this time beyond its general character. In this respect it will be similar to the roundhouse system, with similar schedules and method of bonusing.

ECONOMIC RESULTS OF THE BETTERMENT WORK.

The final and decisive test of the worth of the betterment efforts is the effect on the operating expense accounts, of course. An intimation of the effects in this respect was given in the early part of the article where it was stated that "for every dollar of supervising and special expense incurred, the company has saved at least $10 in reduced costs." The figures which are presented below are based on the last annual report of the company for the fiscal year ending June 30, 1906. Certain facts should be known and borne in mind in considering them and the graphical representations of performances, etc., also included.

During the fiscal year mentioned the work was limited to Account 12 (repairs and renewals of locomotives), principally the labor part of it; to supervision; to Account 17 (repairs and renewals of shop machinery and tools), and to roundhouse work. Also the full effects of what this work was able to accomplish were not realized until toward the end of the year; for the beginnings were always small, of course, therefore the total saving distributed over the year would make the average monthly saving much less than was actually being obtained in the closing months; besides, much of the work was not started until the year was half gone, or more. Furthermore, all graphical records presented are based on twelve-months' averages; that is, the figure for any month is the monthly average for the twelve months ending with the month in question. Therefore, maximum results would not show fully in such diagrams until they had been realized for an entire year.

System results include figures for all points, of course. As the betterment work was active only in certain districts or at certain points, and only in certain accounts, its good effects in the System results must bear the burden of any increased expense and adverse conditions in territories and accounts where it is not yet in effect. For example, in maintenance of equipment, those accounts in which it was active showed marked reductions, while those in which it was not active advanced materially, due in many cases to increase of traffic. In transportation accounts, all showed an increase for the year except the one touched by the work, namely, fuel. Territorially, like differences were noticeable. The betterment forces were active on the Atchison proper and on the Coast Lines, but not on the Gulf Lines, except as to fuel. On the last-named lines there was a marked increase in locomotive repair expenses, but a reduction in fuel account. The tool account betterment was accomplished practically at four points, where a reduction of more than 50 per cent. was secured; all other points, almost without exception, showed increases. As already mentioned, the following figures are taken from the last annual report:

*Saving on Locomotive Basis.*

| | 1904-5. | 1905-6. |
|---|---|---|
| Total number of locomotives, June 30 | 1,454 | 1,633 |
| Reduction in cost per engine, including all renewals, distributed and adjusted charges | | $1,064 |
| Total economy on 1,633 locomotives | | 1,737,626 |
| Average locomotives in service | 1,447 | 1,550 |
| Reduction in cost per locomotive, as above | | $918 |
| Total economy | | 1,423,132 |
| Reduction in actual charges for repairs only, Acct. 12 (locomotives) and Acct. 17 (tools and shop machinery) | | 79514 |
| Total economy | | $1,233,909 |

This last figure is based on locomotives actually in service, and with the exception of maintenance of shop machinery and tools, does not include renewals, supervision, boiler service or other adjusted and distributed expenses.

Although new locomotives were added in 1905-6, the mileage per locomotive was maintained.

*Saving on Mileage Basis.*

| | 1904-5. | 1905-6. | Increase. | Per cent. |
|---|---|---|---|---|
| Locomotive miles | 40,727,636 | 45,694,524 | 4,966,888 | 12.2 |
| Miles per locomotive | 28,041 | 27,982 | | |

Direct reduction of cost per engine mile, not including renewals or distributed accounts:

| | |
|---|---|
| Labor | $0.0225 |
| Material | 0.0068 |
| Total, Account 12 | $0.0293 |
| Account 17 | 0.00386 |
| Total reduction | $0.03316 |

Had the cost per mile been as high as in 1904-5 the additional cost would have been:

| | |
|---|---|
| For Account 12 | $1,338,850 |
| For Account 17 | 176,809 |
| | $1,515,659 |

$353,219, part of which is due to the betterment work.

*Fuel Basis.*

It is assumed that repairs properly are proportional to fuel used.

| | 1904-5. | 1905-6. |
|---|---|---|
| Tons of fuel | 2,784,245 | 3,108,000 |

Saving on basis of 1904-5:

| | |
|---|---|
| Locomotive repairs (Account 12) | $1,308,650 |
| Tool account (Account 17) | 155,400 |
| | $1,464,050 |

*Tons on Drivers Basis.*

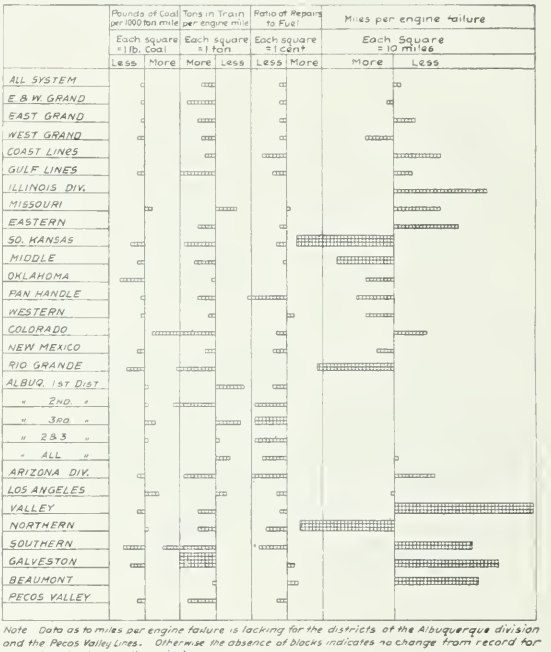
| | 1904-5. | 1905-6. |
|---|---|---|
| Tons on drivers | 85,421 | 100,054 |

Saving on basis of 1904-5:

| | |
|---|---|
| Locomotive repairs (Account 12) | $1,591,859 |
| Tool account (Account 17) | 202,109 |
| | $1,793,968 |

*Road Unit Basis.*

"Road units" are obtained by multiplying a locomotive's mileage




Note. Data as to miles per engine failure is lacking for the districts of the Albuquerque division and the Pecos Valley Lines. Otherwise the absence of blocks indicates no change from record for preceding twelve month period.

**Fig. 15—Combined Comparative Monthly Showing, August Against July, 1906 (Twelve Months' Averages).**

by its weight on drivers in pounds, and dividing the product by 100,000,000; or

$$\frac{\text{mileage} \times \text{wgt. on drivers (lbs.)}}{100{,}000{,}000}$$

| | 1904-5. | 1905-6. |
|---|---|---|
| Total road units | 47,855 | 56,301 |
| Road unit cost | $106 | 878 |

Saving on basis of 1904-5:

| | |
|---|---|
| Locomotive repairs (Account 12) | $1,618,091 |
| Tool account (Account 17) | 204,936 |
| | $1,823,027 |

Performance diagrams or graphs are presented herewith showing the average pounds of fuel per 1,000 ton miles; the freight train tonnage per engine mile; the average mileage per engine failure, and the ratio of dollars for repairs to tons of fuel used by freight engines, all on a basis of 12 months' averages (Figs. 7, 8 and 9). Such records are kept not only for the System and all of its grand divisions, but for each division and district of the latter, there being 31 graphs in all. The records here shown extend from February, 1905, to and including August, 1906. Being based on 12 months' averages, the point indicating any month's performance is the average for the preceding 12 months. Examination of the System graph,

ig. 7, discloses uniform improvement in all four records. The verage fuel consumption per 1,000 ton miles has dropped from 64.5 lbs. to 249.5 lbs. The circle represents the best performance n this respect ever obtained in any single month, and, therefore, upplies an ideal or standard for which to strive. This figure is 22 lbs. and gratifying progress has been made in its direction.

The freight train tonnage per engine mile has steadily increased and has practically attained the standard represented by he best single month's record—the broken-line circle on the 1906 ine. The increased tonnage performance is attributed to improved ocomotive conditions, more miles being got out of the engines and nore tonnage per engine mile. These improved locomotive conditions are due to the bettered roundhouse methods and to improved upervision by the road foremen of engines.

The best failure record ever obtained was approximately 6,000 niles. The average record has been raised from 3,700 miles to lightly over 5,000 miles in the 18 months covered by the graph.

The fourth curve, representing the ratio of dollars for repairs o tons of fuel used by freight engines, furnishes a new basis for naking comparisons of performances and is considered much more ational and therefore much superior to the ton-mile basis. As a ocomotive is a machine for converting the energy of coal into work t the drawbar, it is evident that work done should vary directly

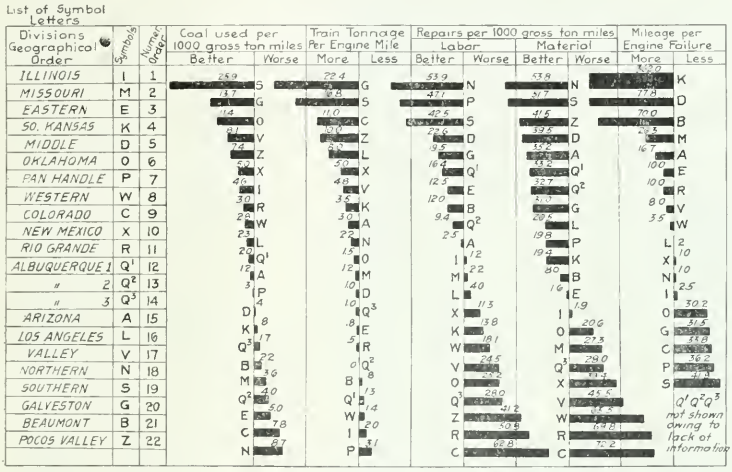



**Fig. 16—Comparative Standing of Each Division With Respect to Its Previous Month's Performance, on a Percentage Basis—August, 1906.**

vith coal burned. Repairs should vary with work done. Therefore, dollars of repairs per ton of coal used gives a unit of comparison in which variation of grades, speed, etc., can be ignored. The coal used on mountain divisions is greater than that used on he plains. The repairs are also greater, but the work done is likewise greater and the ratio of dollars of repairs to tons of fuel remains surprisingly constant. This ratio, therefore, allows comparisons of every sort to be made, such as between various divisions uite unlike in physical characteristics, between passenger and reight locomotives, etc. As will be observed on the diagram, an deal ratio has been assumed, this ideal allowing $1 of repairs for ach ton of fuel used. The proximity of the advancing end of the erformance curve to the line representing this ideal will be noted.

Figs. 10 to 14, inclusive, are graphs of the shop machinery and ools account for the System and some of the major divisions, for 9 months. Reference has already been made to the actual money aving on this account and to the fact that the result was obtained lmost wholly at four shops—Topeka, Albuquerque, The Needles and San Bernardino. The figures previously given appear graphically n Fig. 10, the System graph. The monthly average total cost for 2 months ending with January, 1905, was $44,000. For a like eriod ending with July, 1906, the last entry on the graph, the gure is $29,200. As already mentioned, it has since been brought own to the ideal allotment of $25,000. Labor and material costs re shown separately, the scale for their values being given on the ight-hand side of the figure. The ideal labor cost allotment it will e seen is $11,500 and the material cost $13,500. Fig. 11, for the tchison proper, corresponds in general character with the System raph. Yet it is interesting to know that this condition is imparted argely by the results at Topeka shops (Fig. 12), as the curves of he graphs for the Eastern and Western Grand divisions, which do ot include these shops, exhibit an upward tendency. Some of the individual divisions of these two districts show decided and uniform improvement, however, while others exhibit just the reverse condition.

Three of the four points mentioned above as the ones at which the improvement in this account was mostly achieved, are on the Coast Lines, explaining the decided drop in their curves during the last 12 months of the record, Fig. 13. In contrast with the four preceding graphs, Fig. 14 is presented to show the situation on the only grand division where no work at all was done on Account 17. It represents the Gulf Lines.

In speaking of the work done in Mr. Emerson's office, it was stated that records of pay-rolls, engine repairs, engine mileage, engine fuel consumption, engine supplies, tool and machinery repairs, car detentions and repairs, etc., are sent here regularly to be tabulated and graphed to show promptly and in the plainest manner the general tendency over the whole System, enabling a comprehensive bird's-eye view of maintenance, shop, engine, car, fuel and supply conditions of the System, as well as of each individual point, to be gained almost at a glance. Samples of such graphs are exhibited in Figs. 15 and 16. They compare performances for consecutive months, the two in question being July and August, 1906. The items covered are given in the respective column headings, and every division on the System is listed. Fig. 16 simply arranges on a percentage basis and in the order of their magnitude the results exhibited in Fig. 15, the figures above the blocks in the former being the percentages. This arrangement necessitates the use of symbol letters to identify the various blocks, each representing the performance on a division. A list of the divisions with their symbol letters is given in connection with the figure. In Fig. 15 it will be noted that some of the blocks are thicker than others. This was because of lack of room to give the higher values their proper relative length. In such cases the volume of the block is the measure of its value; that is, doubling the height, or thickness, is equivalent to doubling the length.

In conclusion it should be stated that throughout the work it has constantly been borne in mind that in railroad operation efficiency is more important than economy, and when any question arose in which there was even a remote possibility of impairment of efficiency, economy was postponed. Nothing was said in discussing the individual effort reward system regarding possible reductions in force as a result of the improved efficiency of the men. When the bonus stimulus makes possible such reductions, they can be effected simply by not replacing men who naturally drop out. This has been the policy in connection with the Santa Fe work, so that there has been no ground for objection by employees on that score. The betterment organization will ultimately be absorbed into the regular organization, such absorption being even now in process, where the work has reached a stage making this desirable. The comparative slowness of the general introduction of the work on the System is due to the two-fold condition of working only through the regular officials, and of not attempting economy where there seemed a possibility of impairing efficiency.

## Relations of the Engineer to Sociey.*

BY HENRY G. PROUT.

It is my constant observation of four engineering works, employing about 20,000 men, that engineers reach the limit of their usefulness from defects of character, rather than from want of technical attainments. Our greatest difficulty is to find courage, candor, imagination, large vision and high ambition. I do not know which of these qualities is most often lacking, or which is most essential. The lack of courage and candor comes most often to my notice, but the lack of imagination and of broad outlook produces the most serious disasters. All of these things an engineer must have if he is to go far in the work of life. Our scheme of education will be radically defective if it does not provide for the development of courage and candor of imagination and broad vision and high ambition. Our scheme of education of the engineer and the citizen must also teach our youth something of the large mistakes of men and nations in the past and something of their successes. Lacking that teaching we see the farmer in Texas and the third-rate lawyer in

*Abstract of an address by Henry G. Prout, Vice-President and General Manager of the Union Switch & Signal Company. Colonel Prout was for many years Editor of the *Railroad Gazette*.

Congress and the professional friend of mankind in Nebraska reinventing ancient errors and diverting valuable energy from the useful purpose of hoeing corn.

This brings me to another suggestion. Gen. Gordon used to say that it would be better if the young British officers were made to read Plutarch's Lives. "There we see men of no true belief, men who are pure pagans making their lives a sacrifice as a matter of course. In our day it is highest merit not to run away." This is a fertile suggestion under which lies a truth of the greatest importance in the scheme of education. At this moment we may see Plutarch's men fighting for their country on the other side of the world and showing noble devotion and a lofty idealism, because for centuries and centuries great ideals have been held always before them. Admiral Togo's little address to the spirits of the dead the other day in Tokio was a noble inspiration to the youth of his nation. It had the very spirit which made Plutarch's men immortal. The essential thing is to bring youth into habitual and constant contact with great men and great ideas and great deeds. Make them read Huxley's Life and Letters and Lord Robert's Forty-one Years in India and Grant's Memoirs. Or, perhaps better than any of these, let them read deeply in the story of Lincoln's life. There they will find the simple foundation qualities, love of truth, courage, patience and fortitude, tenacity and devotion, working in great fields of effort. If these examples do not stir a young man, you had better let him go quietly back to hoeing corn. He may make a useful man and a necessary man, but he cannot make a great man or even a big man. Huxley has said that the progress of mankind has been through the production of men of genius; but society cannot deliberately and conscientiously produce men of genius. They are the rare fruit of a thousand uncontrollable conditions, but we can deliberately and consciously develop leaders, and the affairs of men have never called for leaders so loudly as now.

It is my proposition that the engineer more than any other man has brought about the new epoch which we have now entered upon, and that he more than any other man is to lead mankind forward in the next century or two. But who is this engineer to whom we assign such a place in human progress? What is engineering? These claims, so broad as to seem extravagant, must rest on a broad foundation.

Some eighty years ago Tredgold made that famous definition of engineering which has never been improved upon. It is the art of directing the great sources of power in Nature to the use and convenience of man. Broadly this definition must include the physicist, the chemist, the biologist, the geologist and the metallurgist, for they discover those laws and properties of matter in the knowledge of which the engineer must work. Narrowly the engineer is one who, having knowledge of the laws and properties of matter, designs and constructs. The primitive engineer, the man who had that instinctive feeling for the forces of nature and for the properties of matter, and that quality of contrivance which must be born in a man if he is to be an engineer at all, taught his fellow savages to use fire, to use bows and arrows and to make pottery. Then he taught his fellow barbarians to use the strength of the larger animals and to smelt and forge iron. Just so the modern engineer using the same heaven-sent qualities is carrying forward the conquest of nature until he has brought us into this last and greatest era, the era of the manufacture of power.

I shall not stop to name his doings, they are written across the face of the earth. You remember what Carlyle says of the English, "Of all nations the English are the stupidest in speech, the wisest in action. Thy epic, unsung in words, is written in huge characters on the face of this planet—Sea-moles, railways, fleets and cities, Indian Empires, Americas, legible throughout the solar system, England her mark." Such, too, is the epic of the engineer written in railways, canals and bridges, in fleets and harbors, in water works, roads and parks, and finally in the great ultimate struggles of mankind on the battlefield to save and destroy nations. There, too, the engineer writes his tragic poetry. You never thought of him as a poet, did you? and yet in the last one hundred years the highest expressions of the creative imagination have been in the work of the engineer.

A few years ago Mr. Abram S. Hewitt said that Sir Henry Bessemer had done more than any other man of his time to destroy the power of the privileged classes in Great Britain; that he was the great apostle of democracy. Bessemer's service to mankind was to lower the cost and increase the quantity of steel and so make possible the enormous development of transportation in the last half of the last century, which has changed the face of society, and I do not believe Mr. Hewitt over-estimated the importance of Sir Henry Bessemer's achievement. The wheat that makes a loaf of bread is carried from Dakota to New York for one-third of a cent. One day's wages of a mechanic will carry from Chicago to Liverpool food to last him a year. Quick transportation has cut the peasant loose from the soil of his little parish and opened the markets of the whole world for the labor of the artisan. All this means that improvement in transportation has been one of the powerful forces for preserving and spreading liberty. Thus Bessemer was the apostle of democracy. The engineer has made life freer and easier, he has helped to destroy arbitrary class distinctions, and he has prolonged human life.

I shall not dwell longer on what the engineer has done. I wish especially to take a little time to point out some of the things which he is about to do. Bear in mind that in what I shall say I use the term "engineer" in its broadest sense to indicate the man of modern scientific education and of practical contrivance. Trained in daily contact with exact and inexorable laws he is becoming more and more a leader in large affairs, he is fast taking his place at the head, and close to the head, of the great industrial concerns. Mind I do not say that he will displace men of other professions. Men bred to the law, men trained in business, will always rise to the top. Superior men will make their way to command through many different avenues. What I do mean to say is that the education and experience of an engineer especially fit him for high administrative positions not now commonly thought of as engineering work. Carlyle tells us that "Frederick the Great's ambassadors are oftenest soldiers. Bred soldiers, he finds, if they happen to have natural intelligence, are the fittest for all kinds of work." In Frederick's time engineering as a profession did not exist. Soldiering came nearest to it, and there is great likeness in the work of the engineer and the soldier, and in the qualities of mind and character developed in the two callings. Both must ascertain physical facts without mistake. Both must analyze and weigh evidence and must reason correctly. Both must deal with relations of time, space, force and matter. Both must handle men in action. Both must have the restrained and disciplined imagination to project clearly conditions and results which they cannot see. Both must decide, often very quickly, knowing that on the decision hangs success or failure. But this is the training which makes men of action—leaders, commanders. No doubt you will agree with much that I have just said, but I question if you will appreciate the gravity of the sudden emergency work which comes in an engineer's life.

Suppose you are putting down a deep foundation alongside of a twelve story building in New York City and the quicksand begins to run and the walls of the big building to crack. The peril is not so pressing as the peril of battle, for you can stop work and think. But you must think straight and act right, or you will cost someone a lot of money, even if you kill no one. Suppose you are putting in a foundation for a bridge pier in the bottom of the Mississippi and the river bed begins to scour and a caisson as big as a house begins to tip and to move down stream. A great deal of money depends on what you do in the next few hours. Suppose you are putting a tunnel under the St. Clair river and the compressed air begins to blow out through a pocket in the river bed. Here is an affair of minutes and of life as well as money. These very things have happened and are exactly the things that come as a matter of course in an engineer's life, and they are met by just the same qualities of courage and stored up skill and emergency judgment that you must have ready when the enemy gets on your flank. Beyond all this the engineer is of necessity a student of costs and economics. He must know what it costs to move a yard of earth and to put in a yard of concrete and why. He must know what it costs to produce a horse-power. He has been defined as a man who can do well for a dollar what any man can do somehow for ten dollars. Beneath all this must lie sleepless fidelity to his trust.

These are some of the qualities of leadership, obvious, and recognized as produced in the contest with nature; but there are others, higher ones, not so obvious. I mean the qualities of moral leadership. The engineer can have no object in concealing the truth or in misusing it. His work is a material fact; it is not an impression on the minds of other men. No trick of words, no art of speech, will make his bridge stand up, or his bearings run cool. No ingenuity of argument, no power of rhetoric will save one ounce of coal per horse-power hour. We all know in some vague and abstract way that we must yoke our wagon to a star; but the engineer must do it. The law which guides him is not the product of the schools and the courts, it is not the product of changing standards of life and thought; it is the eternal law of nature. So far as he finds it and follows it he succeeds; so far as he misses it he fails, and there is no escape for him. Nature always stands watching him, neither kind nor cruel, but perfectly just—swift, inexorable and inevitable—at once his guide and his judge. Who else of all mankind has a discipline so fine? Reward is so prompt, punishment is so swift and sure. Emerson has said—"The mind that is parallel with the laws of nature will be strong with their strength."

I have pointed out some of the special and peculiar qualifications of the engineer for leadership. My real purpose has been to call attention to the commanding importance in the advancement of mankind of a certain sort of training. If we are to help mankind forward in the new era on which we have entered we must gain positive knowledge, and we must vitalize it by contact with great characters and great events. We must get command of the sources of power in nature and then within ourselves, we must have courage and candor, fortitude, tenacity and imagination, and devotion; and the greatest quality of all is devotion.

## Samuel Spencer.

To the soil of Virginia, not far from his Alma Mater, on the railroad that had been his charge in early manhood, and an integral part of the system welded together by him in his maturity, Samuel Spencer almost literally yielded his ashes on Thanksgiving morning. On the day that the Nation lifted its voice in gratitude for the manifold blessings of its civilization, he was killed by the instrument he had almost created and had developed to diffuse those blessings, and enhance that civilization throughout the region of his birth, to whose welfare his devotion was unceasing.

The fine old strain of the Spencers and of the Harrisons—the family that has given a signer to the Declaration of Independence and two Presidents to the United States—were blended in this man who graduated at the head of his class at the University of Georgia, and at the head of his class when he completed a subsequent course at the University of Virginia.

He had chosen a course in civil engineering, thus displaying the foresight that marked his career; although but a lad of 18 at the close of the war he saw that railroads were needed, and he thereupon fitted himself to build them. After three years of field service in construction he perceived that there would be a crying need for men to run the railroads that were extending far and wide, and he beset himself to learn the detail of operation. In this he became proficient through seven years of service, as a clerk in the office of the Superintendent of the New Jersey Southern, Assistant Supervisor of Trains, and Supervisor of Trains of the Baltimore & Ohio, Superintendent of Transportation of the Virginia Midland, and General Superintendent of the Long Island Railroad. He never had a friend at court but his promotion was invariably rapid.

Samuel Spencer.

After Spencer had left his service, John W. Garrett, the President of the Baltimore & Ohio, discovered that he had lost a good man, and finally, in 1879, persuaded him to return as Assistant to the President. In this position his experience broadened. Mr. Garrett, who had gained in years and lost in vigor, allowed his clear-headed and indefatigable assistant to unravel problems in traffic and accounts, as well as in construction and operation. A conspicuous achievement was the straightening out of the operation of the Trans-Ohio lines, of which he was made Acting General Manager for that purpose. Before long the actual practical administration of the Baltimore & Ohio fell to him. This condition continued during the administration of Robert Garrett, who gave his attention to the extension to Philadelphia and to the projects for entering New York. With these Mr. Spencer had little or no connection, but he was the virtual head of the existent Baltimore & Ohio system. In 1887 the financial interests that desired to conserve the property insisted that he be made the actual President. While in this position he sought to perform a long-needed surgical operation upon the company's accounts. The valuation of its assets on the books had long been grossly in excess of a reasonable appraisal. Cars and locomotives had been destroyed, and were placed out of commission for one reason or another, without being replaced; docks and wharves had worn out; money had been lost in branch lines, but no deduction had been made from the valuation, nor had allowance ever been made for depreciation. The cut that Mr. Spencer made was not nearly so radical as the circumstances demanded, but it wounded the pride of the majority stockholders, who were devoted to the memory of the Garrett regime, and he was not re-elected. Mr. Spencer's attitude was based upon clear perception of and invincible courage in facing the facts. Had it been accepted, the next few years in the history of the B. & O. might have been of steady recuperation, instead of the deepening disaster that led to the receivership.

Mr. Spencer's services were immediately enlisted by Drexel, Morgan & Company (the firm now designated as J. P. Morgan & Company). Their investments in railroads and railroad securities were extending, and they needed the guidance of a man expert in all that pertained to railroads. Thus Mr. Spencer's courage and ability were given opportunity in a still broader field. He had to arrive at the status of this railroad and that railroad in different parts of the country, of different construction, beset with varying traffic problems, and serving communities of different characteristics. He had learned what constituted good construction, good operation and good direct administration, and now, through more immediate contact than before with financial problems, he developed the capacity to look at a railroad from the standpoint of the investor; he learned what was necessary to a presentation and how to make the presentation that would command respect in the banking capitals. Incidental to his connection with the Morgans, he regenerated and revivified several poorly built and badly conducted railroad properties, and at the same time on behalf of the City of New York, gave much attention to the Rapid Transit Commission, of which he was a member from 1891 to 1893, and as a member of the Brooklyn Bridge Commission helped to design the present terminal structures, which doubled the capacity of the bridge.

In 1893 came the event which led to the crowning achievement of his career—his appointment as Receiver of the Richmond & Danville, and of the East Tennessee, Virginia & Georgia railroads. His extraordinary experience, together with his thorough knowledge of the South, led to the inception of the plan whereunder a number of the southern railroads that had separately struggled along to bankruptcy, could be united in a mutually co-ordinating system. Thus arose the Southern Railway Company, of which he became President. Bit by bit the system extended until it formed a channel for every important traffic current of the South, its lines reaching from the great cities of the seaboard throughout the Southern Atlantic States to Florida; through Atlanta to Memphis and New Orleans; from Cincinnati and St. Louis to the Gulf, and to the southeast. This bringing together of separate railroads required great care and patience; but the principal obstacle to successful operation was the run down condition of the roads and their equipment. The desolation wrought by the war had not been repaired before the depression of the panic of 1873, and the panic of 1893 fell with distressing severity upon the South. The Southern Railway was obliged to demonstrate its ability to exist before investors would entrust their funds with the company. Year by year it struggled along, rebuilding track and structures and providing new equipment as rapidly as earnings would allow. Then came the great revival of industrial and commercial activity. The demands upon the railroads all over the United States greatly overtaxed their capacity; there were not tracks enough, nor equipment enough, and trained and skilled employees in adequate number could not be obtained. These conditions were aggravated in the South, which entered upon an era of growth exceeding in ratio that of the more regularly developed regions. The Southern Railway Company continued to meet the conditions as best it could. Its earning capacity was finally thoroughly established; a bond issue of $200,000,000 was authorized at the beginning of this year. The proceeds of this issue will permit the practical rebuilding of the system. The main lines, however, are well built, well equipped and well operated at this time, the delays not being incommensurate with those on other railroads that have likewise been overwhelmed with the marvelous and continually increasing volume of traffic. At this writing there is nothing to show that the cause of the wreck was other than an error of an operator at a block signal tower. Unexpected flaws in the working of the human brain cannot be eliminated even by the most careful railroad management, any more than can the coming to light of unexpected and undetectable flaws in material and structure.

In the relations of the administration of a railroad company to its employees, Mr. Spencer was thoroughly grounded during the earlier years of his career; into its relations to the investing public

he gained a complete insight while with J. P. Morgan & Company, and during that period his eyes began to be opened to another relation of paramount importance, to the elucidation and cultivation of which the railroad presidents as a whole had given but little attention; that is, the relation to the general public considered not as shippers or consumers, but as the power behind the government.

That there have been abuses in railroad administration has been widely known and admitted by no one more freely than by Mr. Spencer. The actual abuses are insignificant beside the excellence of that administration in general and its beneficent results as a whole is not so widely known, nor freely admitted by all of those who know. That the clamor of recent years against the railroads has sprung largely from ignorance of the principles underlying railroad practice, and has been fomented by those desiring an increase of political power; those who have not adjusted their affairs to the changing economic currents, and those whose vague discontent with existing conditions, leads them, without analysis, to attack whatever confronts them. All this Mr. Spencer knew, and he realized what the ultimate consequences will be if the cause of the railroads is not made clear to the popular understanding.

To the presentation of this cause he freely gave his pen and his voice. His style of expression was as was the man—simple, direct, vigorous, comprehensive in sweep, but of concentrated lucidity. When the agitation for additional railroad legislation resulted in the passage by the House of Representatives of the Esch-Townsend bill in the spring of 1905, the presidents of the railroads, alarmed at last by the proposal to give unrestricted authority to make railroad rates and to determine railroad practices for the entire country to a body of five men sitting in Washington, asked Mr. Spencer to act as their spokesman and representative. In the following year he gave to this mission much of his time and energy. The inherent fairness of his mental processes, the vigor of his thought and expression, and his transparent sincerity are indicated by this oft-quoted extract from his address before the Traffic Club of Pittsburg, April 7, 1905:

"Strengthen the laws in condemnation of rebates, secret devices and unjust discrimination to any extent that may be found possible, and provide, if such further provision be still necessary, for the prompt arraignment and prosecution of all offenders of the law in the duly constituted courts of the country, and for the unsparing punishment of those who are found to be guilty. If there are such offenders in the railroad fraternity, their offences should be exposed and punished, but it is un-American and unfair, not to say outrageous, because it is alleged there are such, that every manager, and every president and director, shall be subject to indiscriminate public condemnation, and that the innocent investors shall have their property jeopardized, and their rights infringed, because those to whom the prosecution of the law is entrusted fail to find the offender, and to punish him."

It is noteworthy that prior to this clarion proclaim there had not been a single prosecution of any railroad for rebate giving, although the Elkins law had been in effect for two years; but since its utterance the Federal government, that had been crying for more law, began to enforce the law then existent, under which, during the last year and a half have been conducted the prosecutions and imposed the penalties for rebate giving.

In his last public address, which was delivered before the Agricultural Association of Alabama, at Montgomery, on October 25th, Mr. Spencer said:

"Everything relating to the business interests of the people has been drawn into the arena of excited popular sentiment and debate. The honesty of fiduciary relations, the accountability of men of great power and great wealth to their fellow men, the regulation and control of so-called trusts and of quasi-public utilities, have received the focussed attention and excited the universal interest of the people. Under the influence of their aroused and determined purpose, some gross abuses have been uncovered. Prompted by these disclosures it is little to be wondered at that the popular judgment has become disturbed and the conclusion hastily and unjustly reached that all important interests merit popular suspicion and distrust."

As the representative of the railroads during the rate regulation controversy, Mr. Spencer relied upon the candid presentation of logical argument to reasoning minds. During the session of the 59th Congress, that passed the Hepburn Bill, there was no railroad lobby at Washington. Although contrary to general rumor and the popular belief, this is the absolute truth. Mr. Spencer insisted not only that there must not be a lobby, but that there must not be the semblance of a lobby.

Mr. Spencer was short in stature, slender, well-knit and amazingly alert in his movements. His fine face and beautiful head indicated his stately lineage, his sturdy honesty, and his great and well balanced intellect. Not only was his mind broad in grasp and keen in penetration, but during the continuously pressing incidents of his ever busy days, it turned with extraordinary rapidity from one subject to another and held the details of each in a marvellous memory. When tasks demanded attention more prolonged than could be taken from the pressure of his office, it was his wont, during the portion of the year passed in New York, to steal away after office hours and go with his secretary to one or another of the hotels—to which one, no one knew save his confidential clerk at his office—and there they not infrequently would work until well into the morning. This great energy was fostered by habits that were moderate to the point of abstemiousness. While under the strain that always marked the hours at his desk, Mr. Spencer once or twice in the morning, and once or twice during the afternoon, would ask for a glass of water; as he drained it fatigue seemed to vanish.

When the writer was asked to prepare this review, he was requested that it be "not merely a tribute, but a discriminating analysis of his virtues and faults." Thereupon, he said to Mr. Spencer's senior secretary: "Now tell me what were Mr. Spencer's faults." That veteran of 30 years in the service of his chief, calmly and deliberately said: "He hadn't any." That is also the statement of the writer, whose own association with Mr. Spencer was close and continuous for a year and a half. In all the relations of life he was clear and clean-cut, punctilious in rendering to every man his due. His keen and direct perception and power of logical and terse expression made him at times impatient of a statement that was long in words and lacking in logic, but this was a virtue, not a fault. Toward the close of a busy day, after he had been battered with letters and telegrams, and callers and board meetings, there sometimes was the display of irritability. This is the very worst that can be said of him; and this is only to say that he was human. To any one who knew the tremendous demands made upon both his body and his mind, the wonder is that the display was not the rule instead of the exception. The trait upon which the men who have been associated with him longest and knew him best especially dilate was his absolute conscientiousness in all things great and small. He did not utter himself, nor permit his subordinates to utter for him, even the fib, the white lie of convenience, but he could parry with the best.

This recountal depicts, without exaggeration, the man whose life was taken on Thanksgiving morning. It is trite to say, that could there have been the foreboding of the disaster in his mind, its most deplorable feature would have been the death of his friends and his servitors that occurred at the same time as his own.

Mr. Spencer was a director in nine railroad and financial corporations; he was active in each board, and held high in the esteem of its members, as evinced by the resolutions they have passed to his memory. He was 59 years old; at the height of his career; without either mental or bodily infirmity; he was never a speculator, leaving a fortune that is but moderate, when his environment and opportunities are considered. His domestic life was of great happiness; his success in rearing a family in no wise being surpassed by his success in business.

LOGAN G. McPHERSON.

## The Strike of Railroad Clerks.

The strike of clerks on Southern Pacific lines in Louisiana and Texas was an unusual event in the railroad world. It appears to have failed. The strikers say that it is still unsettled, but the railroad companies claim that the affair is closed so far as they are concerned; that the places of practically all of the striking clerks have been filled with competent men and women, and that the affairs of the different departments and offices which were involved in the strike are running along smoothly.

The American Railway Clerks' Union, to which the strikers belong, is not an altogether new organization, although very little had been heard of it until this disturbance took place. It has been in existence a few years, but is not as yet affiliated with the American Federation of Labor. Because of this fact, it is claimed, the strike did not have the sympathy of other railroad organizations and was to that extent hampered in getting its demands granted. The organization was particularly strong all along the main line of the Southern Pacific, and extended in a lesser degree to the Houston & Texas Central and the Dallas-Sabine branch of the Texas & New Orleans, but these two latter lines were not involved in the strike to any extent. The President of the union is Wilber Braggins, of New Orleans. He is said to have shown good executive qualities in the conduct of the strike but the odds were against him. The positions of many of the clerks require little training or peculiar experience and can be easily filled. The agitation began in Algiers, La., where a large number of clerks are employed in September. The men claimed that they worked regularly ten hours a day and frequently several hours longer than that without extra compensation. The agitation spread to Houston and to New Orleans. A committee of members of the union went to see Mr. Fay, Vice-President and chief executive officer of the Galveston, Harrisburg & San Antonio, but he declined to treat with the committee, telling its members that they must take their alleged grievances to the division superintendents. Failing to get a hearing before what they considered the proper authority, Mr. Braggins issued an ultimatum on October 3. In this ultimatum, eight hours a day for inside clerks, ten hours a day for outside clerks, extra pay for overtime and Sundays, and recognition as a union, were demanded. The railroad officials ignored the ultimatum and on October 5 Mr. Braggins called out the clerks. More than 800 clerks responded to

the call and joined in a strike for the demands set forth in the ultimatum.

All departments of the general offices and division offices and in the offices at terminal points were involved. For two days the railroad experienced difficulty in moving its traffic. This was particularly true at Houston and at several points in Louisiana. As soon as the clerks walked out strenuous efforts were made to fill the vacant places and in many instances young women were employed in clerical positions. Little difficulty was experienced in filling practically all of the vacant positions within a few days.

The strikers were orderly. Crowds gathered at Houston and military protection was about to be extended to the road when the leaders of the strikers gave their word that no unlawful act would be committed; that the men who were out were not anarchists, but were peaceable, law-abiding citizens who were simply striving to obtain by fair means what they considered their just dues. This statement satisfied the railroad officers.

The strike extended from New Orleans to El Paso, with the exception of San Antonio. At the latter place the local union organization was only in tentative form and the members did not feel that the strike order applied to them. Mr. Braggins and other leaders of the union have been persistent in their efforts to negotiate with the railroad, but the union occupies the position of being wholly ignored by those in authority on the Southern Pacific. There are many good men among the strikers, but whether they will be taken back and under what terms are questions that cannot be answered at this time.

## The Relationship of the Railroads to the People.*

The American people have recently been passing through a period of intense political agitation and excitement in respect of industrial and commercial conditions. Laying aside the issues which have divided parties for half a century, the public thought and interest have been concentrated on economic agitations. Everything relating to the business interests of the people has been drawn into the arena of excited popular sentiment and debate. The honesty of fiduciary relationships, the accountability of men of great power and great wealth to their fellow men, the regulation and control of so-called trusts, and of quasi public utilities, have received the focused attention and excited the universal interest of the people. Under the influence of their aroused and determined purpose, some gross abuses have been uncovered. Prompted by these disclosures, it is little to be wondered at that the popular judgment has become disturbed and the conclusion hastily and unjustly reached that all important interests merit popular suspicion and distrust.

The railroad manager's position—his relationship to the public, on the one hand, and to the properties he represents and for the successful management of which he is responsible, on the other—has undergone radical changes in recent years. A half century ago the need of the people, and their consequent demand, was for the development of the country through the establishment of transportation facilities. Public sentiment did not merely justify, but, with practical unanimity, demanded the granting not only of charters to railroad companies, but governmental financial aid and encouragement as well. It must be borne in mind that such inducements were at that time needed, for in the uncertainty attending these experimental enterprises, private capital was reluctant to embark in them. Alabama was no exception to this rule of governmental encouragement. Its general statutes and the charters granted by its General Assembly, in response to the sentiments of its people, make a history of public aid and encouragement to the building of railroads, and contain no hint of antagonistic public sentiment or of an ulttimate purpose of severe or drastic public control, or injury.

Under these circumstances, these undertakings, so favored by the state, were, with reason, regarded as private enterprises especially favored by public policy—private enterprises established to provide for a public necessity, it is true, but still private enterprises with right of private control, limited only by the adequate provisions of the common law.

But notwithstanding the public and governmental favor thus extended—notwithstanding the substantial freedom from governmental interference in their management—there were very few railroad enterprises in the South which could at first maintain themselves. The history of many of them was a history of bankruptcy and disaster until the weak and disjointed properties were amalgamated so as to afford continuous transportation, and open the markets of the world to southern products in competition with those of the other sections and of other countries.

With that amalgamation of properties and its consequent public good came great power—exaggerated perhaps in the public mind—but still great power, over the interests of commodities, localities and persons, and with it a demand for public regulation. It must be admitted that this demand, within just and reasonable limits, is based on sound reason. There must be some adequate remedy for the misuse of power affecting great public interests, but important as is the creation of the remedy, no less important are its just and reasonable and wholesome limitations. In the progress of time the public aspect of this question has become entirely reversed. The pendulum has swung from an extreme on the one side to an extreme on the other. As, in the inception of railroad construction, the public relations of the properties were largely lost sight of, so now, in reaction, the public character of the enterprises is almost the only thing recognized or considered, and the private rights of the owners are, in the political thought of the day, almost, if not entirely, forgotten. Justice, however, lies between the two extremes. These properties and their owners should be required to perform faithfully their public duties under reasonable rates and practices, under full publicity without unjust discrimination and without favor for any interests. When this obligation is performed, the residuum is private property entitled to the same consideration and protection at the hands of the public and of the government, as all other private property. In the formation of public policies common justice requires us to remember that when these properties were originally created, it was done in reliance in the good faith of that reasonable public countenance and support under which the public powers were granted, and the private investments were made.

There is no legal obligation on any one to invest his money in railroads or in any other properties. The action of the investor must be voluntary, and inducements of a safe and business-like nature must be presented in order to render the investment attractive. The railroad manager must provide the transportation facilities which the business of the public demands. To accomplish this he must have the necessary money, and, to obtain it, must show successful results in the operation of the property—results which will convince the investor that his investment will be safe and remunerative. Few, if any, railroad companies have an earning capacity sufficient to provide for needed betterments, improvements and additions. All of them are large borrowers. This is especially true at this time of the railroads of the South. Originally constructed under great difficulties and with inadequate means, traversing a country, the traffic requirements of which were at the time small, located in a section practically without large capital of its own, and, by the results of the Civil War and the difference in political conditions, separated for a long period from the sympathies and confidence of investors in other sections, these railroad properties of the South were peculiarly in need of an outside credit as a basis for additional capital to bring them up to modern standards and to provide the additional facilities absolutely essential to accommodate the growing traffic of this section. Investors in southern railroad properties had been alienated by their enormous financial losses, and a restoration of confidence was neither easy nor prompt.

You are all too familiar with the wholesale bankruptcy and financial struggles, and the consequently impoverished condition of the railroads of the South during the 80's and the early 90's for it to be necessary to do more than to recall them to your memories. Happily the difficulties of that particular period, and of those special conditions, have measurably passed away. The South has entered upon a period of increased production in agriculture and in manufactures and of general industrial and commercial activity such as her best friends and most enthusiastic prophets had scarcely dreamed of fifteen years ago.

Fundamentally the basis of this improved condition of the railroad properties is financial credit. With a few minor exceptions substantially all of the enormous improvements to these properties and their equipments, costing hundreds of millions of dollars, in the last decade have been made with borrowed money. The basis of the credit on which the money was borrowed was the increased confidence of the investing public in the substantial growth and the future prosperity of the South, and in the gradually increasing earnings of her railroads.

The most pressing problem with every railroad, and every railroad manager of the South to-day is that of providing additional facilities for the safe, prompt and satisfactory movement of the constantly growing traffic. This has been the case for nearly ten years, but the problem is more pressing to-day than at any previous time.

While it cannot in justice be claimed that the railways have at all times done all that was required by the public, nevertheless, bearing in mind the enormous and sudden growth in southern products and southern commerce for the last ten years, and remembering the conditions of the railroad properties at the beginning of that period, the fact that the products of so marvelous a development have on the whole been successfully moved to market challenges the attentive consideration of those who impartially study the railroad problem.

Let us look for a moment at the conditions under which this task has been and must still be performed.

In a country so wide in extent and with a commerce so vast, it

*From an address delivered before the Alabama Agricultural Association, by Samuel Spencer.

is no longer possible to do the transportation service of the public by individual enterprises or even by small corporations. Large corporations and large aggregations of capital are essential.

This fact and the shortcomings necessarily incident to hurried preparations, and overtaxed facilities, have largely deprived these carriers of popular sympathy, and subjected them to easy misrepresentations and to popular misunderstanding. The outward expression of size and power has impressed the popular mind with the idea that they possessed untold wealth and limitless resources. It made them the easy mark of the political agitator. The result has been that there has crept into the public mind a different standard of justice for them from that which governs the property rights of every individual property holder in the land. Statutes have been enacted establishing principles of liability of a railroad company which do not apply in the case of the farmer, the mill owner or the employer in any other department of industry. Juries have come to think it right to award verdicts for larger damages against railroad corporations than against individual litigants.

With the increased prosperity of the country have come—and properly—higher wages and also higher prices for everything the carrier must buy. Instead of $9 per thousand feet for bridge and shop lumber in 1896, the cost is now $16 to $20, or more; instead of $18 per ton for steel rails, the cost is now $28 to $29; instead of $11,000 each for locomotives, the cost is now from $16,000 to $20,000; instead of $475 for box cars, the cost is now $800, and so on throughout the long list of necessary railroad purchases.

I need not call your attention to the increase in the price of labor. It applies to every industry, and the railroads are not only not exempt, but they suffer the great disadvantage not shared by others, that increased prosperity of the country and activity in business does not bring to them increased prices for the only article they have for sale—transportation.

Increased taxes have also added substantial burdens to the carriers, the taxes of Southern Railway Company, for example, per mile of road having increased, since 1898, more than 40 per cent.

Coupled with these increased expenses there has been a constant reduction in rates, and to-day the percentage contributed by transportation rates to the cost of whatever the people consume is much smaller than ever before in history, and smaller in America than in any other country of the world. And yet the loudest cry that is heard to-day from the public voice, and the most persistent demand from every quarter, is for an enforced reduction in railway charges.

It must be apparent that if there is a continual increase in the units of expenses, with a continual decrease in the units of revenue, the financial strength of the enterprise cannot survive indefinitely. If the process is carried far enough, mere increase in volume of traffic which has sustained the carriers thus far, will not suffice, and without financial strength and credit the carrier cannot adequately meet the proper requirements of the public.

Nothing will avert the public calamity of such conditions except the ultimate conservatism and sense of justice of the American people, and in that ultimate and saving conservatism I still have faith. When their attention is seriously and earnestly directed to the real problem, their conclusion will not only be wise, but will result in the establishment of just and righteous standards for the ascertainment and protection of corporate as well as individual rights.

With industrious effort the impression has been made that the carrier is subject to no restraint in the making of rates, except such as is imposed by statute law, and that it can and does act arbitrarily in fixing the charges for the services which it renders. Nothing could be further from the truth.

The rates charged upon pig iron from Alabama's great iron center were never the rates which the railroads could arbitrarily fix. They, of sheer necessity, were the rates which would enable the iron master at Birmingham to market his product in the northern states, in competition with those of Pittsburg and Chicago, situated in the very heart of the consuming territory, and in Europe in competition with the furnaces of England and Germany, with their cheaper labor and their closer proximity to the purchaser.

Without such rates, fixed as they were and are by competition of markets, Birmingham could never have successfully lighted her furnaces.

The cotton mill industries of the South, which now represent an investment of nearly $250,000,000, and whose products find a market not only in every state of the Union, but in Europe and the Orient, could not have been developed, and become prosperous as they have, if the transportation rates for those products had been arbitrarily made even on the same relative basis as those still charged in New England and in England upon exactly the same articles.

The much greater distance of the southern mills from the large consuming markets had to be overcome and it was overcome largely by relatively lower rates of transportation.

These are two illustrations which you will recognize at once.

The same principle applies in thousands of others, and the result for the entire country is a scale of railroad charges which has challenged the attention of students of economics the world over as being the lowest in existence.

By many the fear is honestly entertained that the question of rates is controlled by the capitalization of the carrier. If this were true, it would follow that a company with a large capitalization would charge high rates, while a company with a small capitalization might charge low rates. The fact is that the rates of all carriers serving the same or competitive sections are, and of necessity must be, in practical accord, for otherwise the company with the lowest rates, if it could escape bankruptcy, would soon absorb all the traffic and drive the others out of the business.

Capitalization can have no practical effect upon the rates charged in this country.

Almost all rates are the result of active and current commercial conditions, arising long after the capitalization of the carrier has been fixed, and which are subject to wide fluctuations, while capitalization often remains unaltered.

Theories have been propounded from many sources, high and low, for the adjustment of rates on a basis of allowing the carrier to earn a fair interest upon the cash investment or upon a fairly ascertained value of the property. Such theories seem fair and equitable and plausible until they are examined. Possibly they might be applied to a single line enjoying a monopoly and serving a section of country the products of which were not in competition with those of any other. When applied to the vast railroad system of this country, comprising 220,000 miles and serving thousands of commercial and industrial centers, each struggling to widen the distribution of its products, such a method of adjustment becomes utterly impracticable. Conceive a simple case at your own doors. Montgomery has three lines to the sea coast at Savannah. You all know that the rates by all must be the same. Is it supposable for an instant that the cost of these several lines was the same, or that their value is the same to-day?

If the rates of transportation should be adjusted by some arbitrary power, so that each should earn only a certain interest upon its cost or ascertained value, would not those rates be different from each other? If they were different, could the line having the higher rate secure any traffic?

If it secured no traffic, what would become of the arbitrary dictum that it should earn the interest on its cost or value?

The interests of the railroad and of its patrons are identical. One cannot prosper without the other. The railroad must do justice to the people. The people should do justice to the railroad. Their cordial co-operation in the great field of human industry is essential to the public welfare. They must work together in a spirit of forbearance and mutual consideration and trust, if they are to accomplish the results for which both are striving, and which are within their grasp if they work together. The man who would sow dissension between them and embarrass their co-operation by misunderstandings, friction and antagonism is a public enemy. While the railroads may be in a sense at his mercy, he should not be tolerated by the people, for the oppression he seeks to bring upon the railroads must reflect itself upon the fortunes of the people long after the disturbing cause has been forgotten.

Many and great problems confront us as a people at the dawn of this new century. Not the least of them is the relationship which should exist between the railroads and the people. It should be approached in a spirit of justice, forbearance and moderation, and with the purpose of establishing a completer understanding and more cordial sympathy between the people and the managers of these public service utilities. It is universally recognized that, in the American Government, the power of the people is irresistible. Upon moderation and wisdom in its exercise depend the safety of life, liberty and property, and the stability of our national institutions.

## Foreign Railroad Notes.

The Government of Costa Rica will probably build a bridge over the Barranca river, to replace the structure recently destroyed by a freshet, which was 350 ft. long and 60 ft. high. Francesco Echeverria, General Manager, or Luis Matamoras, Chief Engineer of the Pacific Railway, at San Jose, will furnish information.

Limited through trains, all sleepers and dining cars, are to run the coming winter as follows: St. Petersburg via Vienna to Nice and Cannes, daily; Berlin through the Brenner Pass and Milan to Cannes, daily; Berlin to Naples, twice a week; Paris to Rennes, three times a week; Berlin and Egypt express, connecting with a fast steamer at Naples, weekly in January and till April, then for two months fortnightly.

The Italian State Railroads beginning with December 1 make a rebate on freights for export shipped to the six chief ports of the peninsula (Genoa, Leghorn, Naples, Brindisi, Ancona and Venice). The reduction is 5 per cent. on goods carried 50 kilometers

(31 miles) or less; 10 per cent. for 50 to 100 kilometers; 15 per cent. for 100 to 150, and 25 per cent. for greater distances.

## Repairs to Steel Freight Cars.*

Some early designs of steel cars were gotten up in competition with wooden-car weights which then existed, and the argument that a great ratio of paying load to dead weight was to be had sold a great many cars. As a consequence, many cars were designed that were really too light for the exceptionally heavy service. To-day, however, the weight of the car up to a certain point, is not considered; for instance, 50-ton cars for general service weighed, in 1902, 35,000 lbs.; to-day the same capacity cars weigh 45,000 lbs., or an increase in dead weight of 10,000 lbs. in four years. The questions now are: Will the car stand the severe buffing shocks? Will it keep off the repair track? Railroads now realize that a car continually in service more than pays for the hauling of its dead weight by an increased number of loads. For roads where service is not so heavy, a car with great ratio of paying load to dead weight can be used to advantage.

Wrecked Steel Freight Car.

Wrecked Steel Freight Car.

The first steel cars were built almost entirely of pressed shapes; then other manufacturers designed cars to be built entirely of structural shapes. To-day the builders of so-called "structural cars" use pressed shapes and structural shapes, and pressed shapes are used where, in the mind of the designer, they are most feasible. The days of light construction are over. Where ten years ago an 80,000 lbs. capacity car was considered unusual, the 100,000-lbs. car is now common, and the railroads look for a greater capacity. The time will come when many of us will see trains of cars each unit carrying 150,000 lbs. or over. In fact, to-day this matter is being seriously considered by at least one leading road. True, there are many such cars now, but they are made for special use.

Wrecked Steel Freight Car.

Type of Steel Freight Car Wrecked.

As shown by the records of nine representative car-building companies in the year 1905, there were 224,817 cars ordered; of these 148,493 were steel and 76,324 wood. With steel cars coming so rapidly to the front, the question of repairs is a very live one. In repairing steel cars a road which has none in service usually resorts to the use of skilled labor or returns the cars to the builder; either method is costly, and is apt to prejudice the management's decision when the question of steel vs. wood construction is brought up. There is absolutely no need that any railroad large or small should employ skilled labor or return steel cars to the manufacturer. Skilled labor is not used at shops where cars are built; then why use skilled labor to repair them? When a car is new, naturally the question of appearance and finish is one of the important points of inspection. When a car is out of service the question of utility is uppermost, and repairs should be made in the cheapest manner consistent with good service. Why pay boiler-makers' prices to have a perfectly finished rivet driven, when a laborer at half the pay will drive one that will perform its office satisfactorily in half the time? A little experience with the rough-and-ready car repairer vs. slow skilled labor is usually convincing. Railroads are now using the same repair gangs for both wood and steel cars. If the car foreman lacks the ingenuity or confidence to make the necessary repairs, send him to Altoona, Mt. Clare or Collinwood, where they are past masters in the art. Unless his natural prejudice has overcome his mental balance, the expense of his trip will be repaid many times.

In the early days of repairs to steel cars, it was the custom when a sill was bent to dismember the car and take the piece out to straighten it. Now, an oil furnace or a charcoal fire is put under the car, and when the sill is heated sufficiently it is put back into shape by a pulling jack applied to suit conditions. When sills are broken, a splice can be made by making a butt joint with plates on inside and outside, all securely riveted.

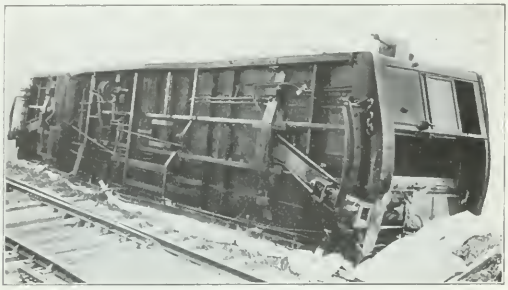
Steel cars received on repair tracks on account of wrecks seldom have any of the frame or body lost, so it is simply a matter of cutting off the bent small parts, straightening them and riveting them in place. It is, however, advisable when purchasing new cars to order a small supply of steel shapes that will most likely be needed for running repairs. This saves time and inconvenience, for no matter what arguments may be put forth about buying shapes, etc., in the open market, when the time comes for such purchase it will be found hard to get immediate delivery, and harder still to shape material for application to cars. On the average road there is not enough demand for repair parts to warrant the expense of putting up a special shop; this condition makes it necessary to look to the builders for material, whether it be of structural or pressed shapes. Pressed members and structural members, such as end and corner posts, stakes, flange angles and plates, can be cut off by hand and heated in a gas or oil fire and straightened on a large flat surface plate or anvil with ordinary blacksmith's tools. One gang of men at this forge can take care of this class of work for a large number of cars. Heating and bending will not injure the steel used in construction of cars, so that practically all the parts removed from a steel car can be utilized either in their original shape or as patches on some other part.

It must be remembered that shocks and treatment that would ordinarily destroy a wooden car merely make the steel car an object that draws the anathemas of the wrecking crew and the solicitous consideration of the repair gang. Gone is the inevitable bonfire that was a simple method of clearing up the debris. The alternative

*A paper read before the New England Railroad Club, Oct. 9, 1906, by J. F. MacEnulty, of the Pressed Steel Car Company, to whom we are indebted for the photographs.

now is either to bury the car or send it to the repair tracks; it won't burn. Heavier and more powerful cranes are necessary, but the right of way is more easily and quickly cleared. When a chain is put around a corner post or sill, the whole car moves, not merely a section as heretofore. There is a record of steel cars wrecked that could not be repaired. They rolled over a 200-ft. embankment into a swollen river and were carried about two miles from the railroad. It was impracticable to tow them back. Aside from a few similar instances, there is no record of a steel car being wrecked in such a manner that the cost of repairs would make it advisable to scrap it.

The cost of steel car repairs is, on the whole, small by comparison with wooden car repairs, when it is taken into consideration that comparative costs of repairs of the two types as given by railroads are as a rule manifestly unfair. The maintenance reports given for publication are generally taken only for cars that have been repaired. When it is a wood car this means, on an average, slight repairs. But what of the wood cars destroyed? There are thousands of such every month. Should not the cost of renewals, less a scrap credit, be added to the wood-car maintenance sheet to arrive at a fair basis for comparison with the steel cars? This would throw a great balance in favor of the steel car. It, however, would bring forth the argument that many of the wood cars thus destroyed were old and of an obsolete type. While this is true, yet the old car has a money value; a car is a car on the records, and the failure of the old wood cars serves only to enhance the value of the up-to-date steel car that will not disintegrate.



Steel Passenger Car Thrown from Flat Car.

Steel Passenger Car After Being Righted.

These figures are from railroad systems using over 100,000 steel cars, some of them having been in service from seven to eight years. They estimate that the cost of car maintenance is reduced 35 per cent., and stock for repairs 50 per cent. by use of all-steel construction, taking an equal number of cars of both types as a basis.

As regards care of cars, while some roads do not consider it necessary to repaint their steel freight equipment, yet "An ounce of prevention is worth a pound of cure," is here applicable. Any metal surface exposed to the elements is better for a little attention, and on any other structure it would be considered a necessity. At a prominent repair point, where 500 cars a month are repainted, the average cost for gondola or hopper cars, not including the trucks, is as follows:

| | |
|---|---|
| Sand blasting | $0.45 |
| Paint for body and lettering | 6.00 |
| Labor for body and lettering (according to locality) | $1.00 to 2.00 |

As an illustration of what a steel car will stand, a number of photographs of wrecked 100,000-lb. standard ore cars are shown herewith. These cars, each containing 50 tons of ore, ran three miles down a 4 per cent. grade on the Lake Champlain & Moriah, an ore road in the northeastern part of New York, and with the engine jumped over the end of a switchback, the cars and engine going through the air 422 ft. before striking the ground; the point of contact was frozen ground, the drop being 53 ft. from the track level. The engine and cars then rolled 516 ft. These seven cars originally cost about $1,200 each. The cost of repairs averaged $690 each, which was the manufacturer's cost, and included 10 per cent. profit and an operating and administration expense that on a railroad would be largely taken care of in other operations, and not charged entirely to cars, as is necessary for a car builder. A large part of the cost was in the trucks, owing to the peculiar nature of the wreck. Eliminating the trucks, the repairs to the bodies cost only $350 each. In repairs to trucks alone, it was necessary to replace 17,700 lbs. of steel, 56 journal boxes and lids, 54 brake shoes, 56 journal bearings and wedges, 28 groups of springs, 20 axles, 25 wheels, 1,200 lbs. of forgings and 3,900 lbs. of castings, or a total of 68,800 lbs. of material. A wooden car under similar conditions would have been good only for firewood and a small scrap credit for truss rods, grab irons, etc. This wreck for a small number of cars represents about as severe a condition as could be met, and shows that a steel car is always good enough to be repaired.

Wrecked Steel Freight Cars from Wreck on Lake Champlain & Moriah.

The average cost of repairing steel cars varies considerably with the type, and as a larger number of 100,000-lb. steel hoppers have been built than any other class, cost of their repairs would be more interesting. The following is a record of average costs of certain kinds of repairs to this type, not including the trucks:

*Cost of Repairing 100,000-Lb. Capacity Steel Hoppers.*

| | |
|---|---|
| One end having side and end sills, draft sills and corner braces and brackets badly bent | $36.50 |
| Both ends damaged as above and body badly sprung | 85.75 |
| To cut entire frame and body apart and re-rivet | *140.00 |
| A steel car having been in a wreck that would totally destroy the body and frame of a wooden car can be repaired as good as new for | 50.00 |
| A steel hopper so badly wrecked that scrapping it was considered, was repaired good as new for | 160.00 |

*This is the labor charge of cutting off the bent parts, straightening and re-riveting in place; the only new material used being rivets.

There are also shown two photographs which illustrate a steel passenger car that was in an accident. The flat car on which it was loaded jumped the track and overturned, carrying the passenger car with it. The first illustration shows the underframe con-

*Fig. 1.*

*Fig. 2.*

*Fig. 3.*

Wrecked Steel Freight Cars from Wreck on Lake Champlain & Moriah.

struction and the corrugated sheets under the monolith floor; the second photograph shows the car after being righted. The only damages sustained were a few broken windows and scratched varnish. A wooden car under similar conditions would have been badly damaged.

## Electrification on the Erie.

Westinghouse, Church, Kerr & Co. have been authorized to prepare estimates for the complete electrification of the Rochester division of the Erie Railroad between Rochester and Corning, N. Y. Ninety-five miles electrification of the 34 miles of this division lying between Rochester and Avon and Avon and Mt. Morris was begun last summer and is now nearly finished. The installation is single-phase, similar to that which is being placed on the New York approach of the New Haven road. Power will be supplied from the single sub-station to be located at Avon, N. Y., which is about 19 miles from Rochester and 15 from Mt. Morris. The power is to be derived from the lines of the Niagara, Lockport & Ontario Power Co., which receives the current generated at the new station of the Ontario Power Co. at Niagara Falls, and is now transmitting it at 60,000 volts as far east as Syracuse, where trolley cars of it at 60,000 volts as far east as Syracuse, where trolley cars of the local electric railway system receive it. This long transmission line, which is being constructed in duplicate, crosses the Erie Railroad at Mortimer, about five miles south of Rochester, and from that point the Power company is building a branch line about 14 miles long, which is to supply the sub-station at Avon.

The sub-station building, of brick and reinforced concrete, is now nearly completed, and the electrical apparatus which it is to contain is being shipped from Pittsburg. The equipment of this sub-station is extremely simple, consists of three 750-k.w. transformers of the oil-insulated, water-cooled type, which transforms 60,000-volt three-phase current down to a 11,000-volt single-phase current.

Difficult problems were encountered at Avon and Rochester in supporting the trolley wires over the tracks through the railroad yards, and a new style of overhead span wire construction has been designed to overcome the difficulty of carrying such heavy trolley construction where it is impossible to place poles between tracks. In place of the steel bridges used for this purpose on the New Haven road a system of "Tripartite" steel poles and double spans have been adopted, and is believed by the Erie to be fully as effective a type of construction as the other to meet the conditions; to be far cheaper, and much quicker to erect.

Electric equipment is being placed in six passenger coaches of the interurban type. Three coaches were built by the St. Louis Car Company are 54 ft. long and seat 56 persons. The equipment consists of four 100-h.p. motors and Westinghouse electro-pneumatic control. The cars are designed for a maximum speed of from 45 to 50 miles an hour and will be able to haul one trailer under any of the conditions of service that are likely to prevail. The trolleys are of the Pantagraph type, consisting of a horizontal crossbar, which makes the contact with the overhead wire, and is raised or lowered by a light jointed framework mounted on top of the car, controlled by air pressure, and making sliding instead of rolling contact.

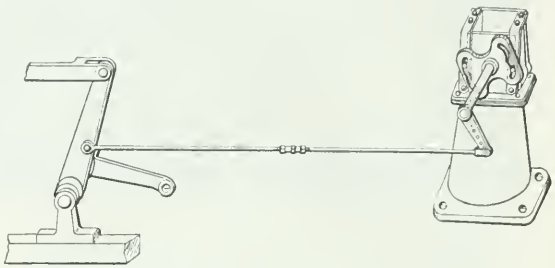
The schedule now being prepared provides for an hourly service in each direction between Rochester and Mt. Morris.

## Locomotive Evaporation Tests on the Pere Marquette.

The International Correspondence Schools, Scranton, Pa., have conducted on the Pere Marquette, with the aid of their dynamometer, track and operation-recording car, a series of locomotive evaporation tests to determine the merit of certain fuel saving devices. These devices were three: the Wade-Nicholson hollow arch, a variable exhaust nozzle, and a feed-water heating system. The first of these, the Wade-Nicholson hollow arch, has been described in these columns and is well known to our readers. The other two will be briefly described.

An illustration of the variable nozzle is shown herewith. The variable feature consists of a pair of movable wings on opposite sides of the nozzle, to which an inward-and-outward movement is imparted by a cam pivoted to the side of the nozzle and connected by bell-crank and adjustable rod to the link-lifting arm, or to the reverse lever. The position of the wings and therefore the size of the nozzle opening is thus regulated by the position of the reverse lever, the maximum opening being when the lever is in the "corner," and reduction occurring automatically as the lever is "hooked up." The bell-crank contains a series of holes to enable the connecting rod to be moved up or down, thereby varying the travel of the bell-crank as desired, between limits. The feed-water heating method consisted simply in discharging the air-pump exhaust into the tank. The devices were used jointly in all cases, and no effort was made to determine the proportion of the saving due to each.

In the first three series of tests three locomotives were tested, two freight and one passenger, each locomotive being tested with and without the devices. Two runs were made under each set of conditions, or four for each engine. The fourth series was between two sister passenger engines, one equipped and the other not, one run for each. The dynamometer car and its recording machine enabled a very complete record of the conditions of each run to be kept. A section from the chart of one of the passenger runs with the special equipment, between Detroit and Grand Rapids, is shown, the train having six cars weighing 265 tons. The signification of each of the several lines is marked, evidencing the completeness of the observations. It will be noted that the milepost pen was also used

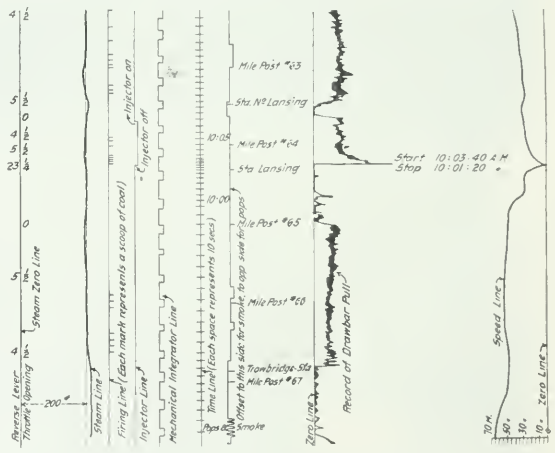


Variable Exhaust Nozzle Used in Pere Marquette Tests.

for keeping record of the occurrence of black smoke and of the opening of the safety valve.

Measurement of the water of condensation from the air pump exhausting into the tank was not attempted, nor any estimate of nor allowance made for same. The effect would be to increase the figures for evaporation per pound of coal, of course, but it was decided to neglect this and thereby insure the conservativeness of the evaporative results. The effect of the introduction of this steam was to produce an average increase in temperatnre in the feed water of 19 deg., the average temperature with the heater being 84 deg. and without, 65 deg. Account of the quality of the steam was also neglected.

The net gain in evaporation due to the special equipment, based on the equivalent evaporation from and at 212 deg., was 15 per cent. and 14½ per cent. respectively for the two freight engines and 23.3 per cent. for the passenger engine of the first three series. For the




Part of Dynamometer Car Record of Pere Marquette Evaporation Tests.

other passenger engine test the gain was 16.4 per cent. This lower gain, as compared with the first passenger test, is ascribed to the difference in the quality of fuel used on the two engines employed in the test, that for the engine carrying the special equipment being much inferior to that of the unequipped engine, the two runs being made on different divisions on the same day. Rates of combustion varied all the way from 29.6 lbs. of coal per sq. ft. of grate area per hour for one of the freight runs, to 101.9 lbs. for one of the passenger runs.

The tests were conducted under the supervision of Mr. W. L. Kellogg, Master Mechanic of the Pere Marquette. We are indebted to the American Locomotive Equipment Company, Chicago, maker of the Wade-Nicholson hollow arch, for information concerning these tests.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 24. FRIDAY, DECEMBER 14, 1906.


The French railroads are perhaps subject to more criticism than those of any other country, due largely to the fact that the nation is, as it were, the partner of the six great companies, and has by original contract extensive powers of supervision. Add to this the large socialist element, including many public men of great ability, who watch for every opportunity to point out any weakness in the existent state of things. Of late years there has been a strong movement to compel the companies to improve the condition of their employees in various ways. It is doubtless to show that the companies have done a great deal without legal compulsion that Dr. Lemercies, Secretary of the Eastern Company, prepared a comparison of certain facts in 1890 with those in 1904. We give below only the percentages of increase:

| | Increase, per cent. |
|---|---|
| Mileage worked | 14.8 |
| Number of employees | 16.9 |
| Train-miles | 32.2 |
| Gross earnings | 31.1 |
| Working expenses | 28.8 |
| Wages and other payments, on account of employees | 38.4 |
| Taxes | 20.6 |
| Dividends | 1.3 |
| Expenses for pensions and other benefits of employees | 88.0 |

The last entry is included in the statement of wages, etc., further up, but it is particularly striking at this time. In amount, the increase in these expenditures for the benefit of employees since 1890 has been $6,531,000, against an increase of $394,000 in the amount paid in dividends to stockholders. The number of pensioners has increased from 27,670 to 66,868; the average yearly pension from $182 to $210.

Notable accidents always bring a lot of letters to the Editor of the *Railroad Gazette*, and the rear collision at Lawyer, Va., November 29, is no exception. Most of the letters of this kind usually have to go unprinted. New "copy" on an old subject is available only when the writer succeeds in putting the ideas in a new way. In the present case, however, a rather novel situation is met with. The first letter to arrive says:

"The deplorable accident in which President Spencer, of the Southern Railway, was killed, shatters one of the oldest traditions of the railroad world—the fond belief that officers' cars on the hind end of trains are always safe, because when an officer is aboard the train the rear brakeman is always particularly alert in the performance of his duty. What was the matter in this instance? So far as I have been able to learn from the newspapers, the two trains had left the last preceding station about eight minutes apart. Is not this length of time sufficient for a flagman to get back? It will be of special interest to learn what this flagman has to say for himself. Is the spirit of loyalty in brakemen so weak and unreliable that a flagman performs his duty when the president of the road sits in the car looking out of the window, but neglects it when the same officer is known to be asleep in his stateroom?"

Whether or not the time interval between these two trains was more or less than eight minutes at Rangoon we are not precisely informed. On many roads the regular time interval between trains, where the block system is not in use, has been five minutes, so that we may assume that even less than eight minutes between the trains at Rangoon would have been deemed a reasonable interval. But if the second train ran materially faster than the first this interval might easily have been reduced in running three or four miles. Another question that may remain unsettled will be that as to how soon or how energetically the flagman went back. In the old times, before the block system was so common, the ideal flagman was one who got off his train before it stopped and ran back at the top of his speed. It is doubtful if such flagmen are as plenty now as they were ten years ago. They were none too plenty then. As to officers' cars, a special train consisting wholly of officers' cars (or a single car), which is a familiar sight on most railroads, usually affords a striking illustration of the confused way in which we try to use both the block system and the hand-flagging system, and how poorly we patch the two systems together. The officers' train usually has on it one of the best looking brakemen, wearing a comparatively new uniform, and carrying a brand new flag. Every time the train stops he goes back a few yards. If the stop lasts one or two minutes he goes back a few rods. If it lasts longer he goes even farther than this, but at best he seems to usually make it his primary object to stay with his train; and the manager, riding in the car, tacitly approves of the brakeman's conduct. Yet the brakeman does not really carry out the flagging rule at all, for the time of greatest danger to the rear of a train which is depending on the flagman for protection is when he is returning preparatory to the resumption of the train's journey. During this time the only protection is that afforded by the torpedo, and the flagman in the case we are considering has not used torpedoes at all. (We are speaking now of the ordinary frequent doings of the special-train flagman.) The man goes back so as to be prepared to carry out the rule, but he does not actually carry it out. If the block system is in effective use all these efforts of the brakeman are useless. If the trains are run by time-interval he may be doing all right as far as regular trains are concerned, for he may not be within an hour or more of any schedule; but if he aims to protect against every possible train, the non-use of the torpedo makes his act almost wholly useless. In connection with the Virginia collision it is said that the brakeman could have stopped the following train if it had not been for a curve in the road; but curves in the road are just what the flagging rule is provided for. As to the average brakeman's respect for a superior officer who is known to be asleep we cannot say; but it is clear that on special trains that make frequent stops at unusual

places the average brakeman has great difficulty in carrying out the flagging rule according to its letter, however laudable may be his attempts to show that he appreciates its spirit.

## TIGHT CAPITAL IN RAILROAD FINANCE.

From time to time during the last few years we have had occasion to point out the magnitude of the absorption of railroad bonds for investment by the savings banks, especially at the East. So long as four years ago that investment process had reached such a point that, joined with existing holdings of railroad bonds by the banks, it might almost be said that the railroad bond fixed for the time the standard of return on the bank's investment and, consequently, of dividend return to the depositor. As railroad bonds of the savings bank class then sold high—often as low as a 3.75 interest basis—and municipal bonds, and also realty mortgages corresponded there followed a tendency among savings banks to reduce the dividend rate from 4 to 3½ per cent. on ordinary deposits. A good many banks, in fact, especially in New England, made such a reduction, and when they did not reduce the dividend it was because they held large blocks of older railroad bonds originally bought low. Nor was the situation relieved much by new legislation enlarging the scope of legal savings bank investment in railroad bonds and, in some states, extending it to good street railway bonds also. It was a time of loose and free capital seeking railroad investment forcing down the interest return. It is a time of very tight capital for railroads now, forcing steadily the interest return up. Consequently the savings banks are reverting to the old and higher dividend rate and probably some of them regretting that they ever cut it down.

We have used the savings bank experience here as the index and measure of the change from free to "tight" railroad capital and of a change not less remarkable for its speed than for its degree. Its phenomena loom big and conspicuous in their main features. As a generality covering the whole situation business expansion, railroad improvements, financial projects of a hundred different kinds, good and bad, outrun capital. In that sub-circle which includes the railroads just at the time when they have carried through minor improvements, largely from surplus earnings, they face tight capital as a burden on major improvements which must be financed by funds greatly in excess of surplus earnings.

The most prominent and, it may be said, logical results of the situation, such as a 4 per cent. investment rate for very high grade railroad bonds—some of them carrying good mortgage liens—convertibles, debentures, short notes carrying as high as 5 per cent. and new stock issues with the annexed "rights" need only to be mentioned. What have attracted less attention than these devices for raising new railroad funds are certain novel sub-forces in the investment motive. There the holder of the convertible bond finds it sometimes actually below par and its convertibility privilege worth less than nothing; or, in another case, where convertibility is fixed at a certain future period, he finds a low quoted premium for his bond which is in effect a market "bet" that the stock into which he is to convert will be selling at twenty to thirty points lower a few years hence at the time of actual convertibility than now. He sees his new stock rights when issued apparently knocking his stock to a point far below the figures where the subtracted rights should carry it, rumors of new rights often depressing the stock instead of lifting it, and, intrinsic railroad values in the quotations counting for much less than they should. What wonder that, under such conditions—and there are others—the investor falls into confusion and timidity. His confusion is shared by the railroad corporations themselves when in the face of tight capital, high money and the personal equation of the investor they must consider the relative expediences of new stock, new bonds and new notes in obtaining funds.

As regards, however, the railroads and their relations to tight capital, besides their fine showing in gross and net earnings, there is one ameliorating fact which has not been adequately noticed or fully measured. While railroad corporations will need great sums for improvements they will not during the coming year have to carry a heavy burden in refunding bond issues. The total is between $60,000,000 and $70,000,000 for some 40 railroad corporations and that total widely distributed, the largest issue being the Chicago, Rock Island & Pacific three-year notes for $7,500,000 and the next lower the Wabash three-year notes for $6,160,0000. Out of the total amount maturing there is some $24,220,000 or more than one-third, which is represented by old sixes and sevens, of which doubtless a large proportion of the holders will accept new refunding issues, though exacting a bond more favorable to the owner than would be the case in a lower money market. The less conservative holders of the maturing fives and fours can also probably be taken care of between alternative propositions of cash, extensions or new bonds of from 4 to 5 per cent., especially if they are long bonds with mortgage security. But in the latter case new borrowing power of the refunding corporation will be correspondingly impaired. It is well for the railroads confronting the stressful and prolonged conditions of tight capital that they are not soon to assume any refunding on a large scale and are now reaping the benefits of the low rate and long time refunds of the later nineties.

## ELECTRIC DRIVE FOR MACHINE SHOPS.

The advantages of the electric motor drive for machine tools was discussed at some length in the *Railroad Gazette* for November 17, 1905, at which time it had come to be the accepted and standard practice for all shops where new work was to be installed or any extensive changes made in the existing power plant. The adoption of the electric drive has been quite as rapid as the development of electric railways, though with perhaps not quite the extensive application of individual motors that electricians urged at the time of the first introduction of the idea. At that time the advantages of an individual motor for each machine, no matter how small, were strenuously urged. But the anticipations of a year ago have not exactly been realized, for instead of the individual drive for all machines, there is now an almost universal grouping of the small machine driven by single motors, with individual drive for the larger ones.

Without entering into the economy of this method of shop propulsion that has been proven time and again in service, it may be well to call attention once more to a few points in which an extension of the system will be profitable. A railroad shop is particularly well suited to the electric drive, and the case described in another column is only one example in the long list of shops where the management has decided that conditions are favorable to its adoption. In this class of work large buildings are invariably required and, when the power is transmitted mechanically from a central source, long lines of shafting with the resultant high frictional resistance are required. Rush repair jobs are of frequent occurrence, demanding overtime and Sunday work, in which but a few machines, requiring a small amount of power, are used. Under these conditions the mechanical transmission of the power is wasteful, in that heavy weights of shafting and hundreds of feet of belting have to be kept in motion in order to reach the single point where the work is being done. It is here that the electric drive manifests its great superiority, since that the losses from transmission are small, and the amount of power generated can be closely adjusted to that actually used. Moreover, railroad repair shops usually consist of a number of separate buildings in each of which, under old conditions, it was necessary either to install boilers and incur the expense of special attendance, or to convey steam long distances to the engines.

The cost of power is not, however, the ranking item in railroad shops, and were this to stand alone the rate of introduction of the electric drive would probably have been much slower than it has been. The advantage of the new method lies in its adaptability or flexibility to all the requirements of a varied service, and particularly to the fact that the machine can be taken to the work instead of the work to the machine, as in the case of most old style machine shop operations. Stepping outside the domain of railroad work, a few instances of how heavy work is done with electric drive in some outside shops may be suggestive.

Where very heavy work is to be done all the operations can frequently be performed by light portable tools, fully as rapidly and with a lower labor cost for handling than where a large machine capable of carrying the piece to be shaped is used, to say nothing of the original investment. For example, in a shop where large pumping engines are built it had been customary to cast the bedplate in three pieces, plane the edges where they came together and bolt them with finished bolts. This was done principally because of the difficulty of boring out the bearings for the main shaft and planing the footings for the bottoms of the cylinder frames. A great saving was effected by casting the bed in one piece, planing the frame footings with a portable machine similar to that used in facing the valve seats on a locomotive, and using one long boring-bar driven by an electric motor to bore the boxes in line and in

place. The cylinders of these engines were often several feet in diameter and drilling of the stud holes for the heads was an expensive piece of work. With the improved methods the cylinders were erected and then a radial drill was raised and bolted to the upper face and the holes drilled quickly and cheaply. In like manner the crankpins were turned after they were in place, and so through many other operations the machine was taken to the work instead of the work to the machine.

In railroad work the same principle holds and has already received an extensive application. It is customary to bore out cylinders, face valve seats, expand and bead tubes by means of small tools driven by electric motors, and the use of this class of tool is rapidly extending. This does not mean that the use of portable tools is to be recommended where there is work enough to keep a heavy machine busy, but it frequently happens in repair shops that there is only occasional necessity for performing some piece of heavy work for which the investment required for a stationary machine would be too great, but which can be well done by one that is portable. This is especially true in the smaller shops where the engines to be cared for are few and where it is undesirable to send them to large shops that are more fully equipped with special tools. By the proper adaptation of these means it is often quite possible to secure an economy of operation that would otherwise be out of the question.

## THE BLOCK SYSTEM ON TRIAL.

The collision at Lawyer, Va., November 29, was due to a "failure of block working," as the English inspectors would say. Whether due to (1) the signalman's lack of knowledge of his duties, or (2) to his neglect, or (3) to the moral fault which leads men of experience to take dangerous risks knowingly, or (4) to a combination of these, or (5) to one of those inexplicable errors of competent men which we charge to our inability to deal with the "personal equation," are questions which evidently will not be fully settled until an investigation of the collision is held by public authority. But as the block system is in a sense on trial in the United States, and as the main thing to discuss now is the prevention of such disasters in the future, the lesson of this one may profitably be looked at as bound up with all of these five possible causes. It is fair to say that the block system is on trial, because the railroads have been slow in adopting it, and have often seemed in doubt as to which of the different methods of working the system should be employed; and because Congress has paid no heed to the recommendations of the Interstate Commerce Commission. The halting way in which some large roads have extended the use of the block system may have seemed to some smaller roads which naturally would look to the practice of the larger ones for an example, to indicate a question as to its economy and value. Such a question, if it exists, should be settled. The inaction of Congress suggests the same question. For Congress to neglect an important public question is nothing new, but if the public has any interest at all in the long lists of deaths and injuries reported by the Interstate Commerce Commission during the past five years; if Congress is really charged with the duty of discussing questions of public welfare and if the Federal Government really has the power of control over railroad operations, the facts and arguments that have been set forth by the Commission in its annual reports should have received intelligent attention.

All of the defects mentioned in the foregoing paragraphs must be considered, because all occur on nearly every prominent road. All must be cured if we are to have perfect service, and nothing less than perfect service is tolerable in this matter. The operations of manual block signaling are simple, yet they are repeated by each signalman so many times that he is in danger of making blunders because of the monotony. Though an error in performing a simple operation may be as simple as the operation itself—so simple as to defy analysis—its result may be a hundred deaths. The model superintendent, who is mortified at every evidence of imperfection in the work done under his management is, of course, doubly mortified if such an instance of imperfection results in the death of the chief officer of his road. No superintendent justifies himself in retaining incompetent or morally weak men in his signal towers, nor does he feel safe with men who *may* be thus deficient, unless and until he has done everything in his power to provide cures for such deficiencies; for there is no satisfaction in laying the blame for a collision on the "personal equation" when it is known that more might have been done to improve the personality that broke down.

What then can be done to insure that a collision like that which has now shocked the world will not occur on your road? In other words, assuming that the telegraph block system is a suitable system, what is needed to make it perfect? Perhaps this question will in a measure answer itself if we separate it into the questions of detail suggested in our opening paragraph.

1. Lack of knowledge. How many years' training had each of your operators before being put in charge of a block signal tower? Under what kind of a trainer? Are all your trainers (operators who instruct new operators) required (and known) to conform to a thorough and uniform scheme of training? Does the scheme provide for drilling new men on the causes of collisions; that is, on a knowledge of the combinations of circumstances which lead to fatal errors? Have your signalmen all read the explanations of collisions due to operators' errors, which have been issued by the Interstate Commerce Commission and published quarterly in the *Railroad Gazette?* Do you keep a full record of all operators' dangerous blunders, for the benefit not only of the blunderer, but of the whole force? Are you sure that your chief despatcher knows of all these blunders? Do you test operators on those rules, depended on for safety, which come into play only on rare occasions? Do you have anything like "surprise checking" to see whether they omit required extra precautions? What are you doing to cope with the present scarcity of operators, and to provide against a possible diminution of your force which may lead a superintendent some day to take the risk of entrusting a tower to an inexperienced man? How strenuously do your superintendents fight against having "emergencies" which are taken to justify the relaxing of safeguards ordinarily deemed necessary?

2. Neglect.—How do you punish neglect, where it is not due to vicious purpose and does not result in harm? Are your operators of sufficiently high class to warrant special consideration for those who fail in some serious point now and then, so as to retain (and improve) good men in spite of lapses? Is there on every division a superintendent (or any officer) big enough in head and heart, and sufficiently free from other burdens, to give this special consideration, without impairing the general discipline?

3. Moral Weakness.—What do you do with an operator known to be untruthful? Do you make the conditions of life in the signal towers in small towns, or in the wilderness, such that young men of character are willing to stay in such positions? Would a satisfactory answer to these last two questions require such a large increase of pay that you lack the courage to tackle the question, and wink at deceptions by operators which ought to be exposed and punished? Do your operators conspire to conceal each other's delinquencies? If so, can the evil be cured? If not, what should be done? Do you recognize sleeping on duty as a moral weakness? If this vice is not cured is the superintendent morally blameless?

4. No questions are necessary concerning the combination of the foregoing; but it is pertinent to observe that the combination frequently includes another element, for which we cannot with any satisfaction hold an individual operator responsible—that of brevity of tenure. From one cause or another men resign or are dismissed before they have been long in one place. This is a real though not easily definable cause of errors. The long experience of the average signalman in England is a large factor in his reliability. What are we doing about this?

5. Do you know of any recent case of a disastrous error for which there is no possible explanation except temporary, pardonable mental aberration or deficiency? If so, please report it to the *Railroad Gazette.* We have difficulty in finding such.

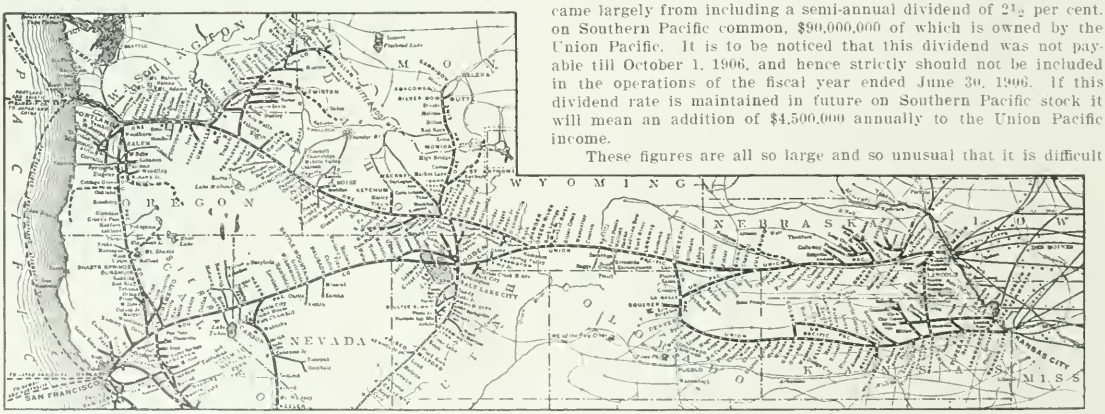
The manager who is able to give himself satisfactory answers to these questions should be in a fair way of getting the best possible service that can be had with this system—the telegraph block system. We do not say that the system is satisfactory for all conditions. Our accomplishments in the matter of safety are so far below those of our English friends that to reach their standard of security has been often looked upon almost as the acme of excellence. They have made their records with what is substantially the same as the telegraph block signal—except on a few roads. Still, it is to be remembered that the English record is not immaculate. If we were equal with the British roads, to-day there would be a clear duty to do still better. If the Coleman lock-and-block or the electric train staff ought to be adopted on all important single track railroads in America to make them safe for their own officers to ride on, let us acknowledge the issue and face the problem. If all double track lines worked by the telegraph block system ought to be equipped with automatic signals within a year let us face that problem also. Unless these problems are properly and promptly dealt with there will be another to add to them; the demand of the public that automatic stops, on the principle of those in the New York subway, be put in use everywhere. Most railroad officers, we

believe, are firmly convinced that on their ordinary railroad lines their money for some years had better be spent wholly for other things which are more pressingly needed than are automatic stops; but if collisions continue to agitate the minds of people who read the newspapers it will be well to be prepared to defend this position.

In closing the discussion of his paper on "High Steam Pressures in Locomotive Service," read at the November meeting of the Western Railway Club, and reprinted in the *Railroad Gazette* November 30, Professor Goss called attention to the relation which necessarily exists between results obtained and money expended, in the advancement of scientific research. Purdue University, he said, had adopted a program of tests designed to disclose the value of steam pressure in locomotive service, and had provided itself with a locomotive especially designed to work under pressures as high as 250 lbs. as long ago as 1897. During the five years succeeding, the work was limited by the ability of the University to supply funds, and since the University funds are chiefly required for the purposes of instruction, very little could be accomplished in the way of research. Three years ago, however, through a grant from the Carnegie Institution, a considerable sum had been placed at the disposal of the University for this particular work, since which time a hundred tests had been run, the results thereof had been completely summarized, and a final report for publication had been rendered. It was an abstract of this report which he presented at the club meeting. Proceeding, he called attention to the fact that the problem, the solution of which was presented by this report, concerned only the single expansion locomotive using saturated steam. It was desirable, he said, that the same processes be now applied, first, to a single expansion locomotive using superheated steam, and later to a compound locomotive using saturated steam. This was the programme which he had mapped out for the Purdue laboratory. Unaided, a good many years would elapse before definite conclusions could be reached, whereas the importance of the subject demanded an early solution. This statement ended his reference to the matter, and while the public discussion went no further, individual members were outspoken in their desire to uphold his hands in this matter. The readers of the *Railroad Gazette* will, we are sure, join with the members of the Western Railway Club in hoping that some way may be found whereby the important researches of the Purdue laboratory may proceed with all possible expedition.

## Union Pacific.

The Union Pacific is the most remarkable example in existence of the present railroad prosperity of the West. Due primarily to the great growth of traffic in its territory, and secondarily to the improvement of the line thus made possible together with an investment which has proved most profitable in the securities of the competing Hill roads to the northward, its position to-day is one of unusual strength, both as an operating railroad and as a holding company for other railroads. This twofold aspect of the company was definitely recognized in the increased dividend declaration of last August, when the 5 per cent., announced as the new semi-annual payment, was officially stated to be made up of 3 per cent. from the earnings of railroad lines directly operated and 2 per cent. from income from investments. The increase in the rate thus amounted simply to the beginning of payments from the company's investments, as 6 per cent. annually was being paid already from railroad earnings.




Union Pacific System.

*The Southern Pacific Lines west of Ogden and south of Portland are not included in the Union Pacific System.*

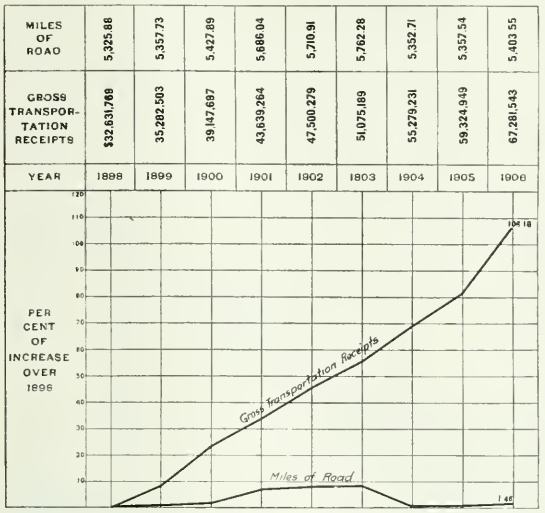
The Union Pacific, as an operating railroad, is made up of the Union Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Company. Under these three groups, the average mileage operated last year was 5,400. Gross earnings, not including $402,000 from water lines, were $66,879,142, an increase of $8,122,296 over the wonderfully prosperous year of 1905. It will be remembered that the Union Pacific's statement of a year ago was, at the time, the most remarkably successful showing made by any railroad during that high record year. It now appears that not only has 1905 been surpassed, but surpassed by margins much greater than the increases shown that year over the results of the not specially prosperous fiscal year 1904. Operating expenses of rail lines were larger by $5,000,000 than in 1905, but they include the charge of $2,206,610 as a reserve fund for future maintenance and renewals under the two maintenance accounts, a charge which was not made in the previous year. Net earnings were $32,000,000, against just under $29,000,000 in 1905, a gain of over $3,000,000 for the year, even after this new charge of $2,200,000 for future maintenance. If this charge be deducted from net income instead of from gross earnings, net earnings for the year are larger by over $5,250,000 than in 1905.

Owing to the increasing importance of income from investments and the distinction made between the two parts of the dividend payments, the income other than from transportation operations is not dealt with in this year's income account until after dividend payments on railroad operations have been deducted from net income. In this way the two principal sides of the company's operations are to a certain degree separated and therefore presented more clearly. In the condensed table at the close of this article, however, the net income is treated as is regularly done in reviews of annual reports in the *Railroad Gazette*, that is, as being the surplus remaining from the total receipts from both transportation and investment operations after all taxes and fixed charges.

Considering the income account as is done in the report, the surplus (not including income from investments) after payment of fixed charges was $21,400,000. Deducting from this a dividend of 6 per cent. (but no more) on the common stock, there was a surplus after railroad dividends of $5,800,000. Income from investments was $10,300,000, from which was deducted $3,900,000 necessary to cover the one semi-annual payment of 2 per cent. out of the investment income which was charged during the year on Union Pacific common stock. This left $6,400,000 to be added to the surplus after dividends, making a total surplus of $12,200,000. From this there was appropriated $2,700,000 for betterments and additions, $500,000 for betterments and additions on branch lines and $1,000,000 for new equipment, a total appropriation of $4,200,000, as against $2,479,000 in the previous year. The new charge direct to operating expenses already mentioned of $2,200,000 reserve for future maintenance and renewals must also be remembered in comparing the betterment appropriations of the two years. After subtracting the $4,200,000 for betterments from the total surplus, there was a balance of $8,000,000 profit and loss surplus for the year, as against $7,200,000 in 1905 and $4,700,000 in 1904. The increase in income from investments came largely from including a semi-annual dividend of $2\frac{1}{2}$ per cent. on Southern Pacific common, $90,000,000 of which is owned by the Union Pacific. It is to be noticed that this dividend was not payable till October 1, 1906, and hence strictly should not be included in the operations of the fiscal year ended June 30, 1906. If this dividend rate is maintained in future on Southern Pacific stock it will mean an addition of $4,500,000 annually to the Union Pacific income.

These figures are all so large and so unusual that it is difficult to really grasp their true significance without careful study, but in a word, they show that consolidating the two sides of the company's operations, there was a surplus after payment of preferred dividends of $27,782,642, or over 14 per cent. on the common stock, as against $18,800,000, or over 11 per cent. in 1905. This takes no account of the reserve of $2,200,000 for maintenance and renewals, $1,240,000 net receipts from land sales, an equity estimated at over $8,000,000 in the surplus and undistributed earnings of the Southern Pacific, or profits actually gained or which could be obtained

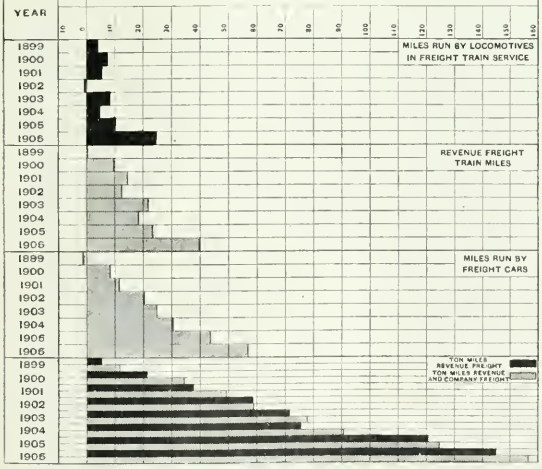
from the sale of stocks of the Great Northern and Northern Pacific. Including all these equities, but only the estimated profits of some $30,000,000 from the sale of Hill stocks during the year, it is probable that the company earned last year something over 35 per cent. on its common stock. When it is considered that about ten years ago the road was in the hands of a receiver and the common stock of the reorganized company could be bought for around 15 cents a




Increase in Earnings and Mileage of the Union Pacific, Shown Graphically.

share it is hard to find words to express the tremendous growth of the property.

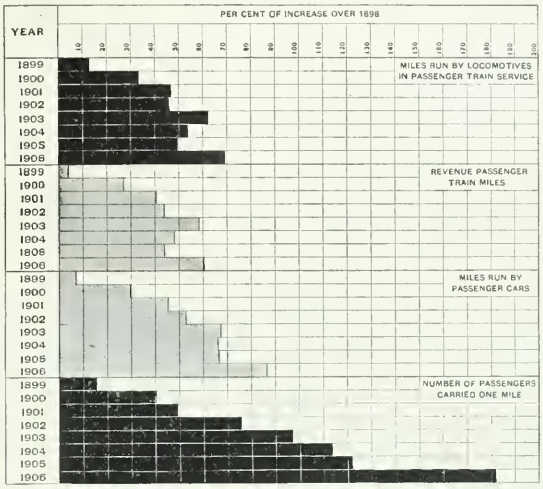
There was sold during the year $9,960,089 par value of Great Northern stock, $14,830,082 par of Northern Pacific and $2,850,000 par of Northern Securities stock (not yet exchanged). The amount realized from these sales (something over $60,000,000 at prices current during the year) was credited against the cost of stocks owned. The exact amount received may be pretty accurately judged from the decrease in the item in the balance sheet, "Stocks and bonds owned," which decreased $62,500,000 for the year. The *proceeds* of these sales were "used in the construction and acquisition of new lines and in




Increase of Freight Service and Traffic; Union Pacific.

the purchase of equipment and other property; also in an increase in cash assets, which, since the close of the fiscal year, has been applied to the construction of new lines and to the acquisition of other property. The current and other free assets increased $71,354,759 over the preceding year."

There are few more interesting conjectures than as to the facts back of this short statement. Do "new lines" and "other property" acquired include the Baltimore & Ohio stock sold by the Pennsylvania to Kuhn, Loeb & Co., the Union Pacific's bankers, last September, or any Chicago, Milwaukee & St. Paul stock bought in the open market or any Illinois Central holdings? The shareholders are given no definite information of the use to which these great funds were put. The strength of the company for any such campaign is shown by the fact that on June 30 the item of cash, among




Increase of Passenger Service and Traffic; Union Pacific.

the free assets, was $21,258,000, and demand loans, $34,710,000, a total available working capital of $55,968,000, against a cash item of $7,000,000 in 1905 and $3,500,000 in 1904.

Entirely aside from this immense cash fund there were new advances made during the year up to June 30, 1906, for construction and acquisition of new lines of $17,500,000, against a total of such advances to date on June 30, 1905, of $6,000,000.

The transportation side of the Union Pacific's development is exhibited graphically in the accompanying diagrams taken from the report. The first shows the increase in gross transportation receipts—which it must be remembered include no income from in-

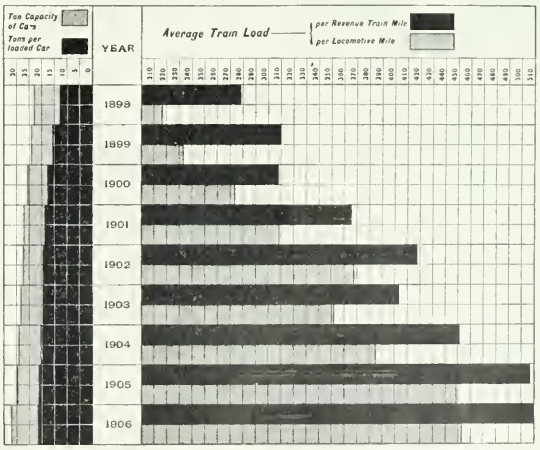



Diagram Showing Train Load, Car Capacity and Car Loading: Union Pacific.

vestments whatever—as compared with miles of road. The mileage has scarcely increased at all, while gross railroad earnings are more than as large again as in the fiscal year ended June 30, 1898, the first complete year of operation by the new company. The two following diagrams, one showing the increase in passenger and the other in freight service and traffic, combined with this diagram, are a demonstration of what has been accomplished by reduction of

grades, changes in line, heavier rails and bridges and rolling stock of greater capacity. This showing fits in well with the present discussion about car shortages and their causes and the need of more railroad mileage. It is a striking exhibit of accomplishment in carrying twice as much traffic on the same mileage by provision of better facilities. So far as a comparison between ton mileage and the amount of railroads in the country is concerned, the result is the same as though 5,000 miles of new railroad had been built. More than this it represents the most satisfactory way in which to meet new traffic demands, for it is axiomatic that additional traffic can be better handled by improvement of an existing line than by the building of an equal amount of new mileage, in which case both roads on account of thin traffic are unable to make the improvements necessary to efficient and economical operation.

The gross transportation receipts of rail lines last year increased 14 per cent.; operating expenses increased 17 per cent., and net earnings 10.6 per cent. The operating ratio was 52.41 against 51.19 in 1905. It is interesting to observe, as reflecting the heavy traffic of the year, particularly in passenger service, that there was an increase of 37 per cent. in passenger locomotive helping miles and of 12 per cent. in similar freight service, along with an increase of 12 per cent. in total passenger locomotive miles and 14 per cent. in total freight locomotive miles.

Maintenance of way and structures cost $1,777 per mile of main and second track as against $1,343 in 1905. The road has only 168 miles of second track, as against 105 miles in 1905. The cost of maintenance per mile was larger by 32 per cent. than in 1905. On the other hand, maintenance of equipment per locomotive cost $3,068, against $3,791 in 1905, a decrease of 19 per cent., and per passenger car $1,079, against $1,272 in 1905, a decrease of 16 per cent. Repairs and renewals per freight car increased 20 per cent. from $103 in 1905 to $123, a gain of $20, which, in itself, is about half the average figure spent for this purpose on some roads. These maintenance charges are obviously all high.

The passenger density during the year increased 20 per cent. from 98,000 passengers one mile per mile of road to 119,000. There was an increase of 21 per cent. in revenue passenger miles. Freight density increased 13 per cent., from 1,062,300 ton miles (including company freight) per mile of road to 1,200,000. There was an increase of 11 per cent. in the number of revenue ton miles. The revenue trainload remained practically stationary at 510 tons, against 507 tons in 1905. The ton mile rate is not given in the report, but works out at 0.93 cents. The Great Northern's rate is 0.79 cents. The omission of this important figure from the showing of the report gives the impression that the Union Pacific is not anxious to bring up for discussion the rates which it has in force. The report takes up in some detail the new construction of the year which has already been covered in the construction columns of the *Railroad Gazette*. After summing up a number of projects, the statement is made that since the close of the fiscal year additional companies have been incorporated and that the cost of lines in course of construction and other lines projected will involve an outlay of about $37,000,000. In addition new equipment to cost about $13,000,000 is on order for delivery in 1907.

The following tables sum up results on the Union Pacific (including rail and water lines) for the past two years:

| | 1906. | 1905. |
|---|---|---|
| Rail mileage worked | 5,404 | 5,358 |
| Passenger earnings | 13,326,055 | 11,343,339 |
| Freight earnings | 48,992,015 | 42,962,238 |
| Gross earnings | 67,281,543 | 59,324,949 |
| Maint. way and structures | 9,900,409* | 7,341,905 |
| Maint. of equipment | 7,118,940† | 6,883,676 |
| Conducting transportation | 16,203,783 | 13,927,128 |
| Operating expenses | 35,361,171 | 30,370,702 |
| Net earnings | 32,020,372 | 28,954,247 |
| Other income | 10,329,816 | 6,496,759 |
| Total income | 42,350,188 | 35,451,006 |
| Net income | 31,764,674 | 22,785,507 |
| Dividends | 19,532,424‡ | 11,087,061 |
| Appropriated for betterments | 4,200,000 | 4,479,165 |
| Year's surplus | 8,032,250 | 7,219,282 |

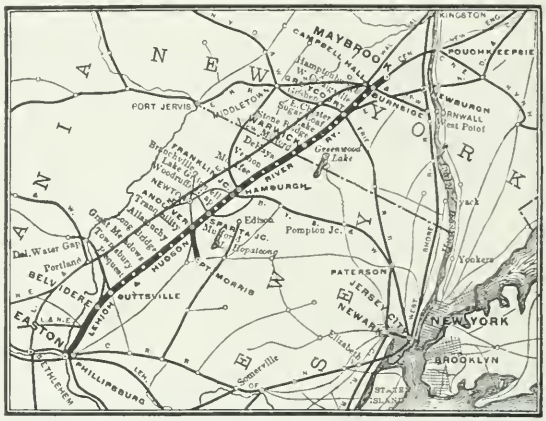
*$1,691,610 charged as reserve for future maintenance, renewals, etc., in 1906.

†$515,000 charged as reserve for future maintenance, renewals, etc., in 1906.

‡Dividend requirements for a full year at the present rate will be $23,441,982.

## Lehigh & Hudson River.

The Lehigh & Hudson River is a small road controlled by a community of interests in which the Reading, Central of New Jersey, Ontario & Western, Lehigh Valley, Lackawanna, and Erie are represented, officers of each of these companies being directors of the road. It connects the eastern part of the anthracite coal territory and the slate regions near Easton, Pa., with Maybrook and Campbell Hall, N. Y., where the Central New England furnishes a connection across the Hudson River and into New England. It is a road naturally of thin traffic and small importance, but the annual report for the past year, recently issued, shows the favorable results which can come to a small company when it becomes the gateway for traffic between two important roads. By an arrangement between the Lehigh & Hudson River and the Lackawanna, the interchange traffic of the Lackawanna with the New York, New Haven & Hartford, was, on September 1, 1905, transferred from the Harlem River route around New York harbor to the Poughkeepsie Bridge route. This traffic is moved over the Sussex branch of the D., L. & W. from Port Morris to Andover, thence over 50 miles of the Lehigh & Hudson River to Maybrook, where it is handed over to the Central New England to be carried east and delivered directly to the New Haven system. In the 10 months of the fiscal year during which this traffic was moving there were 255,000 tons carried. Even though the Lehigh & Hudson River received so short a through haul on this traffic, the year's earnings clearly reflected the new business. It is stated in the report that it is probable that other railroad connections will soon make use of this outlet for New England business. It is worth noticing in this connection that the Lehigh & New England, which is the line on the accompanying map which parallels the Lehigh & Hudson River for its whole length, is controlled by the same interests, and that if the time ever comes when sufficient traffic moves by this route to warrant it, the two




Lehigh & Hudson River.

roads could be used as a double track line between the coal regions and the Central New England connection. In order to do this, however, it would be necessary to make considerable expenditures in improving the lines, particularly in reducing grades on the Lehigh & New England.

Gross earnings of the Lehigh & Hudson River increased 35 per cent. over 1905, being $627,000, an increase of $163,000 over 1905. Net earnings were $254,000, a gain of $83,000. Freight earnings were $567,000, against $400,000 in 1905, an increase of 42 per cent. The five principal groups of commodities carried were ores, anthracite coal, bituminous coal, merchandise freight and milk and cream. There was an increase in tonnage and earnings in every one of these groups, but particularly in merchandise freight, earnings from which were $273,000, against $165,000 in 1905. The ton mileage was over 70,000,000, as against 45,000,000 in 1905, which plainly shows the increased business.

The following table gives the principal results of operation of the Lehigh & Hudson River, excluding the Orange County Railroad, which operates 13 miles on the northern end of the line, and shows a net income for the year of $58:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 86 | 77 |
| Passenger earnings | 40,016 | 35,000 |
| Freight earnings | 567,185 | 400,450 |
| Gross earnings | 626,971 | 464,110 |
| Operating expenses | 372,669 | 292,795 |
| Net earnings | 254,302 | 171,315 |
| Net income | 72,492 | 22,023 |

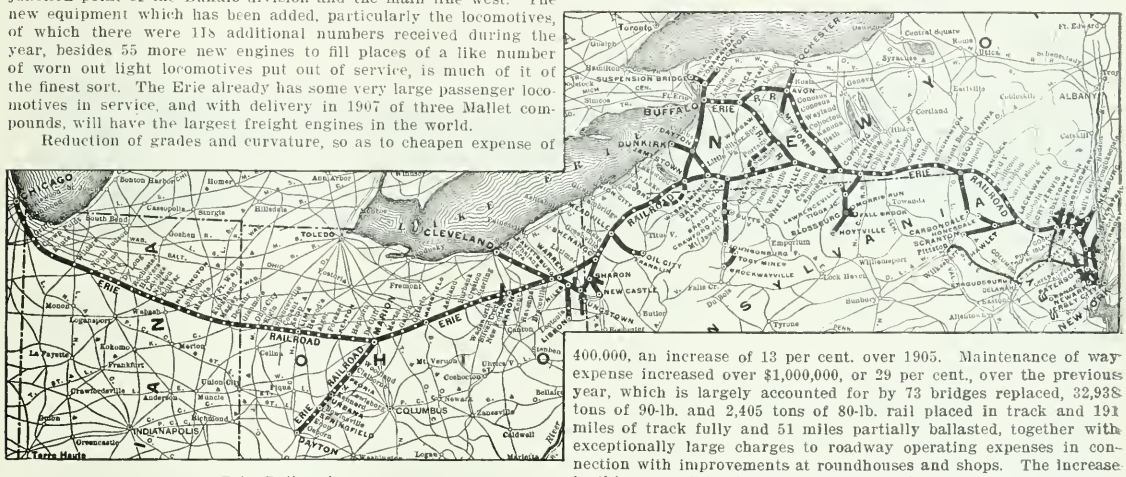
## Erie.

The Erie is a New York to Chicago trunk line, an anthracite coal road, a bituminous coal road, and a railroad with a large suburban business. It is also the typical example, financially, of a railroad company which in its earlier history was subject to the most notorious kind of bad management, a handicap which was by no means cleared away at the time of the most recent reorganization, when in 1895 the Erie Railroad succeeded the New York, Lake Erie & Western. Because the reorganization was not more drastic and comprehensive in its terms the Erie has been handicapped in developing the many and varied activities included in its various mileages. With the gradual enlargement of its credit, which has come with the general prosperity of the last 10 years, a way has been found to provide funds for important improvements to put the road in efficient condition according to modern standards, toward which a beginning had earlier been made by small appropriations

out of surplus income. This is through the sale of convertible bonds, an authorized issue of $50,000,000 of which was made in 1903, when the first $1,000,000 were sold. Up to June 30, 1905, $9,000,000 more were sold and $12,000,000 during the last fiscal year, making a total of $22,000,000 issued on June 30, 1906. It is notable that in the 10 years since reorganization the mileage has increased only 181 miles. In a word, the great development which has been made on the Erie has been intensive rather than extensive, except for the important purchase of the Pennsylvania Coal Company in 1901—the improvement of the transportation plant rather than the building or buying of new railroad lines.

Owing to the funds available from sales of convertible bonds last year saw improvement work carried on to an unusually large extent, and plans more or less definitely determined on for the future are even more far reaching. The principal work already begun is improvement of shops, purchase of equipment and improvement of the line, the last including the beginning of work on electrification of a 35-mile suburban line out of Rochester, N. Y. The shop arrangements of the whole road have been reorganized with headquarters at certain strategic points, where shops and equipment of the most modern sort have been installed. For example, in another column will be found a description of the new electric equipment of the Erie shops at Hornell (Hornellsville), N. Y., the junction point of the Buffalo division and the main line west. The new equipment which has been added, particularly the locomotives, of which there were 118 additional numbers received during the year, besides 55 more new engines to fill places of a like number of worn out light locomotives put out of service, is much of it of the finest sort. The Erie already has some very large passenger locomotives in service, and with delivery in 1907 of three Mallet compounds, will have the largest freight engines in the world.

Reduction of grades and curvature, so as to cheapen expense of




Erie Railroad.

operation for through freight, is the road's most serious problem, both in its size and the long time which will be necessary to carry it through to a satisfactory conclusion. It is the plan to have a low grade line all the way between Jersey City and Chicago. This is being taken up in two parts, the first part from Jersey City to Port Jervis, a region of particularly bad grades at present; the second, between Port Jervis and Chicago. There is to be an entirely new line for about 70 of the 89 miles between Jersey City and Port Jervis. The first part of this, from Guymard, eight miles east of Port Jervis, east to Highland Mills on the Newburg branch, 42 miles, is shown on the accompanying map. On this section work has been under way during the year. To follow this, construction of a new and better line from Highland Mills south to Passaic Junction, which is about 12 miles out of Jersey City, has been authorized. When these lines are built, they will reduce the present maximum grades between Jersey City and Port Jervis from 1.25 per cent. east and westbound to 0.2 per cent. east and 0.6 per cent. westbound, except for a helper grade westbound from Port Jervis to Guymard, eight miles. They will also do away with 1,329 deg. of central angle of curvature, making, with some exceptions, 1½ deg. the maximum curve. As a result, it is expected that the trainload can be increased by 63 per cent. eastbound and by 83 per cent. westbound. Another large betterment which is being planned on this end of the line is a general reorganization and improvement of the Jersey City terminal, plans for which will probably be announced next year.

Between Port Jervis and Chicago the general plan is to eventually obtain a maximum grade not exceeding 0.3 per cent. east and westbound. A single-track line from Columbus, Pa., to Niobe, and a low grade double-track line from Niobe, Pa., to Lakewood, N. Y., in all 23 miles, are now being built. This will reduce the present grade of 0.75 per cent. east and 1.09 per cent. westbound to 0.2 east and 0.3 westbound, and maximum curvature, with one exception, from 3 deg. 40 min. to 1½ degrees. Double-tracking and correction of grades and alinement of the existing road between Salamanca, N. Y., on the Allegheny division, and Cuba, 28 miles, is in progress. A low-grade single-track cut-off is being built from Cuba to Hunts, on the Buffalo division, 33 miles. These new lines are also shown on the accompanying map. Improvement of grades and alinement of the Buffalo division between Hunts and Hornell, 26 miles, has been authorized. Present grades between Hornell and Salamanca will be reduced from 1.07 per cent. east and 1.25 per cent. westbound to 0.2 per cent. east and 0.3 per cent. westbound, and, with two exceptions, maximum curvature from 4 to 1½ deg., with a saving of 1,014 deg. of central angle. These important improvements to the line already authorized or under way give an idea of the general policy, which, it appears, can be expected to be in force on the Erie in the future. It is a large task to bring about such general improvement of the whole property, but a strong beginning has been made, and it is entirely probable that before many years the road will be able to make a much larger profit than now on its through traffic, through reduced cost of operating expenses as a result of such improvements.

Gross earnings, including earnings from other than railroad operations, that is, by water routes, shipping and coal storage plants and elevators, stock yards, etc., were just over $50,000,000, an increase of $4,278,000, or 9 per cent. Leaving out results of the other operations, gross railroad earnings were nearly $47,500,000, an increase of not quite 10 per cent. Net railroad earnings were $15,400,000, an increase of 13 per cent. over 1905. Maintenance of way expense increased over $1,000,000, or 29 per cent., over the previous year, which is largely accounted for by 73 bridges replaced, 32,938 tons of 90-lb. and 2,405 tons of 80-lb. rail placed in track and 191 miles of track fully and 51 miles partially ballasted, together with exceptionally large charges to roadway operating expenses in connection with improvements at roundhouses and shops. The increase in this account is all reflected in the unit charge for maintenance of way per mile, as there has been no increase during the year in average mileage operated. This was $2,139 in 1906 against $1,652 in 1905.

Maintenance of equipment cost also increased a little over $1,000,000, which is more by 14 per cent. than in the previous year. There was a large increase in the item, repairs and renewals of freight cars, which is stated to be partly due to the fact that the largely increased traffic made it desirable to put a number of old light capacity freight cars into serviceable condition, whose use, in trains with new and heavier equipment, required extraordinary expenditures for maintenance. The shop improvement is also reflected in this account in the increase of $111,110, or over 70 per cent. in the item, repairs and renewals of shop machinery and tools. The unit maintenance of equipment charges, including repairs and renewals and value of equipment destroyed or sold, which amounts to a small additional charge for renewals in each case, were, per locomotive $2,954 against $3,080 in 1905, per passenger car $618 against $582 in 1905, and per freight car $60 against $47 in 1905.

With an increase of 5 per cent. in the number of passenger miles and 15 per cent. in the number of ton-miles, conducting transportation cost rose by only $100,358, or 0.61 per cent. over the previous year, a fine showing. Revenue per freight train mile was $2.72 as compared with $2.57 the previous year, an increase of 6 per cent. The revenue trainload increased from 412 tons in 1905 to 455 tons, or 10 per cent. Including company freight the trainload was 484 tons against 441 tons in 1905. The average carload rose from 17.70 tons in 1905 to 18.75 tons, or 6 per cent.

Of the tonnage of revenue freight carried, anthracite coal and bituminous coal each furnished 20 per cent.; coke, 6 per cent.; iron and other ores, 5 per cent., and stone, sand, etc., 3 per cent., showing that over 55 per cent. of the company's tonnage is in these heavy products. Owing to the strike in both the anthracite and bituminous regions, there was a decrease in both classes of coal tonnage, each of which furnished 22 per cent. of the traffic in 1905. Of the other tonnage in 1906, grain made up 3 per cent., merchandise 8 per cent., and articles not classified 12 per cent.

The principal results of the last two years' operations of the

Erie Railroad Company, except the New Jersey & New York Rail road and the coal companies, are as follows:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 2,151 | 2,151 |
| Passenger earnings | 88,982,811 | 88,397,368 |
| Coal freight earnings | 12,049,493 | 11,628,376 |
| Mdse freight earnings | 23,506,444 | 20,553,003 |
| Gross railroad earnings | 47,461,402 | 43,321,647 |
| Maint. way and structures | 4,600,230 | 3,553,410 |
| Maint. of equipment | 8,677,904 | 7,595,751 |
| Conducting transportation: | | |
| Operation | 16,644,723 | 16,344,365 |
| Traffic | 904,771 | 912,124 |
| Railroad operating expenses | 32,059,130 | 29,722,190 |
| Railroad net earnings | 15,402,272 | 13,599,457 |
| Net income | 5,016,614 | 4,406,596 |
| Appropriated for improvements | 1,926,973 | 1,360,555 |
| Year's surplus | 533,975 | 490,344 |

# CONTRIBUTIONS

## An Oversight.

Baltimore, Md., Dec. 10, 1906.

To the Editor of the Railroad Gazette:

Was it not an oversight in omitting the names of Mr. Charles D. Fisher and Mr. Frank T. Redwood, both of Baltimore, who were also killed with Mr. Samuel Spencer and Gen. Philip Schuyler in the recent Southern Railway accident recorded in the *Railroad Gazette*, Dec. 7th? Messrs. Fisher and Redwood were also Mr. Spencer's guests.

READER.

## Block Signals Required in Massachusetts.

The Railroad Commission of Massachusetts acting under the law passed by the last legislature* has issued to the railroads a circular setting forth its purpose to require block signals throughout the state. The circular says:

"The ultimate end to be secured is the installation of some approved form of block signals upon all steam railroad lines within the state at as early a day as may be practicable. This means a substantial outlay by railroad companies in the immediate future.

"The order in which block signals should in the future be installed must have reference to both amount of traffic and physical conditions. Of first importance is the equipment of lines of railroads embracing two or more tracks, or presenting the conditions of a single track carrying a large amount of traffic and involving heavy grades and sharp curves. Local conditions may, of course, demand at particular places early equipment out of the usual order.

"Companies are requested to submit to the board on or before December 15 a brief description of the block signals now in use upon their several lines within the state, together with an explanation of such action as has been taken in either actually equipping these lines or in making arrangement for their future equipment with block signals since January 1, 1906."

The pipe line from the wells on the Caspian at Baku to the Black Sea at Batum has been but recently completed, although it was begun about ten years ago. For a long time it extended only 140 miles eastward from Batum, the oil being collected from the wells at Baku by local pipe lines and delivered to tank cars on the railroad at stations close by, hauled thence some 400 miles and then transferred to the great pipe line for conveyance to Batum. The line is now about 550 miles long, and is estimated to be capable of passing about 400,000,000 gallons of oil yearly (1,440,000 tons), which is about twice as much as the quantity which it is expected to use at present. This must release a great number of cars, which are often badly needed on other routes.

*"The Board of Railroad Commissioners may from time to time require railroad companies to install and maintain at such places upon the railroad premises as it shall designate such block or other signals or devices as it shall approve for the purpose of safeguarding public travel. The supreme judicial court shall have jurisdiction in equity to enforce compliance with any order issued by the board. . . ."

## The North Platte River Bridge of the Union Pacific.

Bridge No. 193 of the Union Pacific, over the North Platte river, 289 miles west of Omaha, which was recently rebuilt, is the third bridge to be built at this point since the construction of the line. The original structure was a pile trestle with planked deck and was used for highway traffic as well as for trains. It was replaced in 1887 by an ordinary pile trestle 2,101 ft. long with 16-ft. spans. There were six oak piles to the bent, four of which carried the track and the other two supported an ice breaker. The width of the river at this point varies from 2,000 to 2,500 ft., and like all such streams in this region, is comparatively shallow, with sandy bottom and low banks. The view looking down on the top of the new bridge shows the condition of the river at low water. Most of the bed is exposed and the numerous small shifting water channels existing at such times can be plainly seen.

The second bridge was strengthened from time to time as the loadings and traffic volume increased, but for three or four years prior to replacement it became increasingly difficult to maintain it in proper condition to carry the traffic, and train speeds were limited to 20 m.p.h. over it. The piling, which had been in service since 1887—a good record for this region—was failing, making it difficult to keep the structure in line, especially when the ice moved in the river, and a supply of dynamite was kept constantly on hand during the winter and spring months to break up ice gorges.

North Platte River Bridge of the Union Pacific.

The new bridge is a single-track structure of 40 spans of Harriman Lines' common standard 50-ft. deck plate girders on concrete piers with pile foundations. The bridge is 2,013 ft. 8 in. long over all. The piers have a pointed nose shod with a steel cutting edge

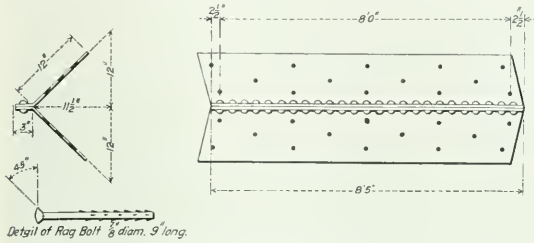
View of North Platte River Bridge.

to resist the action of the ice. The center line of the new bridge was located 16½ ft. north of the similar line of the old bridge; this permitted it to be built without disturbance to traffic. A line change of about three-quarters of a mile each way from the bridge was necessitated by this change of location, and the grade was also raised 4 ft. to give about the same clearance below the girders as existed below the old bridge. Through girders would have required less lift in the grade than deck girders, but future double-tracking was considered in making the plans, and as now arranged,

will only require extending the piers and setting on another row of deck girders without disturbing the present bridge.

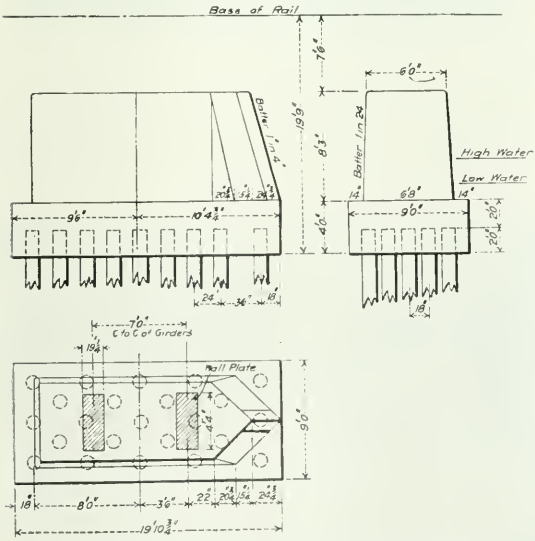
Work was to have begun on the new bridge in August, 1905, when the water was lowest, but delays in receipt of equipment held up the work until the middle of November, so that practically all of the foundation work was done during the winter months. Last winter was unusually mild, enabling the concrete work to be done without freezing, but this advantage of the mild weather was overbalanced by troubles of another sort that it caused. The ice, instead of remaining solid and stationary, was continually breaking up and gorging against the work, causing shifting and changes of depth in the channels, washing out the sheet piling and necessitating frequent rebuilding of the cofferdams. It often happened that an entire day's work would be undone over night in this way. Difficulty was also experienced in maintaining a sufficient labor force. As a result of these delays, the pier work was not completed when the spring rise in the river came, and the last four piers were built in from 8 to 13 ft. of swift water and running ice.

There were 960 pieces of piling driven, the average penetration being 16 ft. below foundation bottom, through sand to hard-pan or rock. The piles were sunk with the aid of a water jet, a special plant having been bought for the purpose. This plant was set up in the river bed and the water piped each way to the work through a 4-in. main. A pressure of 250 lbs. per square inch was used.




Steel Nose Plate for Piers.

sinking the piles quickly through the sand. The piers and abutments contain 2,532 yds. of concrete and there are 730 tons of metal in the superstructure. The total excavation was 3,300 cu. yds. The plate girder spans were received riveted up and were unloaded directly on the piers by the self-propelling derrick car which has




Details of Piers for North Platte River Bridge.

been referred to previously in these columns in connection with Union Pacific bridge work. This car stood on the old bridge.

An interesting feature of the work was in connection with the instrument work in locating the piers. The instrument man of the small engineering party constantly on hand for this special purpose was required to supervise the setting of all forms and have them in exact position and the concrete was carried up and finished to surface under his observation, the result being that the work checked to $^{2}/_{100}$ of a foot in this respect. For longitudinal location the conditions made it difficult to obtain accurate results. Measurements had to be preserved on the deck of the old bridge, as the moving ice prevented placing points in the river bottom. But as the result of a bad case of creeping rails which had always existed over this bridge, its deck was constantly subject to more or less movement, necessitating repeated checking of the pier centers, and verification of instrument points before final setting of each form. However, the completion of the work disclosed a total error of only ⅝ in. in the total bridge length of more than 2,000 ft., and it was easily absorbed in spacing the girders on the piers.

The steel work was furnished by the American Bridge Company, and erection was done by the railroad company, Mr. R. L. Huntley, Chief Engineer. Mr. J. H. Howe was Resident Engineer in charge of the work, and the instrument work was under the supervision of W. H. Larson, Assistant Engineer. The bridge was opened to service last summer.

## Transportation and Car Accounting Officers.

The Association of Transportation and Car Accounting Officers, of which T. S. Bell, of the Pennsylvania, is President, and G. P. Conard, of New York City, Secretary, held its regular meeting at New Orleans, November 21 and 22, with a fair attendance. The address of welcome was by Judge T. J. Freeman, Solicitor of the Texas & Pacific.

Judge Freeman spoke, as he put it, "from the standpoint of a layman," but before he had gone far the members concluded that he was a pretty good transportation man. Judge Freeman called attention to the present congestion of traffic, and advocated pooling of cars, the restriction of "transit privileges," such as compression and concentrating of cotton in transit, and milling in transit, and would make shippers increase their facilities for prompt handling of freight. He offered a scathing criticism of what he aptly called the "mathematical tonnage system," and said that it should give place to a "speed tonnage system." The Judge favors a systematic courting of favorable public opinion of railroads, and suggested that the people should be educated through good treatment in small as well as large matters to consider the railroads as their friends instead of enemies.

The Executive Committee reported the addition of 18 active, one associate and two honorary members since the last meeting, and the total number of roads now in active membership is 191, holding 275 memberships. These roads work 207,912 miles and own 1,997,780 cars. Seventy-eight fast freight lines are affiliated with the association.

The Committee on Car Service reported that it had formulated and recommended to the American Railway Association a set of rules to control and restrict diversion of cars. These rules were approved as follows:

These rules are founded on the following principles:

That the owner has a right to demand that his cars shall be kept moving in a homeward direction.

That the marks of ownership on a car are a sufficient guide to insure its movement toward the owning road.

That the intent of these rules is to make railroads responsible for keeping foreign cars moving toward the home road and to prohibit them from sending a foreign car in an opposite direction if in serviceable condition, except as hereinafter provided for.

IF LOADED.—Foreign cars must be handled as follows:

1. Loaded to or via the home road by any route.
2. Loaded to the road from which originally received if such loading is in the direction of the home road, *but not otherwise.*
3. Loaded to an intermediate road in the direction of the home road.
4. Loaded in local service in the direction of any junction point with the home road. After being released from such loading car must be sent to the home road loaded or empty.
5. Loaded in the direction of any junction point with the road received from, if such loading is in the direction of the home road, *but not otherwise.*
6. Cars may be loaded locally in an opposite direction from the home road or home route if they are immediately thereafter to be loaded according to Rules 1, 2 or 3.
7. Cars may be reconsigned to connecting road in an opposite direction from home only when permission to reconsign is obtained from the car owner.

IF EMPTY.—Foreign cars must be handled as follows:

8. Empty cars belonging to direct connections must be returned to the owners regardless of whence they came or in what service they were received, except as provided in Rule 13.
9. Empty cars may be sent in an opposite direction from the home road or home route if to be loaded according to Rules 1, 2 or 3.
10. Empty cars may be delivered to connecting road to be loaded in accordance with Rules 1, 2 or 3, *but not otherwise.*
11. Empty cars belonging to indirect connections must be returned to the road received from if that is in the direction of the home road, *but not otherwise.*
12. If a road has an empty car that cannot be disposed of according to the foregoing, it must be reported to the owner and disposition arranged for.
13. Owners shall have the right to demand that special equipment, such as refrigerators, coal, coke and stock cars and other special cars, which

cannot be loaded in such directions as a general proposition, shall be returned to the junction point at which delivery was made.

CARS IN SWITCHING SERVICE.

14. Cars handled in switching service, whether by railroads or by switching roads, shall be subject to these rules.

The committee's recommendations that the penalty for diversion be $2; that diversions be reported within two months to the owner, and that failure to thus report be penalized in the sum of $10 were not approved by the meeting.

The Committee on Per Diem reported its interpretations and conclusions on the application of double reclaim in a territory where there is no local agreement to the contrary; on the necessity of giving advice to all roads over which a car is to move on M. C. B. home-route card; on reclaims to be made covering per diem accruing on cars not accompanied or preceded by proper data for forwarding; on adjustment of controversies arising in connection with errors in penalty notices; on how to establish the date of delivery of a car, by a road which does not pay per diem, to a per diem road; and on the reporting of receipts as well as deliveries on junction cards.

The Committee on Office Methods and Accounting reported concerning the project for uniform standard abbreviations for car initials; that in order to avoid confusion no abbreviation of initials should be used on billing, car reporting or for other purposes. Its recommendation that claims for unreported per diem be held back three months so as to give debtors time to make supplementary reports was not adopted.

The Committee on Conducting Transportation reported on the best means of facilitating the movement of cars through yards, and embodied in its reports samples of forms of blanks that have been used with success for daily records. One of these is for a record of cars received and forwarded for 24 hours, and another for a record of shop cars for 24 hours.

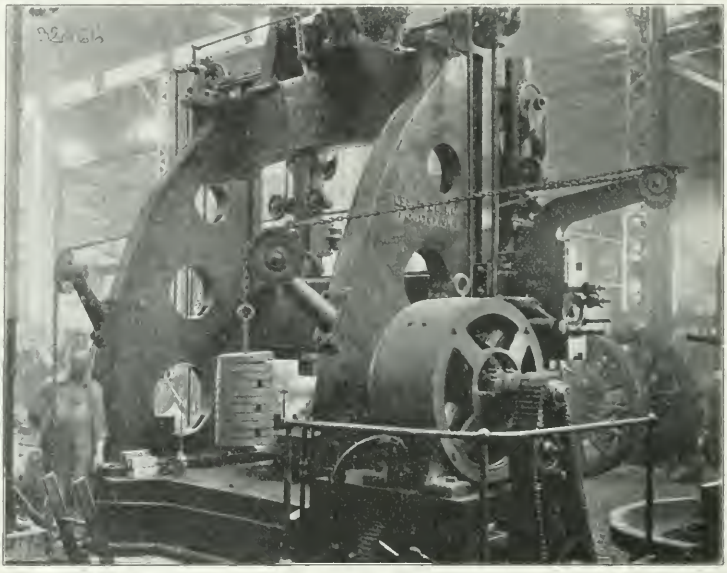
The daily reports are to be kept in a loose leaf binder and are subject to inspection by the yard master, or his representative, at intervals during the day, being abstracted from the binder and forwarded by the yardmaster to the Superintendent of Transportation at the close of the day's business. As the entry is made of the leaving time of each car, a blue pencil mark is drawn through the car number to indicate that it has been disposed of. Shop cars, or cars abnormally delayed, are transferred to the next day's sheets, the total time in yard being shown when each car is disposed of, and entering into the average for the day on which car is released, shop delay being entered as a separate item.

The Japanese Government, according to reports from Tokio, has decided to build a bridge over the Yalu river at Yon-jen-Pho to have a span of 3,239 ft., and to cost about $2,000,000. The bridge will be a part of the Wi-Ju-Mukden Railroad, which will provide direct communication between Mukden and Fu-San.

## Electrical Equipment of the Erie Shops at Hornell, N. Y.

The Hornell shops of the Erie have recently been enlarged and equipped with electric drive throughout. New buildings have been built, additions made to old buildings, a new power house erected and a large number of new machine tools installed. This installation is an interesting and instructive illustration of the latest engineering practice for a railroad shop where the largest proportion of power is required at short distances from the power house and a large proportion of variable speed and crane load is required.

A careful comparison was made of the advantages and disadvantages of the alternating-current and direct-current types of apparatus for the service contemplated. It was decided that present conditions do not justify the installation of both types of motors, although it appeared probable that at some time in the future an equipment of this nature would be necessary. Under the conditions existing at Hornell it is apparent that all of the motors are located well within the limits of 220 volts distribution, so it was finally decided to install only direct-current apparatus, excepting a small generator set which is used to supply current for the present yard and depot lights. The enlargement of the power house at some future time has been provided for, but the type of apparatus to be placed in the engine room will be determined upon at the time of making the addition, as the present system can readily be expanded in either of two ways. Additional power can be ob-



90-in. Boring Mill Driven by Two Motors—Erie Shops at Hornell.

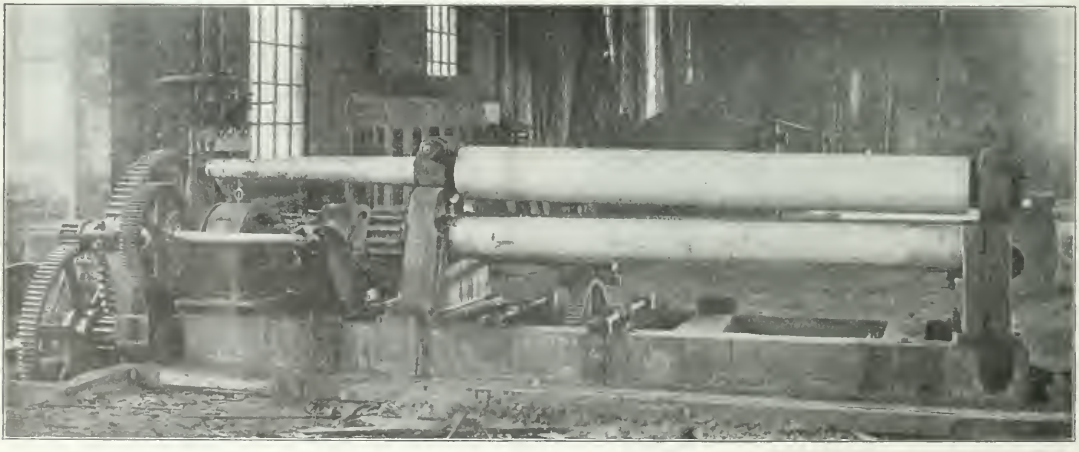
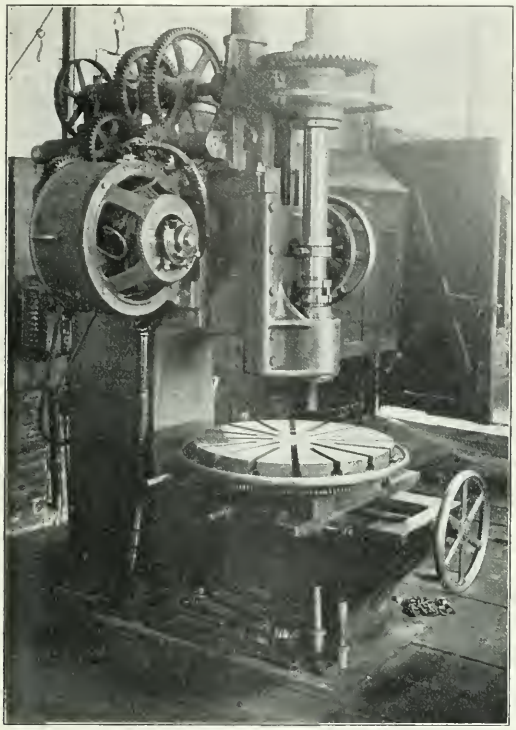


Plate Rolls Driven by Two Motors—Erie Shops at Hornell.

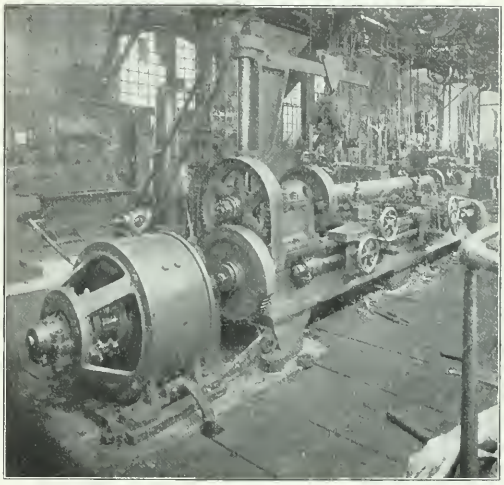
tained by installing either an alternating-current generator which would supply the lines direct, the present motor generator set acting as a tie between the present units and the future one, or a direct-current generator, with the necessary transforming apparatus for alternating-current.

The power house is a large brick fireproof structure, with concrete roof and flooring, and has ample provision for light and ventilation. Foundations are in place for ultimately doubling the boiler capacity so that it is only necessary to erect the additional units. The boiler plant consists of four Babcock & Wilcox units of 400 h.p., operating at 150 lbs. pressure and equipped with chain grates. All live steam mains are provided with the Holley drip system.



Vertical Miller—Erie Shops at Hornell.

The coal is conveyed automatically from the time it is dumped from the cars until it is fed into the furnace. It passes from the car into a chute which empties into a crusher, and is then conveyed by an endless belt to the top of the power house, where it passes through another chute to the second conveyor that distributes it in the bunkers over the boiler room. From there the coal passes through chutes to hoppers in front of the furnaces, where it is fed into the chain grates. The conveyors, which were made by the Exeter Machine Company, have a capacity of 60 tons per hour, and are operated by a 10 h.p. and a 13½ h.p. Westinghouse type S motor. The coal crusher is operated by a 20 h.p. type S motor. The generating equipment consists of three Ball & Wood cross-compound, high-speed condensing engines, two of 500 h.p. each, direct-connected to a Westinghouse 300-k.w., direct-current, 250-volt, three-wire generator running at 150 r.p.m., and one of 400 h.p. direct-connected to a similar generator of 200 k.w. capacity operating at 200 r.p.m. The engines run condensing except in cold weather, when the exhaust steam is used in heating the shops. Besides the generating equipment and pumps there are two Ingersoll-Sergeant compound air compressors that furnish compressed air to the pneumatic hammers in the shops.

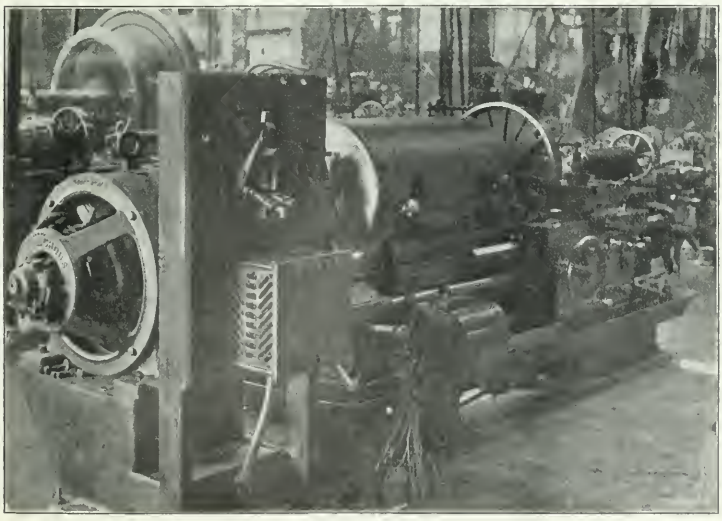


Niles Lathe Direct Connected to Motor—Erie Shops at Hornell.

Current is transmitted by cables through a large tunnel to the new erecting shop and thence through underground conduits to the buildings. The Westinghouse three-wire system of distribution is used for lighting and power, with an electromotive force of 250 volts between outside wires and 125 volts between each outside wire and neutral. Incandescent and Cooper-Hewitt lamps are operated on the 125-volt sides of the system and constant-speed, 250-volt motors are connected to the main or outside wires, while the variable speed motors use shunt field control.

The old erecting shop uses both group and individual drive, the group-driven machines being divided into five sections and operated by five type S constant speed motors, two of 30-h.p. capacity and three of 50-h.p. capacity. The machines in the fitting shop, which occupies one wing of the erecting shop, are also group-driven by a Westinghouse 30-h.p., constant speed, type S motor. The accompanying photographs show some of the heavier tools. The Niles 90-in. boring mill is driven by one type S 20-h.p. and one 7½-h.p. variable speed motor. A type S 20 h.p. is direct-connected to a Niles lathe. The crank pin lathe shown herewith is driven by a 7½-h.p. type S motor; the controlling apparatus is shown in the photograph. The plate rolls are driven by two motors of 10 h.p., and 15 h.p., and the vertical miller is operated oy a 7½-h.p. motor.

The speed of these motors is controlled by varying the field strength. This may be done while the machine is in operation, and



Crank Pin Lathe—Erie Shops at Hornell.

the controller is conveniently placed within the reach of the operator. Resistance is placed in the shunt field circuit of the motor, which decreases the shunt field current and causes a decrease in the field strength and an increase in speed; this is a simple and effective means of varying the speed of either a shunt or a compound-wound motor. The horse-power output remains nearly constant throughout the whole speed range.

Group drive is used for the smaller machines. One of the photographs shows a 7½ h.p. motor which drives a group of machines in the new boiler shop. In connection with the boiler shop equipment is a flue rattler located outside the building and operated by a 20 h.p. type S motor. It is 48 in. in diameter and 22 ft. long,

Motor Driving a Group of Small Machines—Erie Shops at Hornell.

and has a capacity of from 175 to 200 flues. An average of five lots per day are cleaned, the exact time for each rattling depending upon the water used in the boilers. The longest flue is 21 ft., and the diameter varies from 1½ in. to 2½ in.

The new equipment was installed by Westinghouse, Church, Kerr & Co.

## November Railroad Law.

The following abstracts cover the principal decisions in railroad law by the United States Supreme Court and the Federal courts during November:

*Interstate Commerce Commission findings.*—Under the provision of the Interstate Commerce Act that the findings of the commission shall thereafter be deemed *prima facie* evidence as to the facts found in all judicial proceedings, a railroad company seeking to restrain the enforcement of a re-classification has the burden of showing that the facts on which the commission acted were not as found by it. Interstate Commerce Commission v. Cincinnati, Hamilton & Dayton Ry. Co., 146 Federal Rep. 559.

*Contract to develop traffic.*—A contract to develop the milk traffic of a railroad for a percentage of the freights earned—the rates not to exceed those charged by competitive lines—is not contrary to public policy nor in violation of the anti-trust act, or the Interstate Commerce Act, and cannot be abrogated by the railroad company, though it granted the person an exclusive privilege in the business over the railroad, but subject to the proviso that it was exclusive only "so far as it was permitted to do so by law." Delaware, Lackawanna & Western Railroad Co. v. Kutter, 147 Federal Rep. 52.

*Local attachment of cars belonging to non-resident railroad company.*—Cars belonging to a railroad company and delivered to other companies, loaded with freight for transportation into other states and to be returned within a reasonable time either loaded or empty, are until their return engaged in interstate commerce and such cars are not subject to attachment under the laws of a state into which they may be carried by the connecting carriers. Davis v. Cleveland, Cincinnati, Chicago & St. Louis Railroad Co., 146 Federal Rep. 403.

*Passenger thrown from platform by motion of car.*—A passenger boarding a car at a station where no agent was maintained and required to enter the baggage car to have his baggage checked, after which it is his duty to return to the car set apart for passengers, is entitled to recover for injuries caused by being thrown from the platform by the motion of the car while so returning, and using due care for his safety, and this more particularly where the car platform gates are allowed to remain open while the brakeman charged with the duty of closing them is otherwise occupied. Boston & Maine Railroad Co. v. Stockwell, 146 Federal Rep. 505.

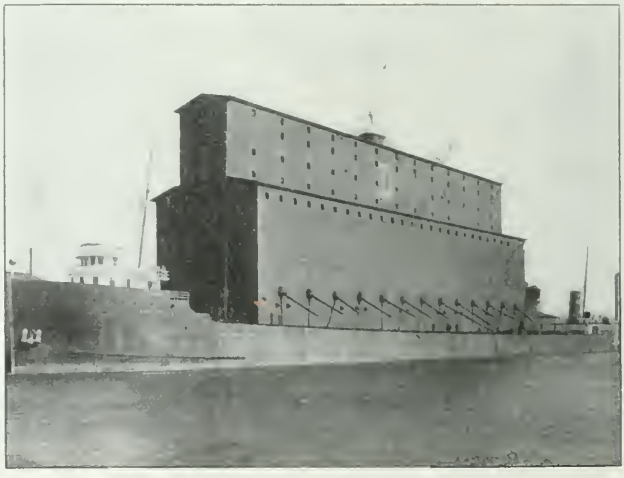
*Condition of spark arrester.*—In a case where the railroad company sued for setting out fires claimed that its spark arrester of approved make was in good order, it was held allowable to show in rebuttal of this claim that on the same day this engine set out ten fires within two miles of the fire in question, and that a spark arrester making this record was not in good condition. Toledo, St. Louis & Western Railroad Co. v. Star Flouring Mills Co., 146 Federal Rep. 953.

*Speed of trains.*—The fact that a railroad train is run over a crossing at a rate in violation of a city ordinance does not show negligence conclusively, but is to be considered by the jury merely as a circumstance from which negligence may be inferred. Erie Railroad Co. v. Farrell, 147 Federal Rep. 220.

*Crossing railroad tracks.*—A street railroad having obtained a right to lay its tracks in a street cannot be enjoined from crossing the tracks of a railroad which cross the street. The steam railroad has no right in the street except subject to such proper use of it for street purposes as may be authorized by the city itself. Pennsylvania Company v. Lake Erie, B., G. & N. Railway Co., 146 Federal Rep. 446.

## Fast Loading of Grain Steamers.

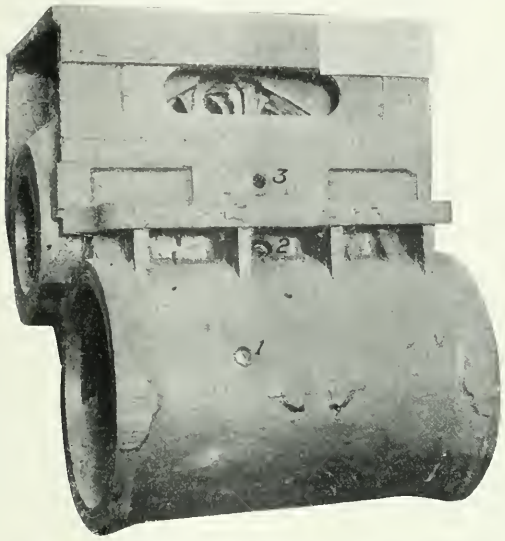
During a temporary lull in the ore trade this fall a number of the large lake steamers which normally are employed entirely in the ore business, have turned their attention to the grain trade and have made some surprisingly fast records in loading and unloading. The best loading record was made by the steamer W. D. Matthews at elevator B of the Canadian Pacific at Fort William, when 198,000 bushels of wheat were put on board in 1 hr. and 57 min., or at the rate of 1,659 bushels a minute. The best previous record was made on the steamer James Laughlin by the Great Northern elevator at Duluth, when part of the cargo was loaded at the rate of 1,300 bushels a minute. The accompanying photograph shows the method of loading grain, and explains somewhat how such tremendous speed is possible. It shows the steamer B. F. Jones loading a cargo of 370,373 bushels at Duluth. In unloading this same cargo at Buffalo, elevating of the grain was begun at 7 o'clock Monday morning at the Mutual elevator and by 4 o'clock 227,000 bushels had been discharged. The steamer then went to the Niagara elevator, beginning work at 7 o'clock Tuesday morning and at 9 o'clock Tuesday night had discharged 143,000 bushels, making 370,373 bushels unloaded in 22 hours working time. These figures make clear one of the principal reasons why steamer rates on a commodity like grain which can be carried in bulk are inherently cheaper than rates by rail.



Steamer "B. F. Jones" Loading 370,000 Bushels of Grain at Duluth.

### Ballistic Test of Cast-Steel Cylinders.

Some time ago the Penn Steel Casting & Machine Co., of Chester, Pa., made some cast-steel locomotive cylinders for the New York Central, which were illustrated in the *Railroad Gazette* for April 20, 1906. As noted at the time, the metal of which these cylinders were made had a tensile strength of 73,600 lbs. per sq. in. of section with an elongation of 29 per cent. Since the publica-




Cast Steel Cylinder, Showing Points of Impact in Ballistic Test.

tion of this description another similar cylinder has been cast and subjected to a rather novel test. It was sent to the United States ordnance proving ground at Indian Head and subjected to a ballistic test after the manner of armor plate. This was done ostensibly to ascertain the resistance of the material, though it could hardly be expected that the metal would serve as an efficient protection against the impact to which it was subjected. In all three shots were fired with the casting set at about 15 ft. from the muzzle of the gun. In these a one-pounder was used for the first two shots and a three-pounder for the last. For the one-pounder a charge of 60 grams of smokeless powder was used, giving a muzzle velocity to the shell of 2,000 ft. per second. The thickness of metal at the point of impact was $1\frac{1}{2}$ in. and the shot

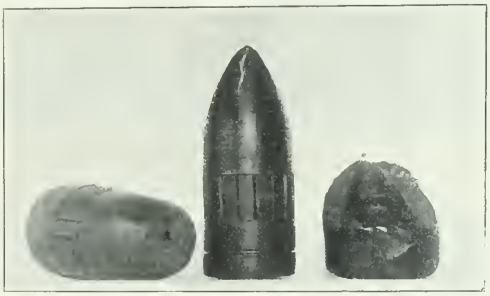
Penetration of 1-lb. Shot in Cast Steel Cylinder.

developed no flaking or cracks upon the outside, while the fringe rolled up was even and about $\frac{1}{2}$ in. high, as shown by the engraving. On the inside there was a fringe of metal carried away with a flaking that ran out so as to cover an area of $2\frac{5}{32}$ in. by $2\frac{7}{8}$ in. In this there was a complete penetration. The second shot was a repetition of the first in every particular, but the shot did not go through, as it was fired against a point where the metal was thicker. In this case the point of the shell penetrated and the remainder broke off and rebounded. There was no fringe, as in the case of the first impact, and only a slight flaking around the outside of the hole.

The third shot was fired from a three-pound gun with a charge of 300 grams of sundried Indian Head Proving Ground powder, giving a muzzle velocity of 2,200 ft. per second. There was a fringe about the point of impact as in the first case and no cracks or flaking was developed. In this the shell penetrated about 3 in. and remained in the hole, the base being broken off. The illustration of the cylinder shows the points of impact of the three shots. The first (No. 1) was against and penetrated the barrel; the second (No. 2) was between the brackets at the side of the steam chest, in which the remains of the shell can be seen, and the third (No. 3) is above and about on a line with the center of the steam chest.

The condition of the shells after the firing is shown in a separate illustration by which the amount of injury received is apparent. The views are numbered to correspond to the shot numbers from which it will be seen that the first shell, which penetrated the barrel, suffered a slight injury at the point, while the other two were broken, the three-pound shell being the worse of the two.

The regular physical tests of the metal gave a tensile strength of 76,000 lbs. per sq. in. of section, with a limit of elasticity of 36,000 lbs.; an elongation of 28.5 per cent. in 2 in. and a reduction of area of cross section of 34.6 per cent. This shows that the tensile strength of the metal is somewhat higher than the ordinary specifications require for boiler plate, though there is a somewhat wider margin between the ultimate strength and the limit of elasticity than plate would usually show. The elongation is high, however, from which the ductility and softness may be inferred, and which undoubtedly accounts for the absence of flaking and cracking about the holes made by the shells. While these tests can hardly be taken to represent the stresses to which locomotive cylin-



No. 2. No. 1. No. 3.

Shells After Ballistic Test of Cast Steel Cylinder.

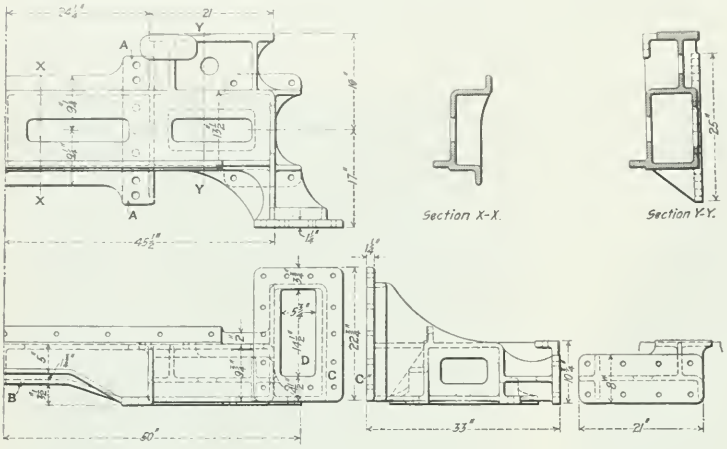
ders will be subjected in service, they are interesting as a contribution to the general fund of information regarding the toughness of the metal that is available for use in so large and complicated a casting.

### State Rights With Interstate Trains.

The recent decision of the Supreme Court of the United States in the Mississippi case, though in favor of the railroad, sustains in a general way the powers of the state commission. The Mississippi commission had issued an order requiring the Illinois Central to stop certain through trains between Chicago and New Orleans at Magnolia, a town of 1,200 inhabitants. The United States Circuit Court sustained the commission, but the Circuit Court of Appeals reversed this action and decided for the railroad. The Supreme Court has sustained the Circuit Court of Appeals in an opinion by Justice Peckham, in which it is held that a railroad commission has a right, under a state statute, to compel a railroad company to stop its trains where the company does not furnish proper and adequate accommodation to a particular locality, and that the order may embrace through interstate trains. But, if the company has furnished all such proper and reasonable accommodation to the locality as fairly may be demanded, then any interference with the company by causing its interstate trains to stop at a particular locality in the state "is an improper and illegal interference with the rights of the railroad company and a violation of the commerce clause of the Constitution." It was found that the company had fully performed its duties toward Magnolia and that the order was improper and illegal. In concluding Justice Peckham said:

"The transportation of passengers on interstate trains as rapidly

as can with safety be done is the inexorable demand of the public who use such trains. Competition between great trunk lines is fierce and at times bitter. Each line must do its best even to obtain its fair share of the transportation between states, both of passengers and freight. A wholly unnecessary, even though a small, obstacle might not, in fairness, be placed in the way of an interstate road, which may thus be unable to meet the competition of its rivals. We by no means intend to impair the strength of the previous decisions of this court on the subject, nor to assume that the interstate transportation, either of passengers or freight, is to be regarded as overshadowing the rights of the residents of the state through which the railroad passes to adequate railroad facilities. Both claims are to be considered, and after the wants of the residents within a state or locality through which the road passes have been adequately supplied, regard being had to all the facts bearing upon the subject, they ought not to be permitted to demand more at the cost of the ability of the road to successfully compete with its rivals in the transportation of interstate passengers and freight."




Details of Frame Crosstie; Cole Four-Cylinder Compound Locomotive

### Interstate Transportation of Intoxicating Liquors.

In the case of Paul Heymann, plaintiff in error, vs. Southern Railway, the Supreme Court of the United States on December 3 rendered a decision that makes more clear the interpretation of the so-called Wilson act which provides that intoxicating liquors transported into any state or territory shall, "upon arrival in such state or territory," be subject to the police laws of that state or territory. Two residents of Charleston, S. C., had each ordered a cask of whiskey from Heymann in Augusta, Ga., sending the price with the orders on the understanding that if delivery was not made the money would be refunded. The whiskey was delivered to the railroad at Augusta. On arrival at Charleston the casks were unloaded into its warehouse, ready for delivery, but before the consignees had been notified, the goods were seized, without warrant or other process, by constables asserting their right to do so under the dispensary law of South Carolina, the agent of the railroad company not resisting the seizure. Heymann sued the road in a Georgia court for failure to make delivery. The case turned on the question of whether the seizure had been lawfully made—whether the goods had yet passed from the protection of the interstate commerce clause of the Constitution of the United States and had become subject to the state law. The railroad contended that the seizure was lawful. The Supreme Court of Georgia decided in favor of the road, holding that certain expressions of the Supreme Court of the United States in earlier cases as to delivery being essential to complete "arrival" under the Wilson act were obiter and not binding. The Supreme Court of the United States reverses this decision, holding that the Wilson act does not give a state jurisdiction until after delivery. It follows that the railroad permitted the whiskey to be taken from its possession illegally, and Heymann wins. Though not stated in the opinion of Justice White, the inference is conveyed that a technical resistance to the seizure would have relieved the road from liability.

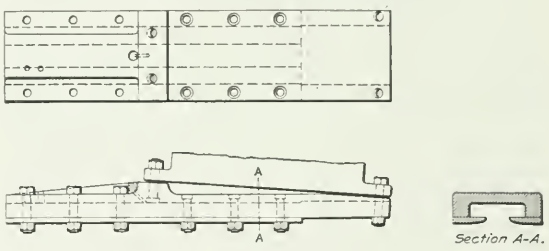
A press despatch of December 7 says that the French Chamber of Deputies has voted, 364 to 187, to purchase the Western Railroad of France. If the bill is passed by the other House the purchase will take effect in about a year.

### Guide and Frame Brace for Cole Four-Cylinder Compound Locomotive.

In the description of the Cole four-cylinder compound locomotive published in the *Railroad Gazette* for November 9, reference was made to the guides, and to the combination crosstie for the frame that was set immediately back of the cylinders. Details of these two parts are given herewith. From the cross-section of the guide it will be seen to be a modification of the well-known Vogt guide in use on the Pennsylvania Railroad having a top wearing surface. There is a broad bearing 8 in. wide in the channel-shaped casting and the guide is held up by two wrought-iron, case-hardened straps $\frac{3}{4}$ in. thick. The guides for the high and low-pressure cylinders are the same except for the minor details of the fastenings.

The crosstie is made to fill a variety of purposes. It is a steel casting, and, besides acting primarily as a frame crosstie, it serves as a guide yoke and a base to which to bolt the rocker boxes. The engraving shows half of the casting which is of steel. It is bolted to the frames at the lugs A A by $1\frac{1}{4}$-in. bolts, and is raised at the center at B to clear the high-pressure connecting rods.

To the overhang outside the frames are bolted the link brackets for the Walschaert valve gear, the low-pressure guides and the rocker boxes. The link bracket is bolted to the rear face of the casting at C, through which there is an opening D for the passage of the radius bar. The guides are bolted to the lugs at E and the rocker box to the front face at F. While there is nothing particularly remarkable about this casting, and it will probably be greatly lightened in future engines, it shows how well this detail can be worked out to give great strength to the frame and tie all of the working parts together so as to make them practically one piece, when the space between the frames is left clear, as it is with the Walschaert gear.




Details of Crosshead Guide.

### American Railroads—A German View.

III.

Parts of the report of two prominent members of the Prussian Railroad Council who spent several months in 1904 in studying American railroads were published in the *Railroad Gazette* of September 7 and September 28. The first article covered the second chapter of the book published as a result of their studies and the second article part of the twelfth chapter. These two chapters are particularly interesting to American railroad men because they contain remarks of a general character. The following is a continuation of the twelfth chapter of the report:

With a length of 208,352 miles of line at the end of June, 1903, the track length of railroads of the United States amounted to 285,418 miles, or only 1.37 times the length of the mileage worked. The Prussian-Hessian railroads with 19,979 miles of line had a track length of 39,078 miles, or 1.96 times the road length, against a proportion of 1.92 of trackage to mileage on the railroads of the thickest traffic group of the eastern part of the United States with their decidedly higher receipts per mile. More than this the rolling stock of many American railroads is absolutely inadequate, so that the relatively large purchases made in recent years will have to be continued for some time to make up for the necessary amount of equipment.

If it must be acknowledged that the Americans have done admirable work in creating an enormous network of railroads within a period of hardly 60 years, to accomplish which great difficulties had to be overcome, it must also be remembered that extensive land

grants were made free to the railroads and that other assistance was given. These land grants enabled the companies not only to build their roads cheaply, but once in operation, to transform previously worthless land into valuable property by supplying transportation facilities. Through the sale of these lands, their income has often been greatly increased.

In spite of all the mistakes made, particularly in the financial development, the amount of money invested in American railroads on which interest must be paid is even to-day after all improvements which have been made in recent years, considerably lower than the amount invested in German railroads. Nevertheless, examination and comparison of the two countries does not show results unfavorable to the German roads. This is the more remarkable because American railroad experts are of the opinion that many of their methods, in particular the use of large capacity cars in passenger and freight traffic, the frequent renewal of locomotives by new ones of large and better construction and other similar methods differing more or less from German practice, tend to considerably reduce expenses and consequently to increase net earnings. To what extent, by adopting at least in part in our practice American ideas, we would succeed in reducing expenses is hard to say. American railroads have an advantage in this respect in that they pay a comparatively low price for new cars, because uniformity in construction of equipment enables the factories to work economically and therefore sell cheaply. In other words, rolling stock is an article which in America is manufactured en masse. In some branches of American railroading more economical ideas might be introduced. Not all of the expenses of American roads are lower than ours. According to our observations the costs of the traffic service department service and the direct expense of management are particularly expensive, more so than in Germany, in spite of all supposed drawbacks of State's management.

To prove our statement that American railroads do not work with a lower expense account than ours, passenger fares and freight costs must be considered together instead of separately, that is, the receipts coming to the railroad from both passenger, freight and all other sources of income must be grouped in totals. This is particularly necessary in considering American railroads because certain large receipts are artificially separated from the totals, preventing a true comparison between the two countries. While in America one is accustomed to see big combinations for the purpose of concentrated management, the development of some branches of traffic shows the opposite phenomenon. We refer to the operation of those branches of the service which by nearly all American railroads are turned over to the Pullman company and to the express companies. Such a relation even from the standpoint of the management is not free from objection, because the railroad official to a certain extent ceases to be master in his own house and because there can be no doubt that by the double and multiple organization thus created, costs of management for the whole traffic service are essentially increased. We tried in vain to find out why this system was followed. Historical development alone with such a practical people as the Americans would not have prevented the railroad companies from consolidating the different branches of the service if it had proved the more advantageous course; therefore, one is not likely to mistake in supposing that other reasons favor a continuance of the present system. The American railroads apparently do not wish to stop this division of business with other companies. They allow these companies to collect at very high prices direct from the public, and by contracts with them secure substantial advantages for themselves. Thus they not only relieve themselves from carrying certain branches of traffic like first-class passengers and small parcel traffic which require a specially large proportion of operating expenses, but in both branches of traffic they secure for themselves special sources of income which are not possible under the German system of direct management of these services. But who pays the very high bill? The public! And it really makes no difference to the public whether the railroads or the other companies collect the bill. The railroads seem to believe that it gives them a certain moral advantage if they do not come out in the open in this business. The same thing is true in a somewhat different way with the mail service. The rates paid by the Government are much higher than ours, the people must pay them directly in postal charges and if this is not sufficient to cover the expense, indirectly in taxes.

No matter whether railroads be owned by the State or by private companies it is invariably their duty as public institutions to carry on traffic in the safest way possible and to do justice to the traffic requirements of the country which they serve without discrimination. Their traffic should be carried at rates which do not interfere with the public good and which at the same time secure a due profit on the money invested. American railroads have not yet generally succeeded in fulfilling these requirements. Therein will be found the main reason why the American roads have not yet become a homogeneous part of the political and economic life of the country, but are looked upon by a large part of the people as more or less of a thorn in the flesh.

Yet American railroad companies in general do not lack the desire to live up to their duties. It must be remembered that the expenses of the roads are strongly on the increase. If we take into account that for many years large amounts must be spent in improvements in order to serve the public well there seems little chance that the roads will be able to reduce rates. On the contrary, we believe that American railroad companies will have to look in the future to higher rates to maintain their profit. This is already manifest in the rise in freight tariffs. In passenger fares an increase will hardly be possible because they are already very high, especially to the large lower mass of people who travel in Germany at the lower class rates. The average passenger pays much higher rates than in Germany and other traveling expenses are relatively higher.

The endeavor of the State railroads of Germany has for many years been to reduce cost of carrying the freight traffic. Of course, in America, looking at the question from a purely economic standpoint, a gradual increase of freight rates has no such detrimental effect as it has with us. Even if goods become slightly more expensive on account of the increase in rates, America can count on selling its goods at home. Not so Germany. Germany has an enormous population of working people whose large increase in numbers carries with it only a small increase in absorbing power of the products of the country. Germany, therefore, has to depend on export business to support its otherwise superfluous population and keep it from emigrating. An increase in German freight rates would reduce exports. For more than 25 years the freight tariffs of the Prussian State railroads have been moving downward and it is probable that further reductions are to be expected. The American producer, however, will have to submit to a gradual increase in freight rates for the reason that the railroads cannot afford not to keep up with the requirements of their traffic. If they failed to do so industry would severely suffer. The losses which are likely to come to the American people by further increase of freight rates would be lessened if it were only possible to lead the rate policy of American railroads into more even ways. The lack of steadiness, clearness and justice in railroad tariffs still plays an important part in American practice. Certainly the extensive combinations into great systems have brought about a good result in doing away with sudden changes in freight rates, but on the other hand other disadvantages have become much more apparent for which no cure has yet been found. Yet from an unprejudiced standpoint one would do wrong to the American roads in general by denying that as a whole they have made great progress in financial and economic management.

## The Paris Subway.

It would be hard to find a more striking example of triumph due to stubborn perseverance over apparently insuperable difficulties than is afforded by the story of the Paris Metropolitan Railway. The five years, from 1896 to 1901, were consumed in wearisome discussion, mostly provoked by subtleties of party politics between representatives of the state and the city of Paris as to which of these two authorities should control the lines, and whether the lines should be purely local and Parisian or in junction with the great trunk railroads that have their termini in Paris and are partially under state control. Finally, the city of Paris won the day, and, while reserving for itself, except for two lines, for which a supplementary concession has since been granted, all the substructural work such as tunnelling, erection of viaducts, bridges and so forth, it conceded to a joint stock company, largely financed in Belgium, the Paris Metropolitan Railway Company, a thirty-five years' lease for the commercial exploitation of the line and the construction and furnishing of the rolling stock and stations and all the electrical apparatus and building works above ground. A notable spirit of democracy appeared in the terms of the lease and excited much controversy at the time they were promulgated. The company was obliged to grant its employees ten days' holiday each year and a whole holiday each week. If a workman fell ill full wages had to be paid to him for at least a year, and in the event of his being the victim of an accident occurring at the works he was to receive full wages until he had entirely recovered. Workmen who were undergoing their annual military training with the colors were also to be retained on the full payroll. All accidents had to be insured against at the sole cost of the company. Workmen on completion of two years' service were to receive a bonus, and pensions were also fixed on a liberal scale.

The total length of the 8 lines is 77 kilometers, or 46½ miles. The cost was $1,650,000 a mile. When all the lines have been constructed a total of 5,000,000 cubic meters of earth will have been excavated, 2,200,000 cubic meters of masonry will have been built up and 67,000 tons of metal will have been utilized. The average total number of workmen employed week in and week out has been 3,300.

The engineers had a much easier task than the engineers of

either the New York or the London subterranean railway, and they were able to decide in favor of constructing the line at a relatively small distance from the surface. Paris is built on a plain and the general character of the geological strata is sandy or chalky. Where sand is found it is generally fine and nearly always impregnated with water. Owing to the crumbly nature of the ground, due to an extraordinary number of abandoned quarries, dating from almost historic times, nearly all the excavation has been done by hand.

The problem of ventilation is not yet solved. The cutting through of outlets to the surface, as has been recently done at points close to the Rome and Belleville stations, and the building of a tall chimney near the Tower St. Jacques, have not been found especially satisfactory, and mechanical ventilation will probably have to be adopted. There has just been erected a gigantic electric fan near the Ternes station, but the difficulty consists in getting a good regular ventilation, such as would not cause drafts violent enough to blow people's hats off.

Under the Seine the line is situated at a great depth beneath the water, there being at one point 66 ft. between the level of the rails and the earth's surface. This section will pass through steel tubes, which are being lowered into the river bed. The two caissons at the wider arm of the river have already been lowered to the required depth, and preparations are being made for sinking the middle section. In the narrow arm the caisson at the left bank is being lowered, and the sinking of the other, which at present is supported on stocks near the Solferino Bridge, will complete the subfluvial portion of the line. Owing to the wet sand near the Place Saint Michel the subsoil is subjected to a drying process which enables the work to be carried out on solid ground. The engineers hope that the whole enterprise will be completed before the end of 1907.—*New York Tribune.*

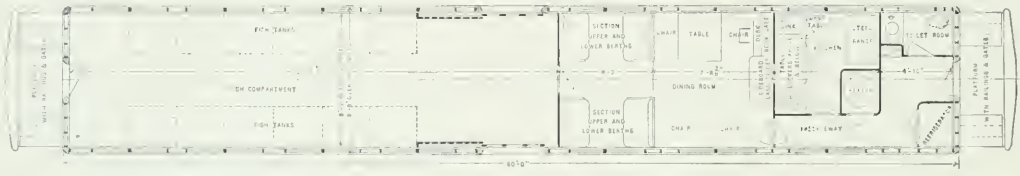
## Car for the Kansas Fish and Game Commission.

A special car built for the Kansas Fish and Game Commission for distribution and exhibition purposes is illustrated by the accompanying engravings. In general appearance it combines features of a sleeping and baggage car, the side doors giving it the latter effect. As the plan shows, it is 60 ft. long and 9 ft. 8 in. wide. The fish compartment occupies a little more than half of the car and the remainder contains the quarters of the Fish and Game Warden and his assistants. The fish compartment is finished in yellow pine sheathing. The fish tanks are galvanized iron incased in yellow pine, and when not in use are covered. For filling the tanks there is a pump driven by a gasolene engine.

The sleeping accommodations of the car consist of four double berths 3 in. wider than the standard. All of the living portion of the car is finished in quarter sawed oak, rubbed finish, and carpeted with Wilton carpet. The dining room has a small extension table and chairs; a writing desk with book-case above, and a sideboard and china cabinet. The sideboard also provides a carving table with two sliding glass doors communicating with the kitchen. The kitchen is complete with steel range, sink, ice chests, dish racks, provision lockers, hot and cold water and other conveniences. There is a refrigerator of large capacity in the kitchen passageway; the Baker heater also opens on this passageway. The trucks are the builders' standard four-wheel design with Schoen 30 in. pressed steel wheels.

The car is to be used by Mr. R. M. Travis, Fish and Game Warden of the State of Kansas, for distributing young game fish for stocking the Kansas streams and small lakes; also as an exhibit car for demonstrating the work of the Commission. Similar cars are used by the United States Fish Commission, and by the State of Missouri, but being the latest, the Kansas car is said to be more

Car for Kansas Fish and Game Commission.




Plan of Car for Kansas Fish and Game Commission.

Fish Compartment in Car.

conveniently arranged and comfortably and completely furnished. The Hicks Locomotive & Car Works, Chicago, are the builders.

The Russian authorities have been called together to plan measures for avoiding a fuel famine, chiefly due to the disturbances at Baku, and threatening still further to limit the efficiency of Russian railroads and river navigation. The production of crude petroleum in the last year reported fell off nearly one-third, or 7,200,000 tons, equivalent to 10,500,000 tons of coal, and the price has risen nearly 10 per cent., in spite of which the explorations for new supplies have fallen off, only 152 new wells having been bored, against 302 the year before. Refined petroleum exports fell off nearly 50 per cent.

### The New President of the Southern.

William Wilson Finley, the new President of the Southern Railway, has had the valuable experience of a training on roads operating under widely differing conditions. He has seen railroad service in the middle South, the Southwest and the Northwest, and has had the past 10 years to apply the knowledge gained in other parts of the country to conditions on the Southern Railway. Mr. Finley was born in Mississippi in 1853, and began railroad work when he was 20 years old as a stenographer on the New Orleans, Jackson & Great Northern, now part of the Illinois Central. During the next 10 years he worked his way up on different southern roads until he was appointed Assistant General Freight Agent of the Texas & Pacific. Mr. Finley retained his position when the road was thrown into a receivership two years later, and was made General Freight Agent in 1886. In 1888 he was appointed General Freight Agent of the Fort Worth & Denver City and other roads comprising the "Panhandle Route," which has since been taken over by the Colorado & Southern. The next year he was made Chairman of the Trans-Missouri Traffic Association, and in 1890 was appointed Chairman of the Western Passenger Association. He spent the next three years as General Traffic Manager of the Great Northern, and then went to the Southern as Third Vice-President. Early in 1896 he returned to the Great Northern as Second Vice-President, but remained there only four months before going back to the Southern as Second Vice-President, where he has been since.

W. W. Finley.

### Four-Cylinder Compound Express Locomotive for the Danish State Railways.

There will shortly be completed at the works of the Hannoversche-Maschinenbau-Actien Gesellschaft, Hanover, Germany, a series of four-cylinder compound express locomotives of an entirely new type designed by Mr. Otto Busse, Director-in-Chief of the Mechanical Department of the Danish State Railways, for working the heaviest and most important passenger train services on the main lines of Denmark. Drawings showing the general construction of the engines are reproduced herewith by courtesy of the designer, and in a succeeding issue we shall hope to publish some details relating to the performance of the new locomotives. The cylinders are arranged in line across the bogie, with the high-pressure cylinders between the frames and the low-pressure cylinders outside them. The high-pressure cylinders drive the crank-axle of the leading coupled wheels and the low-pressure the second pair of coupled wheels and only two sets of valve gear are employed for the four cylinders.

The valve gear is of the Walschaerts type, and piston valves 13½ in. in diameter are used for distributing steam, the steam chests being located above each pair of cylinders in the position shown in the cross-sectional view. The cranks on each side of the engine (one high-pressure and one low-pressure) are set 180 deg. apart and at 90 deg. in relation to those on the opposite side of the engine.

The crank axle has single disc crank webs and the body of the axle between them is of the oblique pattern. Boiler steam is admitted, through a reducing valve, to the low-pressure cylinders when it is desired to temporarily increase the power of the engine to overcome train resistance at starting and on heavy grades.

The boiler has two telescopic rings, the second one tapering out at the rear end to the width of the firebox. The latter is of the wide type with sloping back plate and grate and a deep ash-pan. Two firedoors are provided and a special arrangement of regulator handle connection is fitted with the object of bringing it into a convenient operating position for the driver. The handle and its connections are shown in the rear elevation.

The smokebox is of the extended type, and both it and the cab, which latter is of a very commodious pattern, are arranged on the wind-cutter principle.

The main frames of the engine are of the compound type; partly of bars and partly of solid plate, and the springs of the coupled wheels are equalized with those of the trailing wheels.

The tender runs upon eight wheels, which, however, are not arranged as two four-wheeled bogies with the framing outside the wheels. The axles are set rigidly in the frames with the equalization arranged to work between the front and rear pair of wheels.

These engines mark a decided advance beyond the locomotive standards that have heretofore been in use in Denmark, where machines of a moderate size have been the rule. In this design American, and especially Bavarian, influence is quite marked, and in this connection attention may be called to a few points of resemblance and dissimilarity.

At the front end we find the usual arrangements for coupling, buffing and air connections that regularly obtains in European practice. The smokebox is rather long and the dry pipe leading to it has a diameter of only 5 in. The diaphragm and netting are arranged very much in the American manner, except that the exhaust pipe is given a setback which is very unusual in the United States. From the provision that is made for cleaning, it would appear that this arrangement must be very efficient as a spark cleaner, since the hole back of the saddle seems exceedingly small for any purpose other than the removal of fine dust.

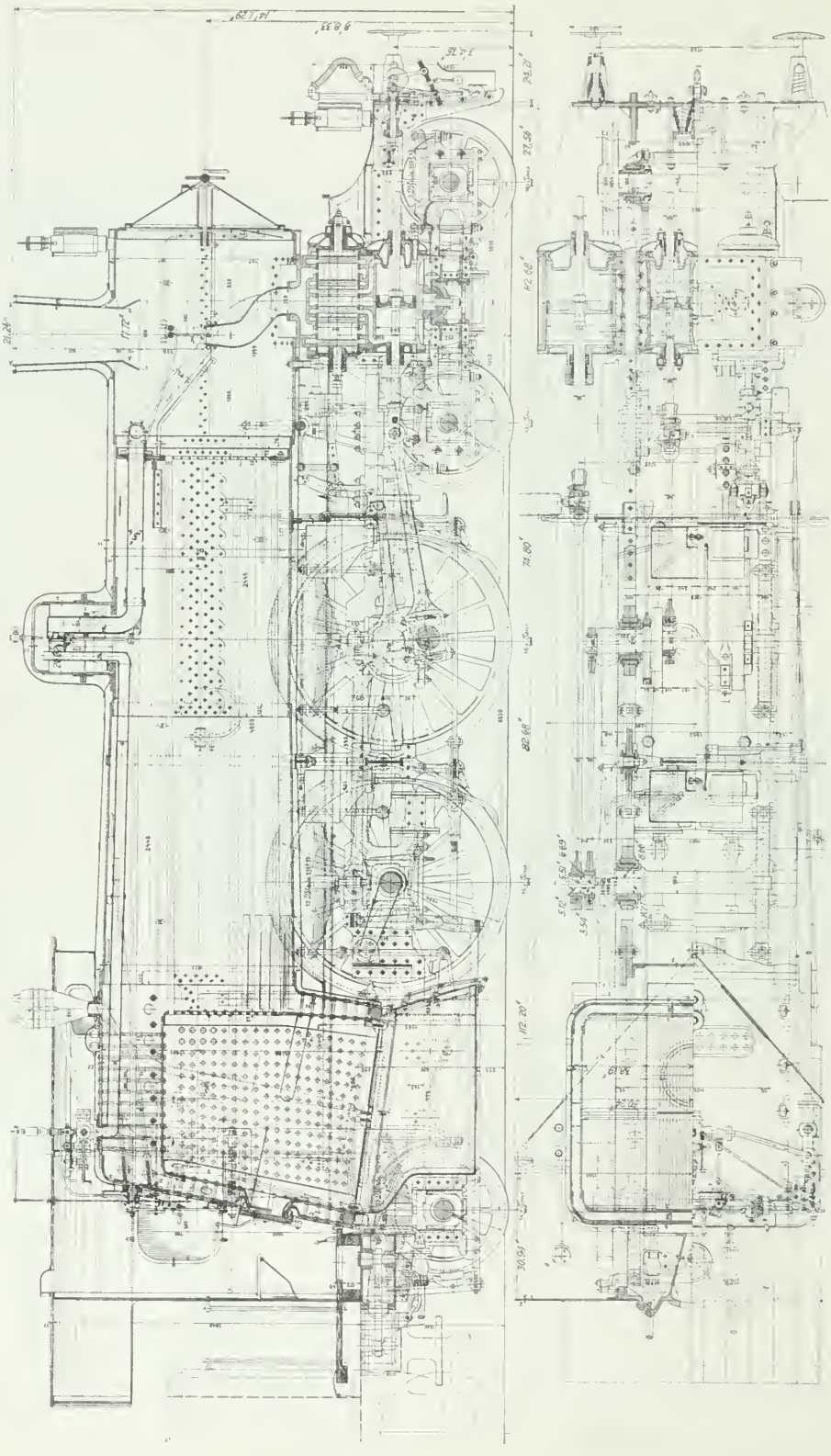
In the arrangement of the Walschaert gear it will be noticed that there is a slight modification from the practice usual in this country. In the first place, the gear is set entirely between the frames and is driven by an eccentric on the crank axle, by means of which a straight line drive is obtained through to the valve. The distributing lever is also arranged to take hold of the valve stem below the pivotal point of the radius bar instead of above it, as in current practice in America. For an inside admission for the high-pressure valve and an outside for the low this involves the raising of the link block for the forward motion, which is done.

The crossheads and guides are also of peculiar construction. Of the general Laird type, the crosshead has a bearing at the top and bottom of the two bars of the guide, passing between them by means of stud bolts, as shown in the cross-section.

Following the working parts back, it will be seen that there is a marked difference in the length of the high and low-pressure connecting rods. The length of stroke is the same (24 in.) in each case, but, as the low-pressure drives the rear and the high-pressure the front pair of drivers, the former has a length of 11 ft. 1½ in. and the latter but 5 ft. 11⅜ in., thus varying in lengths as proportioned to the stroke of from five to a little less than three to one. It will be remembered that this variation was obviated in the case of the Cole four-cylinder engine described in the *Railroad Gazette* for November 9, by setting the high-pressure cylinders ahead of the low and thus securing an increased length of rod. In this case the opposite course is pursued and a shortening of the low-pressure rod is obtained by lengthening its piston rod and by setting back the guides, though it still remains exceedingly long. The forward truck follows the lines of European practice and has separate semi-elliptic springs at each journal box with no equalization.

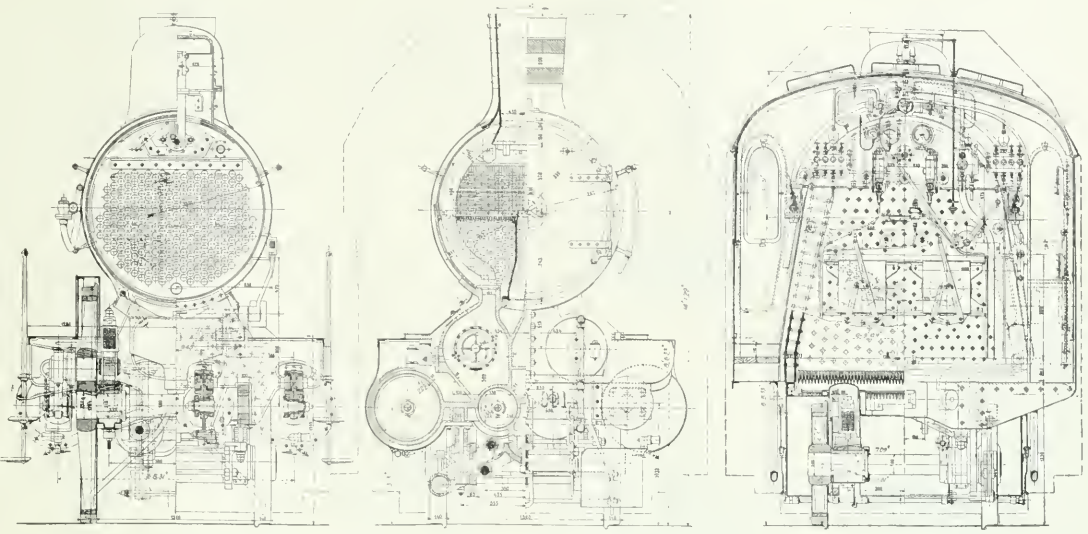
The spring suspension is similar to that used upon American locomotives, in that it extends from the front driver to the rear truck, though there is a difference in the construction of the several details. This is particularly noticeable in the case of the spring hangers, which carry their load through a threaded upper end and nut, setting into a slot in the end of the spring instead of the pin or stirrup used on American engines. Of the two the pin and stirrup construction would appear to be the more secure, while it certainly is the cheaper to make.

In the boiler it will be noticed that the throttle valve is of the sliding type that was discarded years ago in America for the balanced poppet valve. This valve also works against a vertical face instead of on top, as in the case of the old valve here. In riveting the horizontal seams are connected by sextuple riveted



Plan and Longitudinal Section of Four-Cylinder Compound Atlantic Type Locomotive; Danish State Railways.

utt welts, but it will be noticed that the edges of these welts are lbs. In the construction of the cylinders the clearance spaces are
ut away or corrugated between the rivets. This is undoubtedly 16.5 per cent. for the high and 9.4 per cent. for the low-pressure.
scientific method of doing the work as it helps the edges of the The accompanying diagram shows the tractive power rating of
late at approximately the same distance from the rivet holes and the engine for various speeds on different grades. The maximum



End Elevations and Cross Sections of Four-Cylinder Compound Locomotive; Danish State Railways.

hus holds it with a more uniform firmness against the shell plates, tractive effort of the engine is calculated at 18,040 lbs. The for-
nd adds to the efficiency of the calking, but is a refinement that mula used for this calculation is
s not found on American locomotives.

$$T = \frac{1\,(8.4\,d_1^2 + 5.4\,d_2^2)}{D}$$

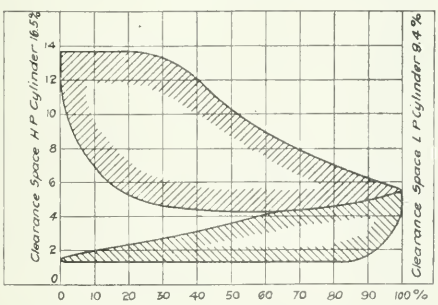
The firebox is approximately a cube. Its greatest dimension in which
s the transverse, where it measures 6.36 ft., with a fore and aft one
f 5.3 ft., while the height at the front is 5 ft. 2 in. This com-
ination is almost an ideal one for securing efficiency of combus-
ion and would be well to imitate where it is possible.

T = the tractive effort.
l = length of stroke.
$d_1$ = diameter of high-pressure cylinder.
$d_2$ = diameter of low-pressure cylinder.
D = diameter of driving wheels.

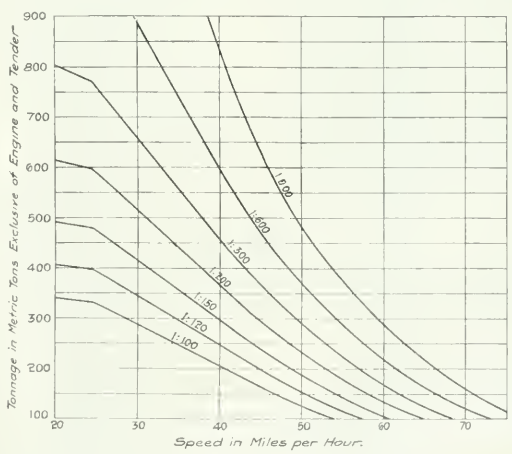
The material of the firebox is copper, about $\frac{11}{16}$ in. thick at
ll points except that portion of the tube sheet where the tubes
re inserted, at which point it is $\frac{13}{16}$ in. thick. This form of
rebox is undoubtedly responsible for the use of the double doors,
hose openings are protected from the abrasion of the shovel by
liner at the bottom. The staying is of the radial type. In con-
ection with the tubes, attention is called to the great amount
f swaging to which they have been subjected by which their
iameters are reduced nearly one-half.

The coefficients of the square of the cylinder diameters are the

In tests that have been made with the engine it has been found
hat the boiler has an evaporative capacity of 18,546 lbs. of water
er hour, with a smokebox vacuum of 4 in., which corresponds to




Maximum Steam Diagram at 50 Miles an Hour.

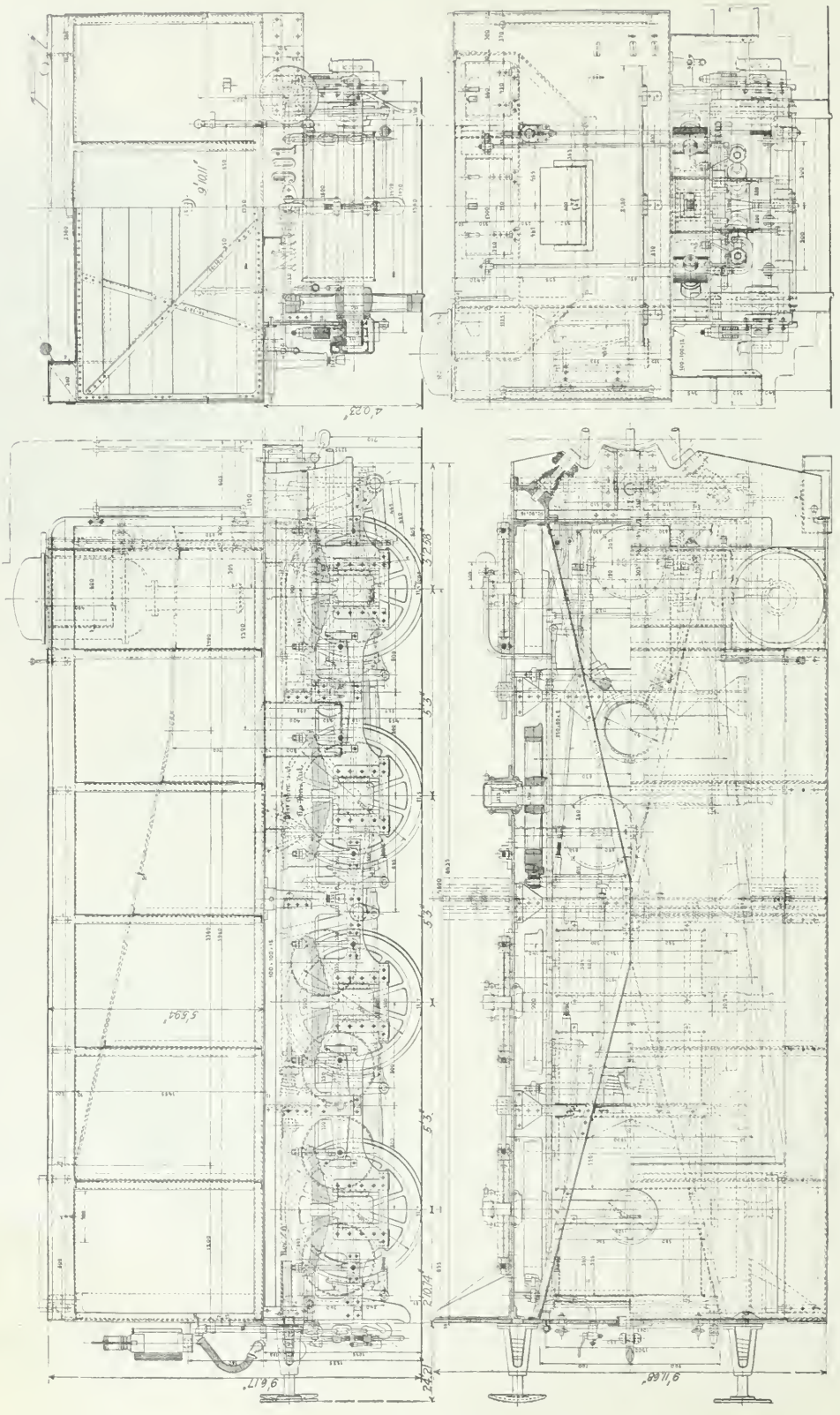



Tractive Power Diagram; Grades as Indicated.

n evaporation of 8.13 lbs. per sq. ft. of heating surface and 534.47 maximum mean effective pressures in kilograms per square centi-
bs. per sq. ft. of grate area. The highest mean effective pressure meter. Converted to English equivalents the formula becomes
n the low-pressure cylinder is 56 per cent. of the boiler pressure,
r 119.28 lbs. per sq. in., and that in the low-pressure is 36 per
ent. of the same, or 76.68 lbs. per sq. in. At 50 miles an hour,
he engine has developed 1,083 indicated metric horse-power on a
team consumption of 17.12 lbs. of water per horse-power hour.
ndicator cards are given as taken at this speed, from which it
ppears that the mean effective pressure of the high-pressure cylin-
der was 44.11 lbs. per sq. in., and in the low pressure it was 17.75

$$T = \frac{1\,(119.28\,d_1^2 + 76.68\,d)^2}{D}$$

This is but slightly different from the formula used on similar engines in the United States, a difference in the coefficients only which does not seem to be altogether dependent upon the ratio of the sectional areas of the cylinders, but upon empirical data obtained with the indicator. On the Danish engine this ratio is as 1



Elevations and Sections of Tender for Four-Cylinder Compound Locomotive; Danish State Railways.

to 2.8, while that of the Cole compound illustrated in the *Railroad Gazette* for November 9 is as 1 to 2.78, or practically the same.

The principal dimensions are as follows:

| | |
|---|---|
| Cylinders high-pressure, diameter | 13½ in. |
| Cylinders low-pressure, diameter | 22¾ " |
| Piston stroke | 24 " |
| Wheels (bogie) diameter | 3 ft. 6¼ in. |
| " (coupled), diameter | 6 " 7¼ " |
| " (carrying), diameter | 3 " 6¼ " |
| Wheelbase, bogie | 6 " 10¾ " |
| " bogie center to center of h.p. drivers | 9 " 8¾ " |
| " coupled centers | 6 " 10¾ " |
| " center l.-p. drivers to c. carrying whls | 9 " 4¾ " |
| " total | 29 " 8 " |
| Centers of h. p. cylinders | 1 ft. 6¾ in. |
| Centers of l. p. cylinders | 6 " 3⅜ " |
| Length of h. p. connecting rods | 5 " 11⅜ " |
| Length of l. p. connecting rods | 11 " 1½ " |
| Piston valves, diameter | 13½ " |
| Boiler, diam (inside front ring) | 4 " 11⅜ " |
| " diameter (inside at firebox) | 5 " 5 " |
| " length between tube plate | 15 " 9½ " |
| " height of center from rail | 8 " 8¾ " |
| " number of tubes | 265 |
| " diameter (outs) | 2¼ in. |
| Heating surface, tubes | 2,054.4 sq. ft. |
| " firebox | 128.4 " |
| " " total | 2,182.8 " |
| Grate area | 34.7 " |
| Tubes, length | 15 ft. 9 in. |
| Steam pressure | 213 lbs. |
| Weight of engine in working order: On bogie | 20.4 tons. |
| On coupled wheels | 32.0 " |
| On trailing wheels | 14.7 " |
| Total, engine | 67.1 " |
| Tubes, number | 263 |
| " length | 15 ft. 9 in. |
| " diameter | 2 " |
| Weight on drivers | 70,400 lbs. |
| " on front truck | 44,880 " |
| " on carrying truck | 52,340 " |
| " total | 147,620 " |
| " of tender in working order | 99,000 " |
| Tank capacity, water | 5,550 gals. |
| Tank capacity, coal | 6 tons |
| Tractive power | 18,040 lbs. |
| Brake | Hydraulic |

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 3.90$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 8.24$$

$$\frac{\text{Tractive power x diameter drivers}}{\text{Heating surface}} = 655.0$$

Equivalent firebox heating surface (Vaughan formula) 678.4

$$\frac{\text{Heating surface}}{\text{Grate area}} = 59.20$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 0.059$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 32.25$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 67.63$$

$$\text{Volume 2 H. P. cylinders, cu. ft.} = 3.98$$

$$\frac{\text{Heating surface}}{\text{Volume 2 H. P. cylinders}} = 548.44$$

$$\frac{\text{Grate area}}{\text{Volume 2 H. P. cylinders}} = 8.72$$

$$\frac{\text{Receiver vol.}}{\text{Volume of H. P. cylinders}} = 1.26$$

## Third Rail Versus Overhead Construction.

At a time when nearly every railroad manager confronted by dense passenger traffic at large centers has electrification on his mind, it seems worth while to print the following comparison of the overhead and third rail systems, viewed solely from the standpoint of their respective dangers and disadvantages. It is quite possible that there may be differences of opinion about some of the points listed. If so, we shall welcome contributions on the subject.

MEMORANDUM OF COMPARATIVE DISADVANTAGES OF THIRD RAIL AND OVERHEAD WORKING CONDUCTORS.

| THIRD RAIL. | OVERHEAD CONSTRUCTION. |
|---|---|
| (a) Hindrance to ordinary maintenance of track. | (a) Inelasticity of construction, which prevents the laying of additional tracks or changes of grade and alinement without requiring radical expensive alterations in the permanent overhead structures. This is one of the reasons why the Baltimore & Ohio R. R. abandoned overhead construction a number of years ago and substituted therefor third rail. |
| (b) Danger from derailments. | (b) Danger from derailments knocking down a supporting structure, which would affect not only the track upon which the derailment occurs, but also all other tracks on |
| (c) Increased difficulties of wrecking due to inability to throw the wrecked equipment to one side. | (c) Increased difficulties of wrecking due to crane boom interfering with overhead conductors. |
| (d) Interference with piling snow between tracks due to presence of third rail construction. | (d) Danger to trainmen on tops of cars. |
| (e) Other objections have been made as, for instance, troubles with snow and sleet, complications at frogs and switches, difficulties of current collection and great danger to employes and trespassers. Extended experiments have proven the fallacy of these objections, provided the rail is properly designed and protected. Objection has also been made to the use of the third rail because of the interference with the clearance lines of equipment, but inasmuch as several trunk line railroads have already adopted third rail so as to fix the standard outlines of equipment, other railroads must naturally adjust the outlines of their equipment to the clearance diagram that has already been adopted to fit third rail conditions, in order that traffic may be interchanged. | (e) Danger to the public at overhead street and highway bridges, especially with 11,000-volt current. |
| | (f) Danger to trains in tunnels, at low bridges and at other places with restricted clearances, owing to the possibility of rearing cars in cases of derailment, making contact with the highly charged 11,000-volt working conductor. |
| | (g) Danger to trains where the overhead conductor, carrying, for instance, 11,000 volts, is within two or three feet of moving cars. In the City of New York, for instance, the public authorities have even taken a decided stand against wires carrying high voltage on transmission lines remote from the track. |
| | (h) Corrosion due to freight locomotive gases. This is a very serious item, as the corrosive action of sulphurous gases not only causes a rapid deterioration of steel overhead structures, but also requires expensive annual scraping and painting. This item also carries with it the danger to painters and others engaged in cleaning, painting and repairing structures over tracks in constant operation and in close proximity to 11,000-volt conductors. |
| | (i) Interception of the view of signals by motormen and enginemen where dips in the grade of the railroad cause the overhead bridges to interfere with the view of the semaphores in advance of the foot of the grade. |
| | (j) Interference with the enginemen's and motormen's view of signals due to the truss members of the overhead transmission bridges acting as a bad background for semaphores. |
| | (k) Danger to signalmen in maintaining the signal structures on the lower side of the overhead transmission bridges carrying 11,000-volt conductors. |
| | (l) Legal obstacles to overhead construction, as, for instance, on the Park Avenue viaduct, and refusal of city authorities to grant permits. |
| | (m) Soot from freight steam locomotives depositing on overhead insulators, entailing heavy expense and interruption of traffic during the time required for cleaning insulators to prevent short-circuits. |

## Report of President Harriman on the San Francisco Disaster.

The following report, published as an appendix to the annual report of the Union Pacific recently issued, was made to the Board of Directors of the Southern Pacific Company by President Harriman on October 4, 1906, covering the San Francisco earthquake and fire:

TO THE BOARD OF DIRECTORS SOUTHERN PACIFIC COMPANY:

An earthquake occurred at San Francisco, on Wednesday, April 18, 1906, at 5:15 a. m. (8:15 a. m., New York time). This was immediately followed by a number of fires in the business and lower sections of the city, which rapidly spread into a general conflagration that could not be checked on account of the breaking of the water mains, which cut off the water supply. The fire raged for three days, and was not brought under control until the night of April 20, when the people succeeded in stopping the progress of the fire towards the Western Addition, at Van Ness avenue and Franklin street. The homes of at least 200,000 people were burned, and the ordinary sources of food supply for the city cut off, so that it became necessary to furnish food for practically the entire population of San Francisco, to improvise temporary shelter for those whose homes were burned, and to carry away large numbers of people fleeing from the city.

Reports of the disaster were received in New York about 9 a. m.

(New York time), and immediately telegrams were sent to the officers in charge of the Southern Pacific and Union Pacific Systems directing them to act quickly and to co-operate with the officers in charge at San Francisco in doing all that could be done to relieve the distress and, before the day was ended, all the forces of both systems were actively co-operating in the relief work. In order that I might give personal assistance and encouragement, I left New York on the morning of Thursday, April 19, and arrived at San Francisco on Sunday, the 22d.

Relief supplies, consisting of food, medicines, medical appliances, and other articles needed in the emergency, were immediately collected in the larger towns and cities on the System and moved rapidly towards San Francisco, so that their delivery to the several distributing places in San Francisco was begun on the evening of April 18 and thereafter continued, so that it may be said that no one needed to be in want of food, and that everyone was able to secure some shelter after the first night. To expedite the delivery of supplies, the number of cars, not only those originating on our own lines, but also cars tendered by connections, was limited to 10 or 15 per train, so as to make passenger train time. This service was continued until advised from San Francisco that a sufficient quantity had been received to provide for immediate wants; thereafter they were carried on regular fast freight trains. In the 35 days following the disaster over 1,600 carloads of relief supplies and over 224,000 passengers were carried free. The company not only gave freely this important service, but the interruption to its regular passenger and freight business was naturally very great, and this, of course, added largely to the expense of taking care of the situation.

The Trans-Bay steamers maintained their regular 20-minute schedules between San Francisco and Oakland, with the exception of a few hours when it was reduced to hourly service because of the impossibility of obtaining fresh water for the boiler supply of the boats. After this short interruption, the usual 20-minute service was resumed and regularly maintained thereafter. The local train service connecting with the boats was also regularly maintained, and although very large crowds were handled, which taxed facilities to the utmost, no accident or injury occurred. In view of the fact that this extraordinary disaster was encountered without warning and under circumstances of great excitement, it is almost miraculous that such a large traffic could be handled under these trying conditions without serious injury to any person. Such a result is certainly the highest proof that could be had of the ability and efficiency of the men in charge of this work. On April 19, the day of heaviest travel, 1,073 carloads of refugees were transported. On the 20th, nearly as large a number were carried, and the movement continued extremely heavy until April 26, when, on the suggestion of the Mayor, the General of the Army, and the Citizens' Committee, unrestricted free transportation was discontinued. In addition to the free service performed by the regular ferry steamers, the company sent its river steamers and extra ferry steamers to take passengers from outlying wharves and landings to the eastern side of the Bay.

Information bureaus were established on the 20th and the 21st at nine points in the city, served by horseback riders, who posted notices advertising free service and particulars as to movements of trains and relief work, inquiries about missing people, statements of accommodations, relief provided by outside cities, etc. In the destruction of power houses and street car tracks, automobiles furnished about the only means of communication. Gasolene for these vehicles was furnished from the company's stores as long as the supply lasted, and the assistance thus rendered to relief committees, physicians, military and civil authorities was highly appreciated. Explosives were issued free from the company's stores on request of the San Francisco Fire Department. Three of the company's steamers were placed at the disposal of the Quartermaster's Department to handle relief supplies and they remained in service without charge until May 26. All of the company's shed facilities in San Francisco were tendered for the immediate relief of the homeless. A number of teams engaged in the construction of the Bay Shore line were turned over to the Government to be used in hauling supplies; the wages of the teamsters were paid by the company. Temporary tracks were laid on request of the city authorities on a great many of the paved streets, for the purpose of removing debris and hauling in material for rebuilding.

Fortunately the fire was checked on the side of the street opposite the company's freight terminals. Its general hospital, a modern and thoroughly equipped building, was burned; its 150 patients, many suffering from severe injuries, were all safely removed under the immediate charge of the Chief Surgeon and his staff and were accommodated in hospitals in nearby cities. In the two days during which the fire was burning towards the hospital, over 250 injured persons were given free attention. The Chief Surgeon and his entire hospital staff, including the nurses, left the hospital only after the removal of the injured, and when there was no longer any possibility of saving it. Some of them remained on duty until they fainted from exhaustion. The Surgeon of the Union Pacific at Portland, and 39 nurses, were taken to San Francisco and gave their time to the care of the sick and injured. The old general office building on Fourth and Townsend streets was destroyed; also the general offices in the Merchants' Exchange Building, with most of the books, vouchers, accounts, records, etc.

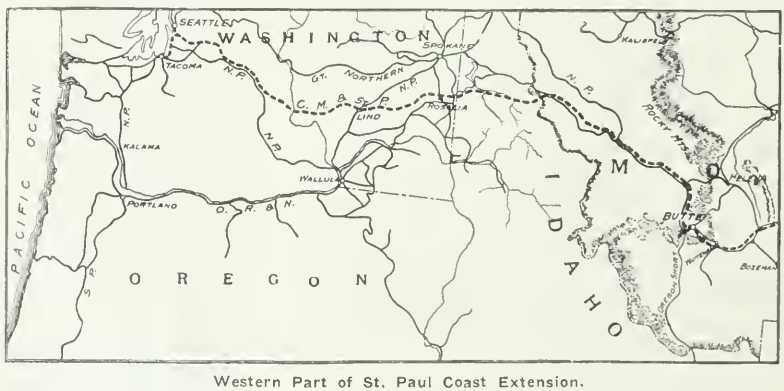
I commend to the Board, the officers and employees of the company in all departments as deserving praise for duty well and faithfully performed, particularly those who remained on duty at a time when their homes and families were exposed to the dangers and terrors of the earthquake and to the subsequent dangers from the flames, whose progress it seemed impossible to arrest. Had it not been for the work of the Southern Pacific Company, the loss of life would have been much greater. The official report shows the loss of 425 lives, although the lives of over 500,000 persons were endangered. The officers and employees of the company deserve the highest commendation for the maintenance of its service, which afforded the means to bring food and necessary supplies to the city and to carry from the city people who found it necessary to go to other places for refuge. The perfect discipline maintained by the working staff of the company reflects most highly on its organization, and the prompt and efficient service rendered contributed largely to the feeling of courage and confidence with which the people of San Francisco faced this calamity.

While the company has done much to relieve this situation, much remains to be done before the city can be rehabilitated. It should be not only the duty but the pleasure of the company to continue in all legitimate ways its assistance in restoring and rebuilding the city. Although the expense of the free service rendered and the loss caused by the interruption in the regular movement of traffic on the lines of the Southern Pacific and Union Pacific Systems were great, I authorized an additional expenditure of $200,000 for relief work and I now ask your approval of this appropriation.

(Signed) E. H. HARRIMAN.

## The St. Paul's Pacific Extension.

A map and brief account of the route to be followed by the first 731 miles of the new line of the Chicago, Milwaukee & St. Paul to the Pacific coast, from Glenham, S. Dak., to Butte, Mont., was given in the *Railroad Gazette* of September 27. This line will cross the Missouri river 12 miles west of Glenham on a bridge of three spans of 425 ft. each, with steel trestle approaches 1,300 ft. long on the east and 125 ft. on the west side. The track will be about 60 ft. above high water. The piers will be concrete faced with granite and excavation for their foundations will be made by pneumatic process. The superstructure will contain 3,750 tons of metal, for which the contract has been let to the Pennsylvania Steel Company. Its erection, and all pier construction, will be done by the bridge department of the railroad.




Western Part of St. Paul Coast Extension.

From Butte, at the foot of the west slope of the continental divide, the line is to follow the Deer Lodge, Hell Gate, Missoula and St. Regis rivers to a point about four miles west of Saltese, Mont., where the ascent of the Bitter Root mountains begins. St. Paul Pass, the summit, is reached at an elevation of 4,200 feet. A tunnel 8,500 ft. long is necessary in crossing this range. The

line follows the drainage of the St. Joe river to within a few miles of its mouth, and crosses the Idaho-Washington state line just east of Tekoa, Wash. The route between Saltese and the mouth of the St. Joe river is heavily timbered with white pine and cedar.

From Tekoa to the Columbia river a fine agricultural district is traversed, the eastern part of which is well settled. The Columbia river will be crossed by a bridge of 15 spans, with a total length of 2,750 ft., exclusive of steel trestle approaches 1,000 ft. long at each end. The steel in this structure will weigh 40,000 tons. The grade line is 80 ft. above low water. The bridge will have concrete piers.

At Johnson Creek Summit, about 20 miles west of the Columbia river, there will be a tunnel 3,400 ft. long, and at Snoqualmie Pass there will eventually be a tunnel about two miles long at a maximum elevation of 2,569 ft., but for the present operations through the pass will be on a surface line at a maximum elevation of 3,010 ft.

Great forests of fir, red cedar and other valuable timber are tributary to the line between the Columbia river and Puget Sound. At Maple Valley, Wash., connection is made with the Columbia & Puget Sound Railroad, over the tracks of which access is to be obtained to the terminal property purchased at Seattle. A new line will be built from Black River Junction, Wash., to Tacoma, where also a large amount of terminal property has been secured.

The line from Glenham to Butte is under contract to McIntosh Brothers, of Milwaukee. The Bitter Root tunnel and approaches for 2½ miles on each side are being built by Nelson Bennett, of Tacoma. The line between the Bitter Roots and the coast is under contract to H. C. Henry, of Seattle. All steel bridges and trestles will be erected by the bridge department of the railroad.

Grading is completed and track laid from Glenham to a point about 20 miles west of the Missouri river, crossing being made on a temporary pile bridge. Much grading has been done in the Yellowstone and Musselshell valleys, and sub-contracts have been let and forces are at work upon the rest of the line. It is expected that the construction will be completed to Butte by January 1, 1908, and to the coast a year later.

## Small Vertical High-Speed Engines.*

To most people, a small engine is something to be avoided if possible. It generally requires constant attention, frequent adjustment, is extravagant in steam consumption, and is difficult to get at to adjust or repair. The main object of most manufacturers seems to be to see how cheap an engine can be built, not how good. This condition has so long prevailed that most people have concluded it is impossible to build a small engine from which the same results can be obtained as from a large one. The troubles to which small engines are incident are commonly accepted as a necessary sequence to their operation.

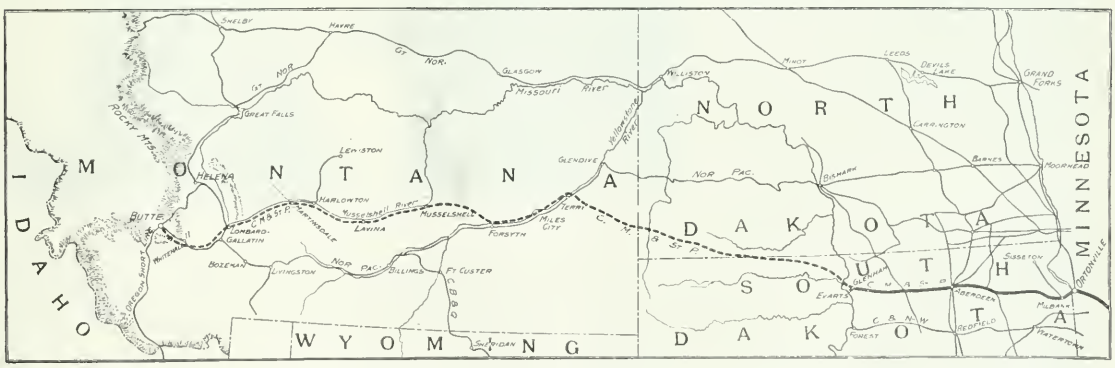
Efforts have been made to mitigate these evils by various schemes in design and lubrication, but usually the designer became so wrapped up in the one particular feature which started him into the design, that he lost sight of the other and more important details, never after being within speaking distance of them. For example, one designer may start out to overcome vertical vibration, having a notion that in a multi-cylinder, single-acting engine there is less tendency to this vibration than in a single-cylinder, double-acting engine. An idea comes to him that if he could get compression on the downward stroke so as to slow up the movement of the reciprocating parts before they reach the end of the stroke, the necessity for heavy counterweights would be removed and a smoother running engine would be the result. So he sets out to accomplish this one thing, and very likely thinks out some scheme by which to introduce air compression toward the end of the downward stroke. He becomes so fascinated with this idea that all other details are almost totally neglected. It would be fruitless for any one to attempt to make him see that the same thing can be accomplished in a double-acting engine with a properly designed valve, so as to get the right steam compression at the end of the stroke.

Another designer starts out to build an engine with some "freak" valve, and every other detail is worked around this one central idea, regardless of efficiency. Several have tried to reduce lubrication troubles, principally by splash oiling, with more or less success. If an engine is always in one position and always runs at high speed, this system may give fairly satisfactory results, but it is unreliable on board ships and at slow speeds. Furthermore, it is extravagant in the quantity of oil consumed. These examples will serve to show the usual trend of effort for the improvement of small, vertical engines.

From experience and close observation it was decided that fully 80 per cent. of the small engine troubles are due to improper lubrication; whereas only about 10 per cent. are due to inadequate proportions and finish of the working parts, and the other 10 per cent. to the neglect or ignorance of the operator. It will thus be seen that if such conclusions are correct, the efforts of most of the designers have been in the wrong direction; that greater attention should be paid to proper lubrication and refining some of the details than to the production of something entirely new, with which there are likely to be as unsatisfactory results as before. Anything radically new is more likely to be misadjusted by the average engineer than something built on lines with which he is perfectly familiar.

Being satisfied that these conclusions and deductions were correct, it was decided to carry them into effect, if with no other result than to prove their fallacy. To get away from any fixed notions, and to gain new ideas from the practice of others, and, further, to give "an opportunity to criticise somebody else," an engine designer of long experience in some of the best shops in this country was engaged. Before him were spread these ideas, also what he was expected to accomplish. This briefly was as follows:

(1) An engine that could be sold with a guaranty that it would run three months or more without requiring any attention, either to the oiling system or for adjustments, except the filling of the sight feed cylinder lubricator; (2) an engine that would be economical in the use of steam and oil; (3) that could be easily adjusted and not liable to easily get out of adjustment; (4) that could be used anywhere and for any purpose that an engine can be used for; (5) that had ample bearing and wearing surfaces to make it long lived and unlikely to overheat at full load; (6) that it should be constructed of the best materials for the purpose intended; (7) that it should be devoid of any semblance to "freaks" of every sort, and last, but not least, and, perhaps, the most difficult of all, it must not be so costly to build as to make the selling price prohibitive to the average buyer.




Map Showing the Eastern Part of the St. Paul's Pacific Extension.

*Condensed from a paper read before the Detroit Engineering Society by F. R. Still, Member of the Society, and printed in the Journal of the Association of Engineering Societies.

Being thoroughly impressed with the importance of a good system of lubrication, the first step was to work out something more effective than previously used. It does not take much thought to arrive at the conclusion, that if metal does not run on metal, but is always separated by a heavy film of oil, there can be very little wear. The problem then settles down to the production of the necessary heavy film.

In looking over the many systems for lubricating engines, the most rational seemed to be forced lubrication by means of a pump. But experience shows this has many defects. The oil be-

ing under pressure necessitates extreme care in adjustment, as any bearing being looser than another vents the entire system and destroys the desired effect. Again, any foreign material that may get into the small tubes or grooves which are an essential part of this system will be rammed in tight by the oil pressure. To overcome these objections it was decided to adopt a gravity flow, the oil being lifted by a pump to the top of the frame, from which elevation it would flow downward by gravity. In this way large tubes can be used; the velocity of the oil will be rapid, the volume of oil in circulation will be much greater, it will not be necessary to have the bearings tight, neither will they all have to be adjusted exactly alike, and any foreign matter will be washed out, instead of being rammed in.

Being satisfied that this came close to the ideal way of producing the flow of oil, the next step was to distribute the oil along the bearing and wearing surfaces to completely separate them by that all-essential film. For ages it has been common to groove the upper or lower half of the journal box or perhaps both. There are as many ideas on the proper way to groove a box as there are people in the business, and there are evidently many more who have no ideas at all, judging from the way it is sometimes done.

Considering the question from a mechanical standpoint, it is at once apparent that an oil film takes up space, so a bearing cannot be tight or the oil cannot get in unless it is forced in at a pressure greater than is exerted on the journal. The thicker the film, the more space there must be between the metals, hence a loose bearing is desirable if it does not cause pounding. When the crank is on the downward stroke, it pushes the journal away from the upper part of the bearing. The shaft is also rolling in the direction the crank is traveling. Hence, the oil should enter at the beginning of the gap which intervenes between the shaft and bearing and thence be rolled up into the remaining space by the rotation of the shaft. The gap naturally begins at one side of the circumference of the shaft, so the oil grooves should most naturally be on the sides. After the crank passes the lower center on the up-stroke, oil should flow in from the groove on the opposite side in the same way. These grooves can thus be made large, say, from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. in width, and the whole length of the bearing metal. The same scheme is applicable to the oiling of the main bearings, crank-pin, crosshead pin, eccentric and governor weight pin, and it works to perfection, better even than was ever thought possible.

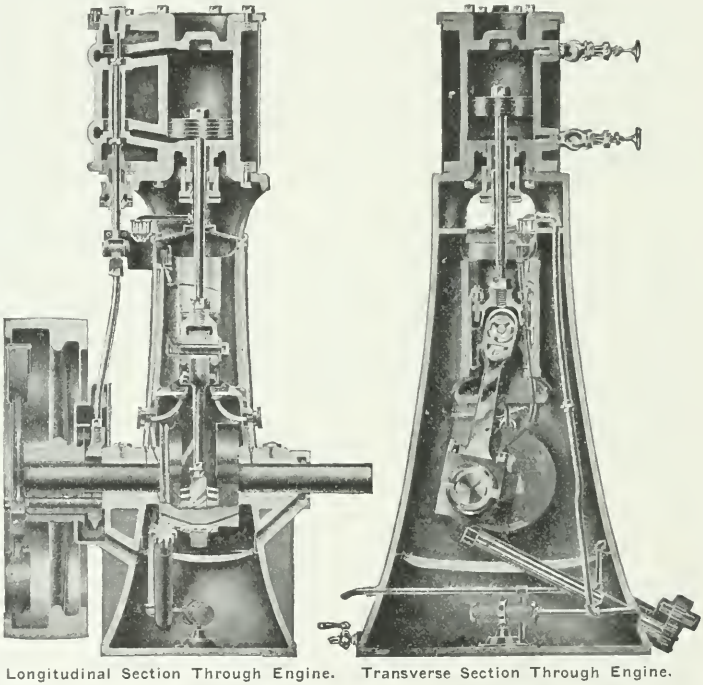
There were many other problems in the perfection of this system which had to be worked out, that were, perhaps, equally as interesting in connection with this oiling system. For instance, after the oil has performed its usual functions it must be filtered, cooled and the water separated from it. Any of the usual methods of filtration were found unreliable, as they all allow pieces of lint or grit to pass through. After much experiment it was found that a plain closely-woven cloth suspended by four hooks from each corner of the frame, hanging just below the crank and above the oil in the base, gave the best results. All the oil dripping down from above lodges on this cloth and passes through to the reservoir below. Any foreign matter is left on top and has no tendency to leave the upper surface. Simple as it is, it has been surprisingly effective. As an extra safeguard a fine copper wire screen of ample area was attached to the pump suction and another to the discharge, both being easily removable for cleaning.

Another source of possible trouble which had to be guarded against is the loosening of core sand from the frame. No matter how much care may be exercised in cleaning a casting, some sand is sure to stick for a while, loosen later and cause serious trouble. To prevent this the frame is painted inside with two coats of thick white enamel. It took a lot of experimenting to get an enamel that would stand the heat, moisture and oil without softening, but it was finally procured.

The pump first adopted was of the plunger type, actuated by an eccentric on the shaft. It was thought too complicated, however, and was abandoned for a gear pump. On the shaft is a large bronze worm with coarse teeth into which meshes a small spur gear attached to a shaft supported at an angle of about 45 deg. The pump gears are within a case attached to the outside of the frame close to the bottom of the base, where they can be gotten at at any time. The discharge pipe from the pump is 0.75 in. diameter, and extends up inside of the frame to the top, where it discharges through a sight-feed glass, so the engineer can easily see if the oil is flowing properly. The oil then empties through a wire screen into a small tray, through the bottom of which latter project the various oil tubes nearly to the top of same. Each tube has a fine slit cut down the side of it to the bottom of the tray, so as to equalize the flow of oil into them all. In adjusting the engine for this system no bearing should be so tight as to make it impossible to easily slide the connecting rod or shaft along parallel with its axis.

The success attained with these engines, while largely due to the perfection of the oiling system, could not have been attained if it alone had been the only thing carefully developed. First of all, good material of the proper kind has to be used, and all the pins, rods, shafts, piston, valve, crosshead shoes, etc., must be ground on centers to a true diameter and smooth finish. The shaft is a forging with suitable counter weights fastened on. The connecting rod is a drop forging finished bright. The crosshead is cast steel having brass shoes, wedge shaped and adjustable at the top and secured with lock nuts. The crosshead pin is a special composition of a very fine grain and hard enough to take on a very smooth finish. This pin in combination with the brass used will not cut. The brasses have been set up as tight as they could be driven on a dry pin and the engine run all day without the least signs of cutting.

The piston rings are roughed out, cut, drawn together and clamped. They are then ground to the cylinder diameter. The crank pin brasses are lined with the best quality of babbitt metal, pened in and scraped to a perfect surface. Adjustment of these brasses is accomplished by two tap bolts turned out of hexagon steel, threaded on the lower ends. Above the nuts the tops of the bolts are turned down to a smaller diameter and threaded again for a lock nut. The two tops are joined together by a yoke-shaped washer which is between the nut and lock nut to prevent either of the bolts working out if one of the lock nuts should loosen.



Longitudinal Section Through Engine. Transverse Section Through Engine.

The flywheel is so designed that the greater part of the weight comes in a plane close to the end of the bearing, thereby relieving to a great extent any strain on the shaft. The inclosing panels are held in place by a single milled thumb screw, thus overcoming the necessity for taking out a dozen or more screws to get off the cover plates.

Every engine is set up, given a day's run under full load, and then taken down, carefully inspected, and if found in a satisfactory condition is reassembled, indicated and adjusted before leaving the shop.

Due to the high speed, small clearance and a well-fitting valve and piston, the steam consumption has been brought down to an average of less than 37 lbs. per h.p.-hr. for a 6-in. by 6-in. engine, with 100 lbs. pressure, when running 500 r. p. m. with full load. It is rare that the same economy is attained with other engines of the same size, as most of them take from 60 to 80 lbs. per h.p.-hr.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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VOL. XLI., No. 25. FRIDAY, DECEMBER 21, 1906.


That the people in some towns of North Dakota are so short of fuel that they are near freezing, and have had to use up good new lumber for fuel, must be known to all our readers, for it has been one of the chief news "features" from Washington throughout the past week; but from the St. Paul despatches the distress seems to be just like what has been reported in past years, when our centralizing government at Washington was less benevolent than now. The distress is real, and in places alarming. We do not minimize it. But the trouble is in not stocking up with fuel before winter sets in. The railroads, justly or unjustly, lay the blame for this chiefly or wholly on the coal merchant; but as the railroads are the servants of the people President Roosevelt will probably ask them to supply themselves with enough cars and engines to carry the coal whenever it is offered. There are two serious difficulties with this scheme. If the railroads are unwilling it will be very hard to enforce; and, secondly, no amount of willingness can cope with a North Dakota blizzard. Not even the warm sympathy that radiates from the White House could have thawed out a path for a coal train over parts of the Great Northern on some days last week. The only practicable thing for the railroads to do toward averting fuel famines would be to make the rates on coal lower in the summer and fall. We should think that the railroads would do this voluntarily, though they could do so probably only at the expense of the grain traffic. If the Interstate Commerce Commission is going to try to carry out the President's wish and "do something" for the freezing farmers we suggest this plan; though we admit that it involves the assurance by a paternal government in the fall that the rates certainly will go up in December. How to do this with fairness we have not yet discovered. Our government has tried to do almost everything with railroad tariffs, but it has not made much headway toward forcing the published rates up.

The present grievances in the Northwest are clouded by being mixed up with another complaint, the lack of cars to carry grain to market. Here again true economy in transportation demands the distribution over months of traffic which the shippers desire to crowd into a few weeks. Mr. Hill has given the public and the government a few bits of cold logic on this point, which cannot be gainsaid. The railroads will, no doubt, continue to try as hard as they can to satisfy the grain shippers by buying new cars and engines, even at a sacrifice of economy in operation. The fact of this sacrifice of economy could be made plain, we think, even to the shipper who believes that the railroad oppresses him. Economy of transportation will, of course, often conflict with the interest of the grain seller and there must necessarily be concessions on both sides. The trouble is that there is no authority to decide which side should make the concession in any given case. Here is a chance for the Interstate Commerce Commission to do some useful philosophizing. What the railroads of the Northwest are doing just now is indicated by some of the replies of the railroad presidents to President Roosevelt's request, made through the Interstate Commerce Commission, that they hasten to relieve the distress. We quote:

Mr. Pennington (Minneapolis, St. Paul & Sault Ste. Marie): There is no blockade of freight or shortage of cars on our lines west of Minneapolis, except what is due to very bad blizzards in the last few days. You can rest assured we would exert every effort possible to relieve any suffering there may be on our line.

Mr. Harris (Burlington): We will endeavor to comply and furnish prompt and satisfactory service, and be much pleased to have any suggestions you will kindly make. There has been no general or protracted shortage of cars or condition of traffic on the Burlington road. Every year there is some car shortage and some congestion due to the fact that shippers, especially of coal, have little or no provision in the way of storage, and always decline to anticipate their orders; consequently there is a general demand for coal at the first real cold weather. We have been able to transport coal for all our customers with reasonable promptness, and to do something in the way of furnishing cars and transporting coal for other railroads. If there is any specific complaint on the Burlington road at present, it has not been made known to the officers of this company.

Mr. Hughitt (Chicago & North-Western): The Chicago & North-Western is not failing at this time, nor has it at any time failed, to furnish cars and to move them with reasonable promptness, both for fuel and other commodities. * * * I have during the last three weeks been in frequent communication with the Governor of South Dakota on this subject.

Mr. Hill (Great Northern): The coal scarcity in North Dakota is not due to want of cars. Thousands of empty cars have been moving from the head of Lake Superior to the grain fields during the fall, and coal ordered by local dealers has only been sufficient to supply from day to day. During the last two weeks there have been very heavy snow storms, with thermometer below zero. Snow drifts around stations from 6 to 15 feet deep have temporarily blocked railroads. Special trains of coal having right of way over all other traffic are being sent, and road is being opened as fast as conditions will allow. The fuel difficulty is temporary, and is being rapidly remedied. The general condition applying to all traffic is due to the rapid increase of tonnage to be moved. * * * Inability to secure labor at any price has badly delayed the completion of additional main tracks and terminals. We have orders for new locomotives to be delivered between now and June 1 for

25 per cent. increase in capacity and 6,000 freight cars to be delivered between January and September; capacity of the latter, 280,000 tons. We are now arranging for $60,000,000, covering next two years, to provide additional tracks, terminals, equipment and new lines where traffic is heaviest.

Mr. Earling (C., M. & St. P.): There has been no deficiency in car supply upon the lines of the Chicago, Milwaukee & St. Paul greater than usually occurs during the heavy fall movement of crops eastbound and merchandise and fuel westbound. The motive power of the company has been sufficient to move all traffic promptly. There has been no failure or unusual delay in transporting fuel or other necessaries of life. Movement of fuel has had preference over other westbound traffic for the past forty days, and such preference will be continued so long as necessity may exist.

Mr. Elliott (Northern Pacific): Our company has done and will continue to do all that it can to prevent suffering. The company realized in June and July last that the fuel supply was likely to be inadequate and that the great increase in general business would probably produce a congestion in the autumn. We therefore urged all dealers at time to look ahead and provide a stock of coal early and to try to find new sources of supply. For a month particular attention has been given to the movement of coal, and that commodity is now being given preference both as to cars and service. We have in a number of cases turned over company coal to protect local demands, and we are doing everything we can to take care of the situation, and will continue to do so.

## NEW CAPITAL FOR RAILROADS IN THE NORTHWEST.

Within the space of less than a week the two great Pacific Coast railroads in the Northwest and the road which is shortly to share with them control of the transcontinental traffic of that territory have announced large increases of their capital stocks. On December 11 President Hill of the Great Northern, in a circular to stockholders, announced that the company would issue $60,000,000 additional stock at par to stockholders to the extent of 40 per cent. of their present holdings. This will increase the outstanding stock from about $150,000,000 to $210,000,000. Three days later President Elliott, of the Northern Pacific, made public the terms of a new issue of $93,000,000 stock to be issued to stockholders at par to the extent of 60 per cent. of their holdings. This will increase the outstanding stock to $248,000,000. An additional $2,000,000 to be authorized will raise the total authorized capital to $250,000,000. On Monday of this week came the third of these announcements to the effect that the Chicago, Milwaukee & St. Paul would immediately issue something over $66,000,000 preferred and $33,000,000 common stock, which will bring up the total amount of both classes of stock outstanding to about $232,000,000. The Great Northern and Northern Pacific have only one class of stock outstanding. The St. Paul common and preferred issues are practically of one class. The total share capital stock of the Great Northern is therefore increased by 40 per cent., of the Northern Pacific by 60 per cent., and of the St. Paul by 75 per cent. The proceeds of the new stock issues of the two Hill roads are to be used principally in extending their facilities now overburdened by a tremendous rush of traffic. In other words, the new capital is to enable them to keep up with the wonderful and increasing prosperity of the Northwest. The St. Paul issue is to do the same thing in another way. It is the long expected financing for the Pacific Coast extension, a project which would never have been undertaken at all if the Northwest had not shown such great prosperity and resources. The St. Paul management is said to have figured that to build 1,500 miles of new main line in the Pacific Coast extension, together with 500 miles of branch line feeders, will cost $75,000,000, which is at the average rate of $37,500 per mile. In all probability this estimate will prove to be too small; the extra $25,000,000 of stock is to cover such contingency. Each of these three stock increases appears to be a necessary and useful extension of its resources by a great railroad company, which will result, not only in benefits to the road and its security holders, but as well in the great upbuilding of the territory served.

Since the increases can, in each case, be easily justified, either from the necessary and important betterment and extension of transportation facilities or to pay for a great new through line, it is interesting to observe the action of the stock market on announcement of these plans, as showing the contrast between the same fact considered as a part of the general railroad development, and as a market factor. The stocks of all three companies pay 7 per cent. in regular dividends. For a long time Great Northern stock has been held at high prices on expectation of valuable privileges to stockholders. The ore land certificates (now deducted from the price of the stock) are valued at about $85 a share. Their issue brought down the price of the stock from $325 to something over $230 a share, a price which still represented expectation of valuable rights. Similarly Northern Pacific was selling above 220 in expectation of a new stock issue, with rights to shareholders. On last Saturday St. Paul common sold within two points of 200 on similar expectation. The day before the Great Northern issue was announced, the stock sold at 230. Northern Pacific sold at 224 previous to announcement of its new issue. At the end of last week when the terms of both issues were known, Great Northern was down to 210 and Northern Pacific to 206. Since that time they have both sold down to 192. In the two days following announcement of its important rights for shareholders St. Paul common declined to 179. Thus is each case announcement of an issue of valuable rights to shareholders immediately resulted in a large drop in the market value of the shares. The brief explanation of this apparently unreasonable phenomenon is that the hopes of speculators had been raised too high. With their imaginations excited by the immense railroad earnings of the northwestern roads and the present general tendency toward more liberal distributions, they expected even larger gifts. Although the rights thus presented are worth about $25 a share on Great Northern, $30 on Northern Pacific and $35 on St. Paul, the stocks declined on disappointment by speculative holders that the free issues were not larger. There is no question but that the investment stockholders are more than satisfied with the distributions made.

## SINGLE EXPANSION AND LOWER PRESSURES.

The single-expansion locomotive, after all the efforts which have been made to supplant it, still stands as an acceptable device for handling railroad trains. Many years have passed since compound cylinders were first used in locomotive service and a considerable period has elapsed since the advent of superheating locomotives, but neither compounding nor superheating have yet gained for themselves a place of real security in the railroad practice of this country, while single-expansion locomotives are being built at a rate never before known. Notwithstanding these facts, train speeds have steadily increased, the loading behind tenders has been made greater, and the cost of operation has been reduced. One reason for this is to be found in the fact that many of those devices which have been put forward as capable of improving locomotive performance are effective only while the cylinders are using steam. They cannot effect a saving in the amount of coal used in firing up nor in maintaining the temperature of the machine while it is being held at stations or on sidings. Another reason is to be found in the exceptionally high qualities of the single-expansion locomotive which in spite of the competition which has been forced against it, and while remaining simple and unadorned, continues to do the business of the country. Its high efficiency has many times been referred to in these columns. The fact that it develops at its drawbar a horse-power in return for the consumption of from three to four pounds of coal per hour has recently been referred to. Its acceptability for hard and continuous work in return for a minimum of attention is well understood. But however complimentary to the single-expansion locomotive these reflections may appear, it will be well to remember always that it is not yet entirely perfect. The process of developing the single-expansion locomotive is in fact still an active one. Each year adds something to the sum of available information concerning its actions, by the application of which the proportions of some important part are fixed with greater certainty. It is by this slow process of evolution that the efficiency of the machine as a whole has been, and in the future will continue to be, raised. A matter of more than ordinary moment which has recently been brought to the attention of locomotive designers, the acceptance of which is likely to do much for the betterment of the locomotive, is a determination of the pressure which is most economical for such service. Pressures have for many years been steadily increasing till the limit of 200 lbs. has been reached and passed. It is now shown by authority, which will generally be accepted as satisfactory, that under ordinary conditions of service, a pressure of from 160 to 180 lbs. will be found more economical than any other.

As locomotives have grown in size, there has been a steady increase in boiler pressures, with the result that those who seek to further augment the power of locomotives have come almost intuitively to look forward to higher pressures as a means through which to accomplish the desired results. The feeling has been prevalent among locomotive users that high steam pressure is a necessary accompaniment to the development of high power. That such a conception is not justified by the facts is well shown by a paper recently read before the Western Railway Club,* presenting the

*"High Steam Pressure in Locomotive Service," a paper by W. F. M. Goss, presented at the November meeting of the Western Railway Club. This paper was published in full in the *Railroad Gazette* of Nov. 30, page 480 to 492.

results of a large number of tests disclosing the performance of the engine and boiler under a wide range of pressures. A conclusion of the paper is to the effect that single-expansion engines should ordinarily carry pressures no higher than 180 lbs., and that such locomotives will perform well the service expected of them if designed for pressures as low as 160 lbs. While the significance of this statement may not at first be fully appreciated, it is understood to have been based on carefully conducted work and sooner or later its force will doubtless be generally accepted. A full array of the data underlying the statement is promised to the reading public through the medium of a forthcoming report of the Carnegie Institution of Washington.

The assertion that a running pressure of from 160 to 180 lbs. will be found most economical for service in a single-expansion locomotive does not imply that existing locomotives designed for higher pressures should have their pressures reduced to the limit stated, for in all cases cylinders must be proportioned to boiler pressure, and ordinarily the pressure should not be reduced unless the cylinder diameters are increased. It may sometimes happen that a class of locomotives may be improved by imposing some reduction in pressure but such a course cannot be contemplated in a general proposition. Again, it should be borne in mind that a reduction of pressure to the limit stated will not operate to reduce the power if the cylinders are proportioned for the pressure from which they are to be supplied with steam. The greatest power will be developed under those conditions which permit the highest economy in operation. Since it is proven that a single-expansion locomotive is ordinarily more efficient at a pressure of 180 lbs. than when operated under higher pressure, it follows that at this pressure it may be worked to a higher power than can be obtained if served with any other pressure whatsoever. Finally, in this connection, due emphasis should be given the fact that the selection of 160 to 180 lbs. as running pressure of the locomotive is not to be regarded as a backward step. The problem in design is to increase the efficiency and power of the proposed locomotive as compared with those previously built and if it is shown that a reduction of pressure is a means to such an end, real progress is to be achieved by using the lower pressure.

## THE NEW HAVEN'S ELECTRIC EXPANSION.

With the acquisition, long heralded and soon to be announced officially, of the Connecticut Railway & Lighting Company's property and of the Rhode Island Company's street railway lines, President Mellen's swift electric campaign closes by the law of territorial limitation. Here and there, probably in southeastern Massachusetts, there may be hereafter a short line bought in; there will be in places extensions of existing lines, and there will be double-tracking of urban lines and other improvements. But, to all serious intents and purposes, electrical extension as a broad and insistent policy closes now that Mr. Mellen has obtained an electric monopoly coincident in area with that of his steam road and a standing bar to long distance competition. The menace of that rivalry has not been very grave in Connecticut since the steam road took in the New Haven and the Hartford street railway systems. But in Rhode Island, especially between Providence and Boston and the nearby cities, the peril has been very serious indeed. In that quarter, hitherto undefended, the New Haven is now firmly and impregnably fortified.

The electric system which the New Haven now holds, in contrast with the three street railways with but 50 or 60 miles of track owned by the corporation when Mr. Mellen became head of it three years ago, deserves attention for its sheer magnitude. The wheels within wheels of the system in Rhode Island, with its multiplied holding companies, prevent accurate and full statement. But, in round figures, the whole system in three states includes some 1,350 miles of electric line; gross earnings of $15,000,000 or more a year; and stock, bonds and floating debt, including securities of the various holding companies, which at market values would probably, in a conservative estimate, capitalize up to at least $130,000,000. It covers all but one of the 18 cities of Connecticut, the centers of population in Rhode Island and, in Massachusetts, Worcester, Springfield and Pittsfield. Purchases of street railways by other steam railroad companies in this country, considerable as they are, become almost trivial in comparison. And, as a mighty step in determining the relations in the carrying trade of steam and electricity, the Mellen policy must be regarded as epoch-making. It involves, not far in the future, not merely physical questions in matters of operation but public and state relations of delicacy and importance.

Some of these may here be fitly pointed out: In taking up the Connecticut Railway & Lighting property the New Haven for the first time assumes the public service of light and power. Gas and electric lighting functions devolve upon the steam railroad corporation in several Connecticut cities as well as the operation of the great Housatonic lighting and power company with its long distance service. Here alone is a suggestive widening of the steam corporation's public relation and responsibility, the outcome of which will be instructive. Then again the new acquisitions have a noteworthy relation to the situation in Massachusetts, where the state policy of preventing purchase of electrics by steam railroads must beat against a great consolidated railway system in the two states below as well as the actual purchases by the New Haven within the state itself. Broader and deeper still is the problem of public service responsibility when over a great region of dense population steam and electric monopolies are thus combined. Turning from questions of public relation to those of physical operation and development they branch out in varied directions. What are to be the direct economies possible by centralized operation of the huge electric system, including wholesale contracts for material? What the opportunity for indirect economies by joint operation of electric and steam lines hitherto rivals? What the scope for development of freight and express traffic on lateral trolleys? And, finally, what the opportunity of testing and, in the event of initial success, expanding Mr. Mellen's favorite scheme of entraining local electric cars for interurban and long distance service on present steam lines?

The price paid by the New Haven's energetic and bold President for the protection of his corporation's property on the one hand and the opportunity to answer the foregoing queries on the other is a high one. Even with increased operating economies and with the growing receipts in gross and net which New England street railway companies generally return, several years must pass before the deficit of some hundreds of thousands of dollars between net receipts and purchase money fixed charges is finally wiped out—and that result presupposes in the country the persistence of the era of prosperity. Against this must be set with a high fiscal credit mark the collateral and protective vantages, the latter permanent. Not so gratifying to the New Haven is the fact that it must pay dividends on a huge volume of watered stock. Its amount in the Rhode Island purchase cannot be estimated owing to complexities of repeated capitalizations during the last few years and the fiscal intricacies of several holding corporations. But in the case of the Railway & Lighting Company the figures can be made more definite. That corporation six years ago with an addition of only two or three miles of new construction jumped its new stock capitalization to $15,000,000 and its bonded debt to $9,350,000. This was based on about 159 miles of track and three or four local gas plants—and the component trolley corporations had been previously and originally heavily watered in both stocks and bonds. At that time, notwithstanding considerable water, the 356 miles of electric railway of all the other lines in Connecticut, including the Hartford and the New Haven city systems, were capitalized at $8,137,048 in stock and $6,908,000 of bonded debt. By another test the Railway & Lighting Company, in its last return to the Connecticut Railroad Commission stands capitalized in stock and floating debt at $156,695 per mile. All this stock watering went through without the slightest protest or resistance from the languid and inefficient state commissioners. It now becomes a fixed charge on the steam corporation, an indirect fixed charge on the public and past hydraulics shift into hydrostatics.

The Belgian State Railroads now include all the important lines in the Kingdom, in 1904 the government working 2,506 miles, while only 365 miles were worked by corporations. No less than 44 per cent. of the State railroads were double track lines. They represented an investment at the average rate of $166,633 per mile, which is exceeded only in Great Britain, and is due largely to the heavy equipment, which was at the rate of 129 locomotives, 258 passenger cars and 3,131 freight cars per 100 miles of railroad (against 22 locomotives, 18.7 passenger cars and 797 freight cars in this country). The average capacity of freight cars there is not more than half the average here. The train service in Belgium was equivalent to a movement of 12.7 passenger and 9.4 freight trains each way daily over the entire mileage (against 2.8 passenger trains and 3.5 freight trains in this country. The travel in Belgium was equivalent to 1,034 passengers carried each way daily, against

143 here. The freight ton-mileage is not given in our authority. The earnings per passenger-train mile were but 63½ cents; per freight train mile they were $1.70½. Here the train-mile earnings were $1.14 for passenger and $2.43 for freight. Though the mileage of passenger trains in Belgium was 34 per cent. more than that of freight trains; the earnings were very nearly twice as great from freight as from passengers, and in all probability the passenger traffic yielded no net earnings whatever. The average receipt per passenger mile was 0.753 cent, the average for first-class passengers being 2.1 cent, and for third-class 0.608 cent; four-fifths of the travel was in third-class cars. Only 10⅔ per cent. of the tickets sold were simple one-way tickets; 33 per cent. were round-trip tickets, and 56 per cent. were various kinds of commutation or season tickets. Nearly two-fifths of all the journeys were made on "workmen's season tickets," at an average charge of 2.4 cents per journey. The State Railroads are heavily manned with an average of 26 employees per mile. The gross earnings were $17,873 per mile and $685 per employee. In the United States the average earnings were $9,306 per mile and $1,523 per employee, and the average yearly pay per employee was $631. The net earnings in Belgium were $7,238 per mile; in the United States, $2,998. The net earnings were 4.2 per cent. on the investment in Belgium.

## Mexican Central.

A preliminary statement made last week by the bankers interested officially announced the pending consolidation of the Mexican Central with the National Railroad of Mexico. Some such consummation had been for some time suggested by the activity of Mexican Central securities in the stock market. The National of Mexico is controlled by the Mexican government, and the consolidation of the Central with it means that the bulk of the railroad mileage of Mexico is to be controlled by the Federal government of that country. One of the accompanying maps shows the territory and extent of the Mexican Central; the other, not only of the National of Mexico, but of the International, the Interoceanic and the Hidalgo & North-eastern, which are also controlled by the government, as well. From these maps it will be observed that the Mexican Central and the Mexican National are parallel and competing lines for through traffic between the United States and Mexico City, the Central via the El Paso gateway, the National via Laredo, and also over the Mexican International, which it controls, via Eagle Pass. It is a striking contrast to see the Mexican government consolidating under its own control two parallel and competing lines at the same time that the United States government, having already forbidden such consolidation by law, is beginning an investigation of the Harriman Lines, in order to prove whether or not the Union Pacific and the Southern Pacific can, in reality, be considered parallel and competing lines. It is also to be observed that the taking over of the Mexican Central brings the government railroad system by two existing roads, and a third projected, to Tampico, the port of first importance in the international business of the Republic, but reached exclusively by the Mexican Central. It also places the government in command of the El Paso gateway, which is of about equal importance with Laredo in imports and exports. The government system on completion of the merger will amount to, not including the Tehuantepec National, 213 miles, in which it has a partnership interest, over 6,500 miles, made up as follows:

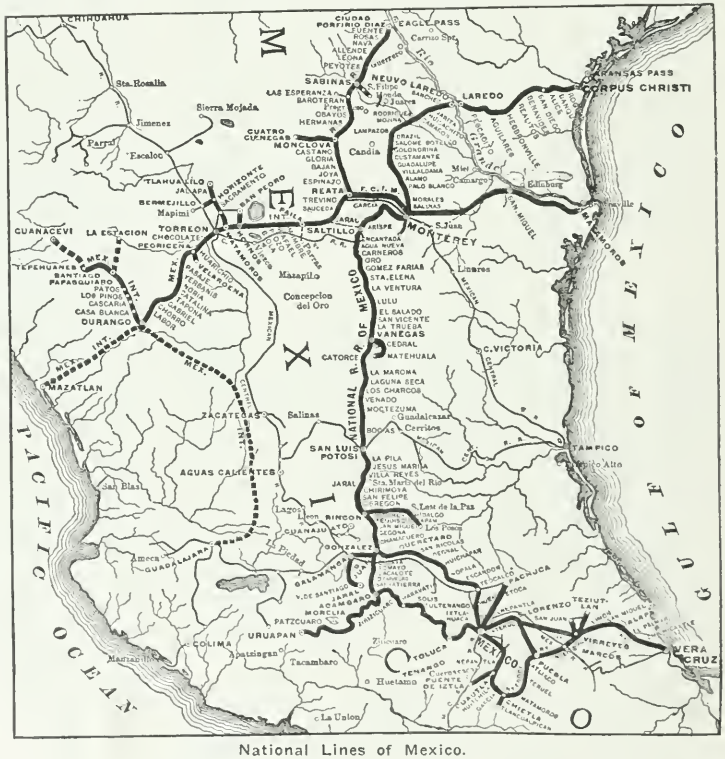
| | |
|---|---|
| Mexican Central | 3,156 miles. |
| National of Mexico | 1,732 " |
| Mexican International | 882 " |
| Interoceanic of Mexico | 736 " |
| Hidalgo & North-Eastern | 153 " |
| Total | 6,658 miles. |

Of this, 426 miles of the National, all of the Interoceanic, and all of the Hidalgo road are 3-ft. gage, a total of 1,315 miles of narrow-gage line out of the total of 6,658 miles.

The consolidated company is to be known as the United National Railways of Mexico. It is to issue two classes of bonds, prior lien 50-year bonds and general mortgage 70-year bonds, each class bearing 4 per cent. interest. The general mortgage bonds, which have the second lien, are to be guaranteed by the government of Mexico. The official statement says that present net earnings of the Mexican Central and the Mexican National are sufficient to meet the interest on all the bonds proposed. It is hard to say how consolidation of the two properties will, in itself, have the effect of increasing their net earnings. In Mexico, railroads are allowed to pool their traffic, so that many of the disadvantages of keen competition can be done away with without consolidation. Potentially it will be a safeguard to have the two roads under one control. The merger, however, appears to be due to the aggressive policy of the Mexican government, which fears absentee ownership of the transportation facilities of the Republic. In fact, the Minister of Finance, through whom negotiations for taking over the Mexican Central were carried on, is reported to have said that the fear of absolute control of the principal Mexican lines by residents of the United States was the compelling cause of the transfer.

The Mexican Central is the largest railroad in Mexico. It has been greatly handicapped by its large capitalization. Even in the last fiscal year, when the prosperity of the country was rapidly increasing, although the road was not subject to the disastrous floods of the previous year and the currency reform act which went into effect May 1, 1905 was in operation the whole year, it was only after withdrawing $1,000,000 from the subsidy trust fund, representing the Mexican Government's subsidy payments on various parts of the road, that a net surplus for the year of $200,000 was obtained. In the fiscal year 1905, even after the help of $750,000 of the subsidy fund, there was a net deficit for the year of over $200,000, which was paid off from the income of the last fiscal year.

Yet the earnings were not unsatisfactory. Gross earnings were $14,000,000, as against $13,000,000 in 1905. Per mile of road they were $4,497, an increase of $360 a mile, or 9 per cent. over 1905. Operating expense, however, was increased over $1,000,000, or 13 per cent., leaving only a trifling increase in net earnings. There is one



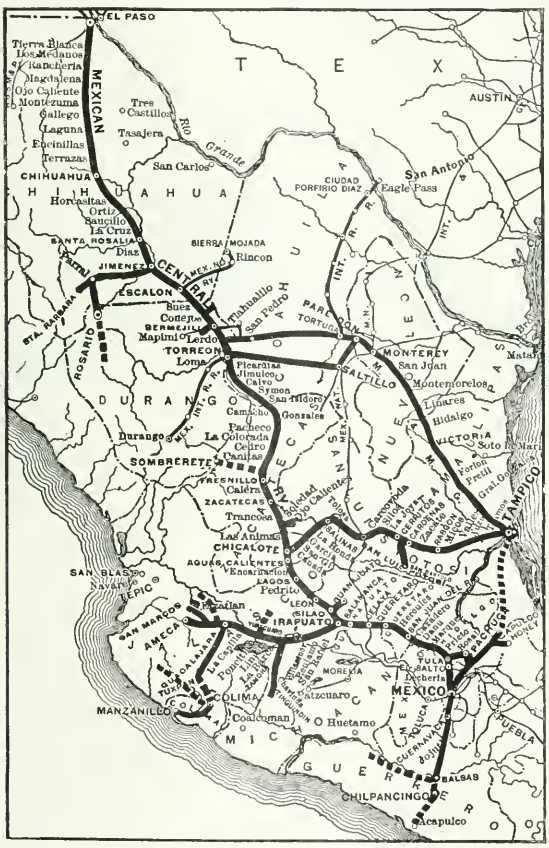

National Lines of Mexico.

unsatisfactory feature among the earnings, which is made clear in the detailed figures. Beginning with January 1, 1904, no charges were included in gross earnings for carrying construction material (company freight), an item of earnings which was as high as $237,726 in 1889 and $125,000 in 1903. Last year, $80,000 of the gross earnings were earnings on construction material, a return to an outgrown practice which belongs only to the days of speculative railroading.

Transportation and traffic expenses, which apparently represent conducting transportation, increased 13 per cent. There is no accurate way to compare this with the increase in amount of business done, as no figures of passenger- or ton-mileage are given. Maintenance of way increased 8 per cent. and maintenance of equipment 22 per cent. The unit figures show the maintenance charges more clearly; maintenance of way per mile cost $514 against $477 in 1905. These represent insufficient amounts on any 3,000-mile rail-

road in the United States or Canada. The low figures are due, in part, to the cheap labor obtainable for roadway work in Mexico, but, even taking this fact into consideration, seem small. Maintenance of equipment repairs cost $2,360 per locomotive against $1,862 in 1905, $583 per passenger car against $427 in 1905, and $93 per freight car against $91 in 1905. The increase in the locomotive figure is said to be due to the heavy repairs necessary in changing locomotives from coal burners to oil burners.

The report is most incomplete in traffic statistics, as was last year's. A statement of exports and imports via the various seaports and gateways of Mexico, although it does not include figures for the year ended June 30, 1906, which have not yet been compiled, shows a surprising decrease in exports via the Mexican Central's gateway of El Paso in the year ended June 30, 1905. While exports via Eagle Pass (Mexico International) increased from a value of $5,400,000 to $5,800,000, and via Laredo (Mexican National) from $9,300,000 to $10,900,000 in 1905, exports via El Paso decreased from $15,500,000 in 1904 to $9,500,000 in 1905, a loss of 38 per cent. The only traffic figures which are given for the past year show that of the total freight traffic—whether this means tonnage or earnings is not stated—forest products made up 10 per cent., agricultural products 21 per cent., merchandise and miscellaneous 10 per cent., ores 28 per cent., and other mineral products 27 per cent.




Mexican Central.

Through the Mexican Pacific Railway, a subsidiary company, the Mexican Central is building the first through line to the west coast of Mexico. The Mexican Central's present line ends at Tuxpan. From Colima, 40 miles southeast, a narrow gage line, which was acquired last year from the Mexican National Construction Company, runs to Manzanillo, on the Pacific coast. The 40-mile connecting line from Tuxpan to Colima and the widening of the narrow gage line to standard gage is now under way. Much grading has been done and a good deal of work on the bridges. There have been serious delays on account of lack of labor; 1,000 Japanese laborers have now been hired in addition to those already employed. A wharf has been built at Manzanillo, 490 ft. long and 73 ft. wide, and a new town site has been laid out near the ocean about two miles south. The harbor of Manzanillo is now being improved by the Mexican Government. The Mexican Central expects to secure a large tonnage of west coast business and oriental traffic by way of this port.

On October 5, 1905, the Coahuila & Pacific Railroad, 200 miles long and extending from Torreon, on the Mexican Central's main line, east to Saltillo, was acquired at judicial sale. The mileage of this company has not been included in the accounts of the year pending execution of an agreement with the National of Mexico for joint operation. This road parallels part of the Monterey division of the Mexican Central. In order to connect it with that line at each end a 47-mile road from Saltillo north to Paredon, on the Monterey division, has been built. This was opened for traffic September 2, 1906. Of the $693,605 charged to income during the year for betterments and improvements, $288,697 was spent in ballasting and improving the Monterey division.

Surveys are still being made for a line to connect the city of Mexico with Tampico direct, by which the distance between these cities will be reduced from 778 miles, the present rail mileage, to about 278 miles.

There have been 50 locomotives already equipped to burn fuel oil and 200 more are now being converted. All locomotives are to be changed to oil burners as soon as possible, and all new locomotives ordered are to be oil burners. The Mexican Central's experience shows that the use of fuel oil saves about $4,200 a year on each locomotive as compared with cost of coal. As the increase in the cost of fuel, due to increased engine mileage and the high price of coal, accounts for one-third of the increased operating expenses of the year, it is easy to see that this is an important item in the economy of operation. Fuel oil is obtained at a point on the San Luis division, 35 miles west of Tampico.

The principal results of operation are summed up in the following table, in which for all figures previous to the net earnings, results in Mexican currency are transferred to United States currency at the rate of 50 cents for the Mexican dollar. The net earnings and following figures are converted at the rate of 49.75 cents for the Mexican dollar:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 3,156 | 3,155 |
| Passenger earnings | $12,650,011 | $12,265,231 |
| Freight earnings | 10,788,448 | 10,119,106 |
| Gross earnings | 14,188,403 | 13,048,850 |
| Maint. way and structures | 1,622,930 | 1,504,396 |
| Maint. of equipment | 2,031,697 | 1,654,860 |
| Transp. and traffic exp. | 5,526,622 | 4,886,924 |
| Operating expenses | 9,905,322 | 8,789,588 |
| Net earnings | 4,287,862 | 4,118,173 |
| Withdrawn, subsidy trust funds | 1,000,000 | 750,000 |
| Total income | 5,476,955 | 5,008,848 |
| Net income | 903,676 | 59,800 |
| Betterments and improvem'ts* | 695,546 | 270,510 |
| Year's surplus | 208,130 | †210,710 |

*Charged to income.
†Deficit.

## Western Maryland.

The Western Maryland was incorporated in Maryland on May 27, 1852, under its original name of the Baltimore, Carroll & Frederick, which was subsequently changed to the present name. The operations of the company during the first 50 years of its existence were restricted to a small local territory in Maryland and southeastern Pennsylvania. The city of Baltimore was anxious to extend its influence as a commercial center through the road and at one time or another gave it aid to the amount of about $9,000,000. Washington County, Maryland, in which is Williamsport, the terminus of the original line, also helped the road. Up to some five years ago both the city and the county held an interest in its securities. In June, 1902, the city of Baltimore sold its interest to a syndicate which had previously bought Washington County's interest, and the West Virginia Central & Pittsburg, a road with 100 miles of main track, 100 miles of branches and control of large coal areas in northeastern West Virginia. The eastern terminus of this road was Cumberland, some 60 miles west of Cherry Run, the western terminus of the Western Maryland. The syndicate which bought control of the two roads proved to represent the Goulds. The new owners at once began the unification and improvement of the property, as a result of which already the road has become of more than local importance and has still larger possibilities for the future.

In 1902 the road did not have satisfactory freight terminal facilities at Baltimore. The first move of the new owners was to secure a satisfactory tidewater terminal, for which surveys were begun in May, 1902. The new line, which amounts to a belt line around the west and south sides of the city of Baltimore, together with the freight piers, was opened for business in September, 1904, and the coal pier in February, 1905. This gave a modern and efficient freight terminal at tidewater.

The next step in the development was the building of a line to connect the Western Maryland with the West Virginia Central & Pittsburg, between which there was a gap of about 60 miles through heavy country along the Potomac river. This connection was opened early in 1906, so that the present year marks the uniting of the two parts of the road. The West Virginia Central & Pittsburg meanwhile has been entirely absorbed into the Western Maryland. Thus the road now consists of a main line 293 miles long

from coal fields in West Virginia east to tidewater at Baltimore, with 250 miles of other lines.

This is considering the road only in its individual aspect—a coal carrier of West Virginia coal to tidewater. It must always be remembered that besides this the road is designed to take its place sooner or later as the outlet on the Atlantic of the Gould system. There is a gap of something over 100 miles between it and the Wheeling & Lake Erie at Wheeling and also between the Western Maryland and the Wabash Pittsburg Terminal at Pittsburg. Work is already being done in a quiet way on a projected railroad called the Uniontown & Wheeling Short Line, which, if built according to its proposed route, would connect the Wheeling & Lake Erie near Wheeling with the Western Maryland near Cumberland. Whether it will ever be possible for the Goulds to build a direct connection between the present terminus of the Wabash lines at Pittsburg and Cumberland is doubtful. Although the air line distance between these two points is small the country is most difficult for railroad building, especially as the available routes are already taken possession of by the Baltimore & Ohio, Pennsylvania and Pittsburg & Lake Erie. By the southern and more roundabout route, however, there is likely to be in operation a through Gould connection to Atlantic tidewater within a few years.

During the recent constructive or formative period of the road, annual reports have not been published. The present report, besides containing figures for the last fiscal year, reviews a period of nearly five years, in which are three and one-half months initial and partial operation of the connecting line between the two formerly separated parts of the property. Including this much operation of the unified system, gross earnings for the fiscal year ended June 30, 1906, were $4,800,900, against $3,900,000 in 1905, an increase of about 20 per cent., net earnings were $1,696,000, also a gain of over 20 per cent. Net earnings of the coal and other departments increased from $428,000 to $720,000, while fixed charges rose from $1,671,000 in 1905 to $2,247,000 in 1906, an increase of $575,979. The net income for the year was $251,000, or 1.6 per cent. on the $15,685,400 capital stock outstanding. It is interesting to compare this figure of net income with other recent years in order to show the effect of the large new construction in temporarily reducing profits. Net income after charges in 1905 were $206,000; in 1904, $400,000, and in 1903, $990,000.

Although there has been an increase of over 50 miles in the operated mileage during the year, the cost of maintenance of way shows only a slight increase, which, on a mileage basis, amounts to a decrease, the figures being $920 per mile for this account in 1906 against $981 in 1905. If the road is to become a large carrier of bituminous coal this standard of maintenance will have to be considerably raised. Under maintenance of equipment, repairs and renewals cost $1,365 per locomotive against $1,211 in 1905, $46 per freight car against $43 in 1905 and $319 per passenger car in both years. The charge for passenger car repairs is much below the general average of other roads. It is, therefore, fair to conclude that it is too low, for, leaving out of consideration equipment on special limited trains, the cost of maintaining a passenger car varies little.

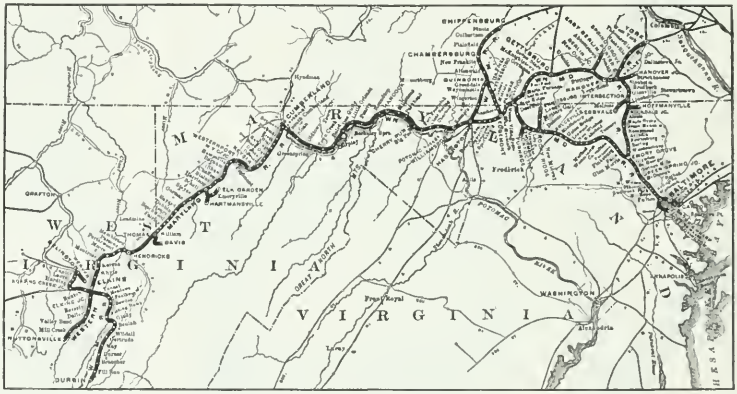
There was an increase of over 4,000,000 passenger miles and 135,000,000 ton miles. Freight earnings per mile of road increased from $5,740 to $7,134, or nearly 25 per cent., these figures being computed on the basis of 507 miles in 1906 and 478 miles in 1905. The trainload, which is not given in the report, was 355 tons against 329 tons in 1905.

Bituminous coal made up 49 per cent. of the tonnage in 1906, against 52 per cent. in 1905. The "products of mines" classification included 66 per cent. of the total tonnage carried last year. Forest products made up 15.5 per cent., manufactures 8.6 per cent., general merchandise 6 per cent., agricultural products 2.8 per cent. and animal products a little over 1 per cent. There was a large increase in tonnage of cement, brick and lime carried, which rose from 162,000 tons to 244,000 tons.

The Cherry Run-Cumberland extension is described in some detail. Work was begun August 1, 1903, and the track connected February 6, 1906. Freight service was begun a little over a month later, and on June 17, 1906, passenger service over the new line was begun. Of the 59 miles of this extension, 37 miles are tangent and 22 miles curve. The maximum grades are 26.4 ft. to the mile westbound and 15.8 ft. eastbound; the maximum curve is 6 degrees. The line is laid with 90-lb. rails, has five tunnels with a total length of 10,142 ft. and 23 steel bridges with a total length of 8,014 ft. The passing sidings average 3,000 ft. long and the average distance between them is five miles. The line is single track, but was built for economical operation of a heavy traffic. The work was difficult because the line crosses and recrosses the Potomac river at points where there are high rock cliffs on each side of the stream.

There are two pieces of important main line reconstruction started in August, 1905, which are now well advanced. The first is the rebuilding of the line from Fulton Junction, just out of Baltimore, into Emory Grove, the junction of the main line with the line running north to York, Pa. Grades and alinement are being improved on this 17-miles trip, and a double track is being built. A second similar betterment is being made to the lines from Williamsport (Potomac Valley Junction) to Cherry Run (Big Pool), 13 miles. Surveys between Arlington, five miles out of Baltimore, and Williamsport, 93 miles, have shown the possibility of getting a low grade line with a maximum grade of 21 ft. to the mile eastbound and 42 ft. westbound, and between Williamsport and Big Pool, a grade of 16 ft. eastbound and 26 ft. westbound, which latter rates are the same as those of the new Cumberland extension immediately adjoining on the west. The reconstruction of the two sections already mentioned is being made with a view to fitting into this low grade line. The need for the improvement is great, for on the section from Baltimore to Emory Grove, at times 50 to 60 trains daily are handled on a single track line with all the difficulties usually resulting from congestion in approaching and departing from terminals in a large city.

The section from Williamsport to Big Pool carries the company's heaviest freight traffic. On this line were nine large old wooden trestles unsafe for any but the lightest motive power equipment, two of the three steel bridges were insufficient and the rail was light and nearly worn out. The grades were 42 ft. to the mile eastbound and 55 ft. westbound, requiring the use of helper engines. It was necessary either to double track the line to provide for the double train movement caused by the helper engine service or to do away with the necessity for this service. The latter plan was decided on.




Western Maryland.

As the existing traffic does not justify carrying out yet the whole plan for the low grade line, instead of beginning work on the remaining portion from Emory Grove to Williamsport, 73 miles, the line from Emory Grove to Highfield via Gettysburg is being improved, thus forming an alternate route with the main line between those points. This, although considerably longer, has better grades than the main line. The improvement of the physical condition of the road may be judged from the fact that there were 93 miles of 90-lb. rail laid last year against 29 miles in 1905.

The coal properties of the Western Maryland include 107,000 acres in Mineral, Grant and Tucker Counties, W. Va., and Garrett and Allegany Counties, Md., 3,000 acres in Barbour County, 3,000 acres in Taylor County, 3,400 acres in Marion County and 2,500 acres in Marion and Monongalia Counties, West Virginia. They are controlled by the Davis Coal & Coke Company, which is operated as a separate subsidiary company. Last year this company produced nearly 2,000,000 tons of coal and 312,000 tons of coke. Net profits of its coal department were $500,000, which, with earnings of the real estate and store departments, made total net earnings of the company $720,000, against $428,000 in 1905.

The operating results of the consolidated Western Maryland Railroad are summed up in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 544 | 487 |
| Passenger earnings | $876,426 | $795,229 |
| Freight earnings | 3,606,087 | 2,738,569 |
| Gross earnings | 4,802,094 | 3,600,249 |
| Maint. way and structures | 497,478 | 479,880 |
| Maint. of equipment | 595,371 | 446,251 |
| Conducting transportation | 1,761,933 | 1,387,147 |
| Operating expenses | 2,995,611 | 2,416,571 |
| Net earnings | 1,806,483 | 1,483,678 |
| Net income—all departments | 251,509 | 206,097 |

## NEW PUBLICATIONS.

*The Steel Square as a Calculating Machine.* By Albert Fair. New York: The Industrial Publication Co. 81 pages; 5 in. x 7½ in.; 27 illustrations. Price, 50 cents; cloth.

It is difficult to determine from this book whether the chief aim of the author is to tell the ordinary mechanic, who has not had the advantage of a technical training, how to perform simple calculations by means of the steel square, or whether it is the belittlement of another author who has written upon the same subject. The greater portion of the first chapter is taken up with repeated attacks upon this unfortunate, and his ignorance and the absurdity of his attempting to handle the topic is brought out in the strongest light. All of which might far better have been omitted. This aside, the book is simply a citation of a number of cases that can be solved with a steel square that would ordinarily be worked out by the rule-of-three. There are also a number of examples illustrative of the application of the properties of the squares of the sides of a right-angled triangle, in which the square of the hypothenuse is equal to the sum of the squares of the other two sides. In addition to this the rule-of-three is given a large number of cases based upon the general proposition that homologous sides of similar triangles are proportional to each other; and this is followed by a description of the rulings on the several squares that are upon the market. For its suggestiveness to the mechanic who has not received a training in geometry the book will be valuable.

*Historic Locomotives.* Contains 10 full-page colored illustrations of old British locomotives, accompanied by descriptive matter. Pamphlet form, 9 in. x 13 in. $1.00, paper. $1.50, cloth. The Derry-Collard Co., 109 Liberty St., New York, American representatives.

This interesting pamphlet, published in England by Alfred R. Bennett, M.I.E.E., and illustrated with colored plates from original drawings by Ernest W. Twining, gives some important bits of English railroad history, written in a popular manner, and also describes a number of famous accidents in which the locomotives described, or their prototypes, took part. The pictures are suitable for framing.

# CONTRIBUTIONS

### Semaphore Indication Above the Horizontal.

New York, Dec. 14, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the recent conclusions of the Railway Signal Association relative to the indication of safety above the horizontal line, the writer has for many years favored the raising of the semaphore arm above the horizontal for the clear indication. The reasons for doing so seemed obvious. This suggestion was deemed radical only three years ago, though now there seems to be a direct reversal of opinion.

In your issue of July 10, 1903, I called attention to what seemed to me to be a costly and dangerous practice in English and American signal practice in giving the clear signal indication. I quote from that article: "If Sir Charles H. Gregory had designed his signal to indicate safety by raising the arm above the horizontal plane instead of lowering it he would have saved a great capital outlay for the railroads. Reference has been made to the present practice on steam roads of indicating safety by the position of the arm below the horizontal, and the writer is of the opinion that in the beginning of signaling on electric lines careful consideration should be given to the position of the signal for indicating safety and danger."

Your editorial comment on my radical suggestion was most conservative, indicating an inclination to put aside the question as of no consequence. I quote from your notes: "The recommendation to incline the semaphore arm upward to indicate go ahead will be received with interest, but probably with conservatism."

More signals have been placed since I made this recommendation than in the ten years preceding, and it will cost a vast amount to change, and probably accidents will occur during the transition period. Is it not better then to discuss and discover the facts concerning radical suggestions rather than make a feeble editorial comment consigning the matter to conservatism. We should not have fallen into this dangerous and costly error in signaling had we not blindly followed English practice. And, indeed, some of the English roads acknowledged the danger of using the clear position below the horizontal; but instead of dealing with the matter boldly they pivoted the semaphore in the middle and let it go at that.

I consider the decision of the signal engineers in favor of giving the clear position above the horizontal to be the most important step ever made toward safe railroad operation. I venture again into the future by recommending the careful study of automatic control of trains. Of course this is now done to a limited extent here, but in no case on regular surface roads. We must guard against the involuntary acts of man.

CHARLES HANSEL,
M. Am. Soc. C. E.

### Why Freight Cars Don't Move.

Champaign, Ill., Dec. 15, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of the leading problems confronting the traffic manager and the superintendent to-day is the scarcity and low average daily movement of cars. Statistics show that a freight car travels about 25 miles in 24 hours. Now we know from actual experience that loaded freight cars are moved while they are in transit, with very few exceptions, at a speed of not less than 20 miles an hour and sometimes even as high as 40. However, an average speed of 15 miles an hour is most economical. But to go back to the original proposition, if a car runs over 20 miles of track in one hour it will cover 25 miles in one and one-quarter hours. Then what is this car doing the other 22¾ hours of the 24? It is evidently standing still or being switched or running empty. A portion of each of the above three items is unavoidable.

One official states that he can see no means of improvement under present conditions, and suggests more unloading tracks at terminals. Another calls for more cars and engines. The plan which suggests itself to me, situated as I am at the "seat of war," is more systematic work on the part of the three most important subordinate officials, without whose intelligent and earnest co-operation the work of the most exacting and energetic manager must fail. They are roundhouse foreman, trainmaster and traveling engineer. To bring this about there should be better inspection, lubrication and light repair work of locomotives and cars before each trip over a district. A "break down" on one engine or one car will delay the whole train. A large number of disastrous derailment wrecks can be traced to careless or indifferent work on the part of inspectors. Careful work by inspectors will also diminish terminal delay and the attendant delay on other trains in consequence of the same. Have all employees connected in any way with the movement of a train perform their duties strictly on schedule time. Put engines through the house for return trip as quickly as possible. Discover a way to eliminate extraordinary delays between terminals. Do not allow switch engines to delay trains or road engines at any time.

It takes time and money to stop and start a modern heavy train and the pulling out of a drawbar in the performance is no uncommon occurrence. This is also the cause of a big loss in daily car movement. An increase in hourly mileage can be made by employing a different system to-day from that which was used ten years ago. Weed out the chronic kickers and disagreeable men. They cost the company a large sum in a year. Successful car movement can only be accomplished by careful, painstaking work by those who are on the field of action, and in a position to watch and note every move that is made. This supervision cannot be accomplished over long distance telephone. Many roads are still trying to operate trains, yards, terminals and machinery on the same plan as of a decade ago, notwithstanding the fact that each particular unit entering into or concerned in this operation has more than doubled in size and importance. In order to overcome this there should be assistants to the superintendent of transportation with practical experience enabling them to detect weak points in operation, and they should also have a technical knowledge of the construction of rolling stock from which they would be able to locate the numerous small defects which if let go unheeded will ultimately lead to a derangement of the smooth working of the entire system. These men then could detect the apparently insignificant things which impair the efficiency of the system. Railroad employees, as a class, while doing the great bulk of their work conscientiously and well, are prone to slight the little things unless closely watched by a superior. These so-called trivial things or circumstances are too numerous to list, but are known to the practical man by intuition and actual acquaintance. Some are caused by the application of a false theory to construction or operation. The great majority, however, are the result of careless or indifferent work and the tendency to stay in a rut after once getting there.

With attention to business and up-to-date work on the part of the three subordinate officials referred to there is no reason why the car movement mileage per hour cannot be increased without additional expense or facilities. More cars would not help when those already in service are getting such poor movement. Additional unloading tracks would help but are exceedingly hard to obtain in the large terminals. There is not a district on any system in the country on which delay in car movement cannot be eliminated to a very perceptible degree by better and closer supervision and inspection by those in authority.

JAMES A. GREEN,
Locomotive Engineer.

[The weaknesses of the train service here recounted do, in-

deed, constitute one of the causes of the widespread inefficiency now everywhere complained of, and we are glad to have a competent observer describe them; but our correspondent must not make his fellow workers in the train service too prominent in this unpleasant notoriety. The chief sinners are the men who are responsible for the use of cars as storehouses and for their unauthorized use on other than the owner's road.—Editor.]

## The Strike of Railroad Clerks in Louisiana and Texas.

Galveston, Harrisburg & San Antonio Railway Company,
Houston, Texas, Dec. 13, 1906.

To the Editor of the Railroad Gazette:

In your issue of December 7, on page 510, I notice what is said about the strike of the railroad clerks. I am somewhat at a loss to know from whence you derived the information contained in the statement, as a great deal of it is incorrect. The facts briefly are as follows:

A committee purporting to represent the railroad clerks in the employ of these [Southern Pacific] companies met in Houston early in October and addressed a communication to me, stating that they desired to have an interview in order to make an agreement with the companies, for their organization, etc. A courteous reply was returned to the committee, advising them that they should properly take up the subject first with their local officers, as they alone were familiar with the details and the requirements of the clerks' duties, and naturally were the officers to first pass upon the justice of the demands. Instead of acting on this advice a communication was received by me from the president of the organization, in which the ultimatum was given that unless I agreed to meet these clerks and discuss the matters with them at a certain hour two days later, he would put the matter up to the men for action. The hour set was noon on October 12th. I was away from headquarters when I received this communication, which reached me in the afternoon of October 12th, and naturally I could not have met the committee at the time arbitrarily set by this man even had I been so disposed. The next morning, Saturday, October 13th, at 10 o'clock, most of the clerks at New Orleans and Algiers and a few local points in Louisiana, employed in the local freight offices, and also a number of clerks employed principally in the yard offices and some in the freight offices at Houston and El Paso, discontinued work. We knew of their intentions a day previously, and inserted advertisements in all the newspapers and soon had the positions of the men who had quit work filled.

Your statement that all departments of the general offices were involved is not correct, as in the auditor's office at New Orleans five clerks left, and none left the auditing department in Houston. You state also that the strikers were orderly and that crowds gathered at Houston and that military protection was about to be extended to the road. This statement is entirely at variance with the facts, and no military protection was about to be extended to the road at any time. At Houston and other localities in Texas, however, we had most excellent police protection, which possibly prevented any trouble at these points. At New Orleans and Algiers numerous assaults have been made on non-union men, generally from 15 to 20 men attacking a single non-union man; but I am glad to say that within the past week or ten days the police there have taken these matters vigorously in hand and have put a stop to such cowardly assaults. In one case, a newspaper reported that two strikers jumped on a 15-year-old boy, who had just recovered from a spell of typhoid fever, and managed to beat the little fellow up.

There was at no time any necessity for this strike. These companies treat their men with absolute fairness and justice. As a matter of fact, the wages paid clerks on our lines are as good, and in many cases better than those paid by other lines in this territory; the hours of work are no longer, and the wages of railroad clerks, as a rule, are better than those paid by commercial houses in this section for similar services. The hours of work in the railroad service are generally much less, particularly at certain seasons of the year, than the hours of work in commercial houses. This strike was absolutely uncalled for, and the interests of the public were entirely ignored by the men who brought it about. Fortunately, however, the railroad companies were prepared for it, and outside of the malicious changing of tags on cars, loss or destruction of waybills, etc., the inconvenience experienced has been of small moment.

I must confess to considerable surprise in reading your statement and at the exaggeration—presumably unconscious—which has lent undue importance and dignity to what was rather a small affair. Instead of 800 men, as quoted in your article, going out, there were less than 300; many of the men refusing to follow the dictates of the agitators, who were really responsible for the entire trouble.

I am confident that the *Railroad Gazette* would not wilfully misstate conditions, and it is because of this feeling that I make this correction.

T. FAY,
[General Manager.]

## The Flagman on Block Signaled Railroads.

Union Pacific Railroad Company,
Omaha, Dec. 4, 1906.

To the Editor of the Railroad Gazette:

I have read with considerable interest your editorial of November 30 on the proposed abridgment of the present standard code flagging rules, as advocated by Mr. Slater, Signal Engineer of the Southern Pacific, every word of which is gospel. That this innovation on our present methods will, sooner or later, be accepted in practice by railroads that are block signaled is certain; and the sooner the better. How this dependence on the automatic signals can be brought about with safety is the problem which confronts those who favor the change.

To a marked extent enginemen become automatons. Their multitudinous duties require involuntary action and the performance of the duties in the order of their assumed importance. For instance, it occurs to an engineer to put on the injector, shut off the throttle and apply the air, whistle for a road crossing or station, call for the train order or block signal and answer its change in position. He would naturally commence the several duties in the order of their importance, as might be governed by the conditions at that time and place. At the same time he might, also, be deciding mentally whether it were going to be necessary at the coming stop to take coal or water, whether he had time enough to key up a rod or light his head-light, or perform some other duty that must be done at an opportune time. Many of the physical moves made by an engineer are apparently mechanical; much the same as one must learn to ride a bicycle—there is no time to telegraph the brain that the handle bar needs turning to avoid a fall; it must be done instinctively, as it were.

The locomotive engineer has been trained for years to look for the human being as his best admonitor of danger. The animation with which the flagging is done indicates, to a great extent, whether the air is to go into emergency or be simply a service application. The inanimate object has not, as yet, the power to jar him loose from a pre-conceived plan as to what he will do in the next few seconds or minutes. The engineer is, perhaps, no more the creature of habit than other men, but when, after a collision, we measure from the exploded torpedo to where he hit the caboose, carefully noting the amount of sand on the rail and take into consideration the grade; and determine as nearly as possible the velocity of the train, the inertia, amount of air pressure, etc., and then decide that, if there had been 50 ft. more distance in which to have stopped, the collision would not have occurred, do we take into consideration the shortness of the time at the maximum speed in which it would have been necessary to act? Very likely it proves to be only one second.

Let us look into some of the obstacles to be encountered in making a change from the present system of flagging, or, rather, its partial abolishment, placing reliance almost entirely on the automatic block signals. With the space interval greatly reduced the flagman must, under the proposed rule, use good judgment in figuring whether the block in the rear is not less than half a mile off, especially if the grade is descending, with a sharp curve. So long as he is within the rule it is, in his opinion, up to the other fellow (the approaching engineer) to make the stop successfully. The grievance committee will take care of him if he is within the law, and he is very apt to take a chance on that. The probability that a signal may be at clear with a train in the block is so remote under the modern mechanism of automatic signals that it can well nigh be eliminated; still the possibility of such a condition cannot be denied. Therefore, the position of the signal will be more or less a question of veracity between the flagman and the man or men on the head end of the following train, in case of collision, with the preponderance of the *testimony* against the signal and the flagman. It has been said that the "science of railroading is the art of shifting responsibility." The rank and file are no mean scholars in this science.

If a red lantern, a fusee and several torpedoes sometimes fail to stop a heedless or reckless engineer, to what extent will the fixed signal decrease the tendency to do some of the things that may be deemed simultaneously necessary before reaching over for the air? Will it indicate, with its cold stare, "EMERGENCY"? or will it say "SERVICE"? How is the problem affected by having the normal position STOP; where the red is a familiar light along the route, until the preliminary section is passed, where it *ought* to change its color?

It is pretty generally agreed that our present flagging is crude, unreliable and a constant source of anxiety. It is practically worthless, without military precision and military drilling. The flagman, unlike the soldier, is not enlisted for a term of years, consequently at times he is poorly drilled. It is also difficult to keep irresponsible men out of the service. The "human equation" is not becoming any less perplexing; on the contrary that one time faithful, loyal, regard for duty that we read of is becoming less common; and it will continue to vanish as government surveillance asserts itself.

The sooner railroad officials make up their minds to substitute

the fixed signal for the flagman and set about the new line of training and discipline to accomplish it, the better it will be for those who have to do with railroads as patrons, managers or employees. That this is no easy task is apparent to those who are acquainted with the human machine who operates the train. It is especially difficult, at this time, with public sentiment, as it is at present, ready to condemn officials or employees for an accident, no matter how remote the responsibility may be. It is, therefore, not surprising that it requires more than the ordinary nerve to advocate a radical innovation of this kind, to say nothing of authorizing it.

The railroad first adopting the new flagging system, if without the endorsement of other roads, would be compelled to stand not only the criticism of the public in case of an accident, but that of the railroad profession at large, who would undoubtedly take such an opportunity to justify their adherence to the old methods. We can imagine the standing of a railroad that was before the bar of justice defending itself against a departure from the methods and standards of all other railroads, if the protection of the train was even indirectly connected with the affair. "Man's inhumanity to man" is proverbial, and is not lessened in the daily training of railroads. There is perhaps no vocation that so hardens the sympathies or so resembles its methods, except that of war. Many go down in battle who are not stricken by bullets; but they are as fatally wounded; blasted in hope, ambition and reputation.

If railroad officials will interest themselves in this matter, which has in it more than some seemingly greater problems, there will be a united movement forward that will never be regretted. There may be trouble which is out of the ordinary, but the final results will justify the step. If the change is left to one railroad to accomplish the move will receive a setback, in the first serious "tail end" collision, from which it will take an indefinite period to recover.

The Train Rule and Safety Appliance Committees of the American Railway Association now have the matter under consideration, and we wait with much interest their recommendation to the association.

W. L. PARK.

[The Editor is glad to hear that every word of the editorial on the flagging rule is "gospel," especially as another esteemed correspondent (see below) seems to think that a part of the article isn't. Defining gospel as "good news of salvation", the Editor must modestly admit that the second correspondent may be right; however sound the views presented, their fulfilment is probably some little distance in the future; too far to warrant the claim that anything has yet happened to cause rejoicing. But on one of the secondary definitions of the word—"any doctrine concerning human welfare that is agitated as of great importance"—we—again with modesty—accept the honor! The flagging-rule problem is a matter of great importance, as related to human welfare, and in the article referred to we set out to agitate it. Whether or not it is safe to adopt any change in practice before assurance can be had that the result will be 100 per cent. perfect we shall not attempt to say, offhand; though in some important railroad improvements we have *not* thus waited; for example, in using air-brakes on freight trains, accomplished, on a great eastern trunk line, by the application of these tests in the comparatively gentle way that on most roads seems to be regarded as satisfactory.]

## Abolition of the Flagman.

Chicago & Alton Railroad Co.,
Chicago, Dec. 5, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Is not your editorial of last week (page 471) on the question of the abolition of the flagman rather too radical? I think you have not given sufficient consideration to the fact that a double-track road signaled with automatic signals is merely operating under permissive blocking. Permissive blocking always means that you have got to depend upon the engineer's judgment as to what is a safe speed in an occupied block.

The engineer in nine hundred and ninety-nine out of a thousand cases finds that the preceding train which stopped him has gone forward and he never sees it. Under these circumstances, and especially in the case of a fast and important train, he is quite apt to misjudge the speed at which he is moving. Then, if the preceding train stands in a dangerous spot around a blind curve, or at a summit, in neither of which cases can it be seen a great distance—and no flagman is back, what hope is there that the following train will not collide with it?

It seems to me that until signals are 100 per cent. correct in operation and enginemen are 100 per cent. perfect in obeying signals, flagmen are an absolutely necessary adjunct of the service.

C. A. GOODNOW.

## The Omaha Cut-Off of the Union Pacific.

The present line of the Union Pacific out of Omaha runs almost due south from the Union station for seven miles before swinging westward. The country immediately west of the city is rugged for prairie country, which explains selection of this route in the original location. It enabled the line to follow favorable water courses, as shown on the accompanying map (Fig. 1). A direct line was not an object of primary importance in the days when the Union Pacific was built, not only because of the necessity for having construction work and cost as light as possible, but because the Government land grant, which made possible the construction of the road, imposed no restrictions as to location of the line and the amount of land thus given was proportional to the mileage. From a point on the main track in the west part of Omaha known as the Summit, to Lane, a small station on the present line due west of Omaha, the

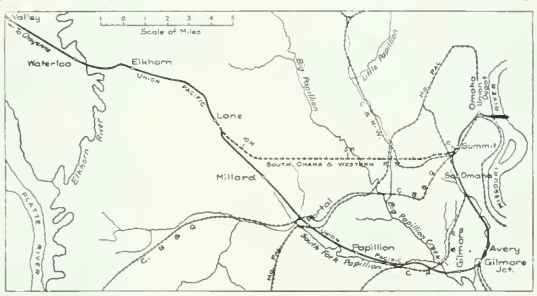



Fig. 1—Omaha Cut-off and Present Main Line of the Union Pacific.

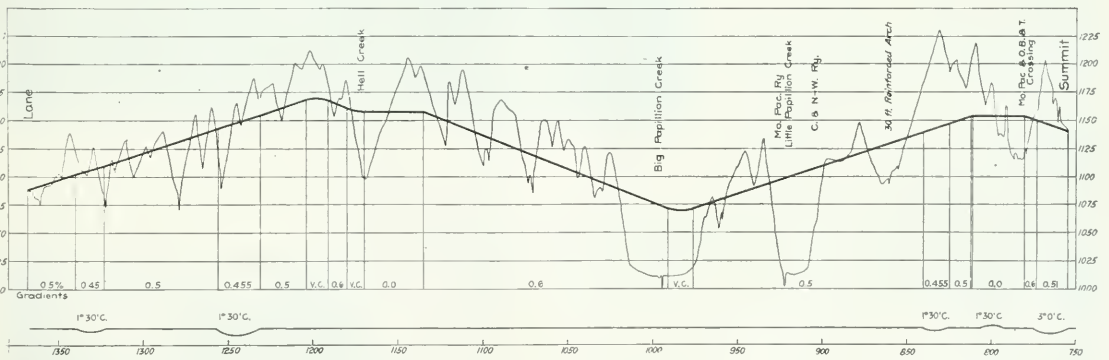



Fig. 2—Condensed Profile of South Omaha & Western Railroad; the Omaha Cut-off of the Union Pacific.

Concerning the perfection of automatic signals, as related to this question, Mr. Slater has already spoken. As to making enginemen perfect, one useful means would be to stop trains five minutes at every automatic stop signal (if the signal should not clear within that time). Probably no one denies that that would help toward improvement, but—can it be that we do not want perfection so badly as that? Another good thing would be to apply "surprise checking" with vigor. We mean with much more vigor than it has ever yet been applied; though we hear great results have been

air line distance is 12 miles. By the railroad it is almost 21 miles. Therefore, the cutting out of this wide detour in the original location, with consequent large saving in distance, has become desirable under present traffic conditions. The work was undertaken early in the present year under the charter of a separate corporation known as the South Omaha & Western Railroad.

The country through which the new line runs is rugged and there is no topography favorable to a railroad. The surface is very rolling, the hills consisting of the material known geologically as "loess." The drainage runs from north to south, practically at right angles to the line, and there are no favorable water courses which the line can follow to secure lighter earthwork. With the exception of a few curves necessary to connect with the present main line near the Summit, also

Fig. 3—Little Papillion Trestle Looking West; Showing Effects of Settling.

Fig. 5—Long Timber Trestle Over Valley of Big Papillion Creek; Highest Point 71 Feet.

some curvature for connecting at the west end to the old line, the alinement is straight, running over hills and valleys regardless of topography. The length of the cut-off, which is being built as a double-track road, is 11.64 miles. The length of the present main line between connecting points is 20.58 miles, yielding a saving in distance of 8.94 miles. The maximum curvature in the new line is the same as that in the old—3 degrees. The total amount of curvature in the new line is 163 deg. 44 min. and in the old line 407 deg. 12 min., the saving therefore being 243 deg. 28 min. The maximum grade in the new line, eastbound, is 26.4 ft. and in the old line is 42.2 ft. per mile. Westbound maximum grades are 31.7 ft. and 41.7 ft., respectively.

Exceedingly heavy earthwork is being done in construction of the line. The estimated total is 2,888,000 cu. yds. of excavation and 4,000,000 cu. yds. of embankment. The heaviest cut is at the east and about a mile west of Summit, as may be seen by reference to the condensed profile shown herewith (Fig. 2). This cut is 86.7 ft. deep at the extreme depth, 394 ft. wide at the top and 5,200 ft. long. The total excavation required is estimated at 1,850,400 yards. The actual width required for this cut is 304 ft. at the top, but considerable material is being borrowed here for the heavy fills further west, which will increase the width to 394 ft.

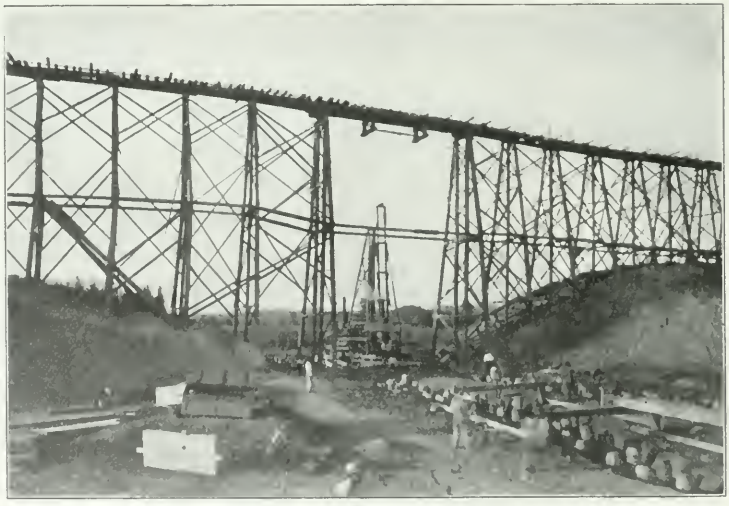


Fig.9—Driving 40- and 50-Ft. Piles for Foundation of Concrete Highway Arch Under 60-Ft. Embankment. Timber Trestle Over Valley of Big Papillion Shown at Extreme Height of 64 Feet.

Crossings of two principal water courses require heavy embankments. The larger of these 65 ft. high and 5,600 ft. long, is across the valley of Big Papillion creek. It will be 300 ft. wide on the bottom and will contain approximately 1,500,000 cu. yds. of earth. The highest fill, and next largest in size, is across the valley of the Little Papillion. It will be 89 ft. high, 3,100 ft. long and 420 ft. wide on the bottom. The original width for this embankment was 320 ft., but in the bottom of the valley is a deep alluvial deposit which is soft. The weight of the fill is displacing this soft material, causing it to bulge up on each side of the embankment as the latter settles. This will necessitate an increase in yardage of 400,000 to 500,000 cu. yds. and an increase in width at the bottom of 100 ft. Some idea of this condition is conveyed by one of the photographic views herewith (Fig. 3) in which the irregularity of the top of the temporary or filling trestle is plainly visible.

The temporary timber trestle across the valley of the Little Papillion (Fig. 4) is 96 ft. high above the bed of the stream and that across Big Papillion valley (Fig. 5) is 72 ft. high. The Missouri Pacific parallels the Little Papillion where the South Omaha

Fig. 7—Twenty-Ft. Concrete Arch for Highway Under 43-Ft. Fill in Valley of Hell Creek.

Fig. 4—Timber Trestle Across Valley of Little Papillion Creek, Looking East; Highest Point 96 Feet.

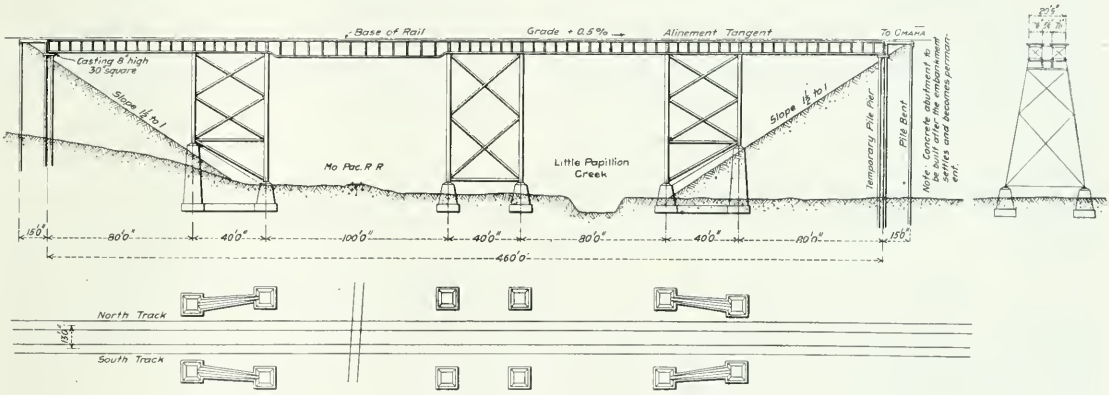



Fig. 6—Bridge Over Little Papillion Creek and Missouri Pacific Railway.

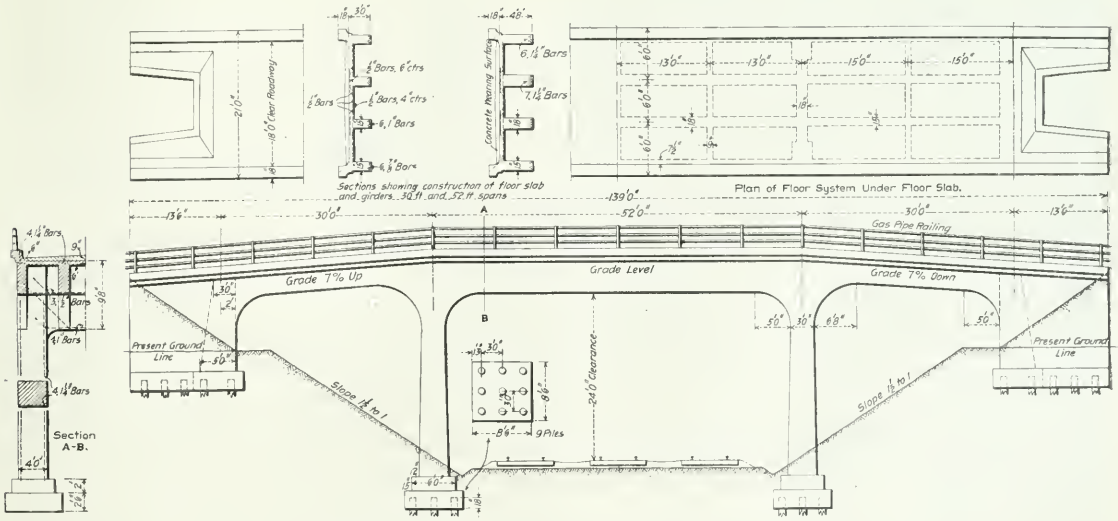

Sections showing construction of floor slab and girders. 30 ft. and 52 ft. spans
Concrete Wearing Surface
Plan of Floor System Under Floor Slab.
Gas Pipe Railing
Grade 7% Up
Grade Level
Grade 7% Down
Present Ground Line
Slope 1½ to 1
24'0" Clearance
9 Piles
Section A-B.

Fig. 8—Reinforced Concrete Highway Viaduct; Omaha Cut-off.

& Western crosses and the new line will go over the creek and railroad on a steel viaduct on concrete foundations, a plan and elevation of which are included in the illustrations (Fig. 6). It contains three 40-ft. tower spans and one 100-ft. and three 80-ft. intermediate deck plate-girder spans, the total length of the steel work being 460 feet. Its extreme height above stream bed will be the same as that of the timber trestle—96 ft.—and its construction will require 3,000 cu. yds. of excavation, 18,000 lineal ft. of piling, 4,000 cu. yds. of concrete and 800 tons of steel. Big Papillion creek will be crossed by a similar but shorter steel viaduct, with two 30-ft. towers, two 80-ft. spans and one 60-ft. intermediate span. The new line crosses the tracks of the Omaha Bridge & Terminal Railway (Illinois Central) and the Chicago & North-Western once each and the Missouri Pacific twice. All of these are overhead crossings by means of steel viaducts. The Omaha Bridge & Terminal line, which does not appear on the map, is parallel and adjacent to the branch of the Missouri Pacific at the point where the new line crosses it just west of Summit and a single structure will span the two. It will be on a $17\frac{1}{2}$ deg. skew, and will consist of a double-track 105-ft. pony truss span and two double-track 80-ft. through plate-girder spans, the total length on center line being 266 ft. $9\frac{3}{4}$ inches. It will contain 460 tons of steel. The North-Western crossing will have a 138-ft. through riveted span and two 60-ft. deck plate-girder spans.

All other bridge and culvert work is of permanent construction, concrete or concrete and steel, except small drainage openings, which are cast-iron pipe. All streets and public highways will be carried overhead or underneath. Subways for highways below grade will be 20-ft. concrete arches where head-room permits. An arch of this kind is shown in Fig. 7, which is a highway arch in Hell creek valley under a 43-ft. fill. The barrel is 91 ft. long. Hell creek itself, 568 ft. west, is crossed by a similar arch, with a barrel 148 ft. long. The soft alluvial soil in these valleys made the building of this latter arch more than ordinarily difficult and also required certain modifications of design to meet the peculiar conditions. In the first place, in excavating, the material was too soft to handle with shovels and had to be sluiced out. Then because the weight of the embankment was likely to cause the material to bulge up between the footings, which were originally 10 ft. wide, they were extended across, forming a continuous footing. Reinforcement by means of corrugated bars was provided near the upper surface to take the stresses from the up-thrust resulting from the embankment pressure already referred to. There were about 24,000 lineal feet—over $4\frac{1}{2}$ miles—of piling driven for foundation, both 40 ft. and 20 ft. lengths being used.

In cases where the embankment is too low for the 20-ft. arches, rectangular openings of I-beam and concrete construction, with a clear roadway of 18 ft. and a clear height above roadway of 14 ft., are being put in. This design of culvert on the Union Pacific was illustrated in the *Railroad Gazette* of Dec. 8, 1905. The line will cross one street in Omaha on a 30-ft. reinforced concrete arch. All other open streets of Omaha and South Omaha will be carried overhead with steel viaducts.

For two of the highway crossings reinforced concrete viaducts have been designed. In general character they are quite similar to the Big Four structures on the Hillsboro-Mitchell double-track short line of the St. Louis division, described and illustrated in the *Railroad Gazette* of May 18, 1906. However, the Union Pacific designs are much longer over all, one being 139 ft. and the other 160 ft., and the individual spans on both are much longer than the corresponding spans of the Big Four bridges. One of the Union Pacific viaducts spans two tracks, the central span being 40 ft. c. to c. of piers, the other spans three tracks with a central span of 52 ft. c. to c. of piers. Drawings of this latter structure are reproduced herewith (Fig. 8). In all cases where important structures are built in the valleys having the deep and soft alluvial deposits it has been found necessay to drive 40- and 50-ft. piling in the foundation pits to secure proper support, as in Fig. 9. On high ground the soil is firm and in some cases will support the masonry without piling.

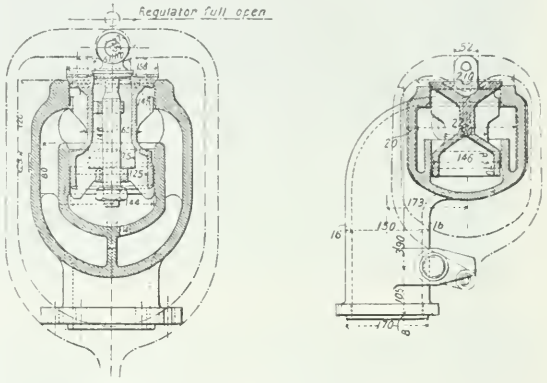
Grading is now about one-half and masonry bridge work more than three-quarters done. The work is being pushed as fast as possible. The present average working force is about 300 men and seven steam shovels, working day and night. There are engaged on the work 13 standard-gage locomotives, 12 narrow-gage locomotives, 72 standard-gage cars for hauling dirt, including flats and Lawson dump cars, and 128 narrow-gage cars. There are also two Lidgerwood unloaders, three pile-driver gangs, and four gangs putting in concrete or excavating for it. The line will probably be finished next summer.

It will be laid with 90-lb. rails, ballasted probably with Sherman gravel and equipped with automatic block signals. The old line is not to be abandoned, as there are several small towns on it and the local traffic, as well as its possibilities as an emergency line, will justify its maintenance.

The work is being done under the direction of Russel L. Huntley, Chief Engineer; J. H. Howe being Resident Engineer in charge. G. W. Sykes is Assistant Engineer in immediate charge of the work, with two field parties under him. The bridges were designed under James Keys, Engineer of Bridges. The contractors are Kilpatrick Brothers and Collins Contracting Company, Beatrice, Nebraska.

## Balanced Throttle Valve; Italian State Railways.

The *Engineer*, London, recently illustrated some compound locomotives built for the Adriatic System of the Italian State Railways, which embody some new features. Among these is a tri-phase throttle valve designed by Signor Zara. There are two forms as shown. It is of the ordinary cylindrical type, but with only one instead of two seats as the American pattern. Its purpose is to avoid the balanced or differential pressure on the two ends of the double-seated valve, which makes leakage possible and may allow the valve to be lifted without touching the throttle lever. With the balanced valve it is difficult to graduate the opening of the




Cross-Sections of Zara Balanced Throttle Valve.

valve when starting; for, as soon as the valve is lifted from the seat, the minimum opening which it is possible to give by hand to valves of this type, which are rarely less than 6 in. in diameter, corresponds to a considerable displacement of a flat valve, the port of which is often of triangular shape, to render the increase in sectional area gradual. There is also difficulty in fitting the double-seated valve on its two seatings. Because of the unequal expansion of the valve, as compared with the head in which the seats are machined, it is usual to shorten as much as possible the distance between the two seats, and by pouring the head and valve from the same melt to obtain like coefficients of expansion.

In the Zara valve the valve is a combination of a drop-seat valve with a piston valve, one above the other. The admission is

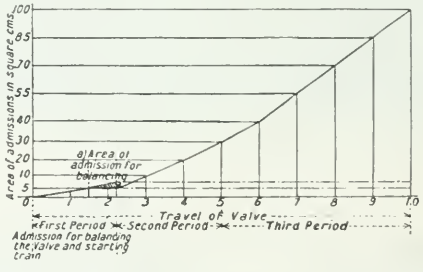



Diagram of Opening of Zara Balanced Throttle Valve.

from the top only, and the full boiler pressure bears against the single-beat valve. The first movement of the throttle lever operates a small valve which admits steam into a closed chamber below the sliding portion of the valve. This piston valve does not fit tightly, but an annular clearance is allowed by which an area is left through which the steam escapes in part to the dry-pipe and valve chests, the other part remains in the chamber to balance the pressure on the single-beat valve. This is the first period of the three-phase valve. The opening made is indicated in the diagram, and is set for starting a train without slipping. The limit of this period can be felt through the throttle handle when the stop on the small valve encounters the under side of the loose-fitting piston valve. Continuing the upward motion unseats the single-beat valve, as its cone extends down below the seat, the full sectional opening of the valve is not had until that cone is raised above the top of the seat. This is termed the second period; its purpose is to accelerate

slowly the speed of the pistons without slipping the wheels. When the valve is raised so that the lower side of the conical portion is level with the top of the seat, the third period is entered, and the action does not differ from that of ordinary balanced valves in the progressive increases of steam volumes admitted to the valve chest.

The small valve by which steam is admitted below the face of the main valve is either a small auxiliary flat valve, or a small valve formed by the vertical rod which lifts the valve, this rod being turned to form a small piston in a cylindrical part of the valve proper. In the compound locomotives built the flat valve was found to be simplest. About 230 locomotives have been fitted with this throttle valve, which, besides being steam-tight and having a gradual opening, is easily made and economical to maintain. It admits steam only at the highest point in the dry pipe, which in low domes is an advantage, and it is said to render unnecessary the employment of relief valves for the automatic discharge of water from the cylinders.

## University Education for Railroad Work.

The Dean of McGill University, Montreal, in the course of an address on "The Advantages of a University Education in Connection with Railroad Work," spoke as follows in regard to the views of prominent men as to the establishment of a railroad course at McGill:

John Carstensen, Vice-President of the New York Central & Hudson River Railroad, writes as follows:

"The great advantage to a young man of a university training is that it moulds his mind, and fits him to deal with affairs and men of affairs. As at present conducted, the education obtained in universities does not seem to produce men who, at first, are of as much value to the railroad service as the boy trained up gradually from the lowest to high positions, but subsequently it has been found that the university-trained man moves forward more rapidly on account of the wider breadth of view inculcated by his superior education, although he may not be able to deal with small details as the boy from the common schools."

Mr. Carstensen is strongly of the opinion that the university-trained men will be productive of the very best results. His company employs a large number of graduates, and he gave me many instances of their success, comparing their progress with the progress of those coming from the common school, and gradually working their way up from the office.

The Pennsylvania Railroad has always insisted on the employment of university-trained graduates in certain departments. They have special apprentices, consisting solely of college graduates, and ordinary apprentices. If any of these ordinary apprentices show any marked ability, they give them leave of absence, and allow them to go to a university in order to get that theoretical training which will make them more valuable to the railroad. On their return, they are immediately placed in the class of special apprentices. W. W. Atterbury, General Manager of the Pennsylvania, says that the rule of employing university graduates has been extended, as far as possible, to all other departments of the railroad, and with the best possible results. Speaking of the work we propose to do in McGill, Mr. Atterbury is of the opinion that such a course should assure for railroad managers and assistants greater intelligence and greater usefulness than the present methods.

Considering the locomotive department, I should like to quote the opinion of Samuel M. Vauclain, of the Baldwin Locomotive Works. He says: "The ideal training for a student intending to take up locomotive work should be a general college education along the lines of Mechanical Engineering, extending over a period of two or three years."

He also says better results might be obtained if the student could be required to take a post-graduate course in some railroad works. The greater responsibilities and the higher rewards in the operation and management of railroads are generally given to those who have been trained and developed in actual service. The result of this state of affairs is that the railroad student is used for railroad construction rather than for railroad operation. The mass of information necessary for the operation of a railroad cannot be obtained in the class room, but must be acquired in actual experience in railroad work.

As far as the operation of a railroad is concerned, we have, I think, solved the problem by establishing in connection with this railroad scheme what we call the operating department. We have three distinct branches, and you can specialize on the civil, the mechanical or the operating side, but in each of these departments everyone taking this railroad course must take certain subjects that are common to all, such as economics. In addition, we also give them in the third and fourth year a broad literary training. I would like to emphasize this fact rather fully, because we find that young men who come to us often do not know how to write a letter, and very often do not know how to say what they want to say. A great railroad manager told me, about 18 months ago, that he had had during the year several hundred applications for positions. These applications came from graduates from technical schools all over the United States and Canada, yet only a few were expressed properly, or in good language, or grammatically. Of course, this is a lamentable showing, but we hope to get rid of such criticism ourselves by continuing the English training in the third and fourth years. This will be largely done in connection with economics, the principles of which lie at the base of many of the most important problems of railroad work. The student is expected to write an essay on certain economic questions, and these essays are corrected not only from the standing of economics, but also from the literary standpoint, so that students gradually acquire the habit of writing briefly and intelligently. If we can only train up these young fellows to do this, we shall have done a great thing for the railroad profession.

Another man interviewed, who was one of those who showed the greatest interest in our scheme, was A. W. Gibbs, General Superintendent of Motive Power of the Pennsylvania Railroad at Altoona. He wrote me a long statement, and thus closed his remarks:

"Taking it altogether, I think the course is one to be very much commended, and while I do not think that from any technical institution full-fledged railroad men will ever emerge, I think that such a course will save future railroad men much of the threshing of old stuff which a man without this training would have to go through. If you can get a man to think straight, I think the rest will depend upon his opportunities, and upon the use he shall make of his training."

Walter G. Berg, Chief Engineer of the Lehigh Valley, and eminent also for his writings on this subject of engineering education, says: "The higher branches of the railroad should be considered as a profession, and as in a profession provision should be made for an adequate training. The misplaced belief that practice can only be learned in practice has caused thousands of boys, not only in railroad service, but also in mechanical and industrial pursuits, to be consigned yearly to the same rut, as others before them. Taken as a whole the young man may be able to become familiar with data and statistics, but experience is a very slow teacher, and it is usually costly to the one that pays the bills."

Opinions of this kind from men like Sir Thomas Shaughnessy and Mr. Hays, and the many others, who are the acknowledged leaders of their profession, should and did have great weight. What I wish to impress upon you is the fact that the McGill University scheme is not a scheme based upon ideas of theoretical men, but it is a scheme based upon the combined opinions of practical and theoretical men in the highest positions.

## Electrification of the Simplon Tunnel.

An interesting description of the electrification of the Simplon Tunnel appeared in a recent issue of *Engineering*, of which the following is a brief abstract: Soon after work had been started on the tunnel proposals were made to the Jura-Simplon Railway Co. to consider plans for operating the line with electricity, but as the art of heavy electric traction was then in its infancy the proposals were rejected. Subsequently attempts to interest the management in electric working met a like fate. Last year Messrs. Brown, Boveri & Co., of Baden, submitted a plan which was unusual and somewhat daring. They agreed to put in the required plant at their own risk and to work the trains through the tunnel with three-phase alternating current locomotives at a fixed rate per train-kilometer. The railway company had the option of abandoning the system at the end of a year's trial, and the contractors agreed to remove the equipment at their own cost at the end of that time if the results were not satisfactory. This offer was accepted on Dec. 19, 1905, and the contractors undertook to have the plant ready for electric working by June 1, 1906.

The contractors had on hand at their works two three-phase locomotives built by them for the Valtellina line, and they made arrangements to borrow from that road three similar machines built by Ganz & Co.* The principal task therefore was to design and install the trolley line for 3,300-volt three-phase current. Because of delays in designing and manufacturing the overhead line material actual construction work was not begun until March 1, but so rapidly was the installation made that by April 29 the electric locomotive entered the tunnel and ran in half-way. Regular operation was begun at the time set—June 1.

In bending the rails it was necessary to clean with the sand blast the surfaces of the rails and the fish plates at every joint. This was done with a portable sand-blast outfit, consisting of gas-engine driven air compressor and sand tank. The work went on continuously with three shifts of men working eight hours each. The overhead work could only be put in between 11 p.m. and 3 a.m., when no trains were running through the tunnel. The tunnel is not only very hot, but also very damp, and the design of suitable insulators for the high voltage employed was a difficult problem. The design finally adopted consists of a porcelain insulator and a rubber

*For a description of these locomotives see *Railroad Gazette, June* 9, 1905.

insulator arranged in series and each capable of receiving 18,600 volts when clean and dry. These insulators are attached to the suspending wires under the crown of the tunnel, which are spaced 100 ft. apart, and the trolley wires are hung from them. The system of insulation adopted has proved quite satisfactory, although, as a certain number of steam trains are still using the tunnel, it is found necessary every two months to wash the insulators free from the soot and dirt deposited by the locomotives. In the tunnel two small light wires are used for each phase instead of one heavy wire, because of the difficulty of stringing a heavy wire. On the approaches at Brique at one end and Iselle at the other single wires are used with a span between bents of 140 ft. These bents are made entirely of $1\frac{3}{4}$-in. gas pipe. One leg of the bent is a tripod and the other leg is made up of two pipes, splayed to give longitudinal rigidity. At Brique these bents are made to straddle six tracks. The ends of the legs are supported on concrete foundations.

When the line was first opened last June some unexpected difficulties were encountered, the most serious being the failure of the insulation in the motors of the two new locomotives built by the contractors. The ventilation of the tunnel is from north to south, and at the southern end the temperature in the tunnel is normally between 92 deg. and 94 deg. Fahr., with the air super-saturated with moisture. When a locomotive enters the tunnel this moisture condenses in streams on the cold metallic parts, and in the case of the new locomotives water poured into the ventilating ducts in the motors, with the result that the insulation quickly broke down. The old Ganz locomotives borrowed from the Vallellina line, curiously enough, escaped this trouble, owing to the fact that the gauze through which the air passes to the ventilating ducts was choked with the dust accumulated in three years' service. On renewing the insulation in the new locomotives the air ducts were closed to prevent a recurrence of the trouble. This does not interfere with the working of the machines, as the trip through the tunnel requires only about half an hour, and the motors are designed to carry their full load for this length of time without overheating. This trouble, however, was not more serious than other difficulties encountered with working by steam locomotives. The blast from the exhaust loosened the roof, and hardly a trip was made without falling stones breaking glass in the cab or following cars. The smoke and steam discharged caused so dense a fog to form at the southern end of the tunnel that the signal lamps were invisible at a greater distance than 50 or 60 yds.

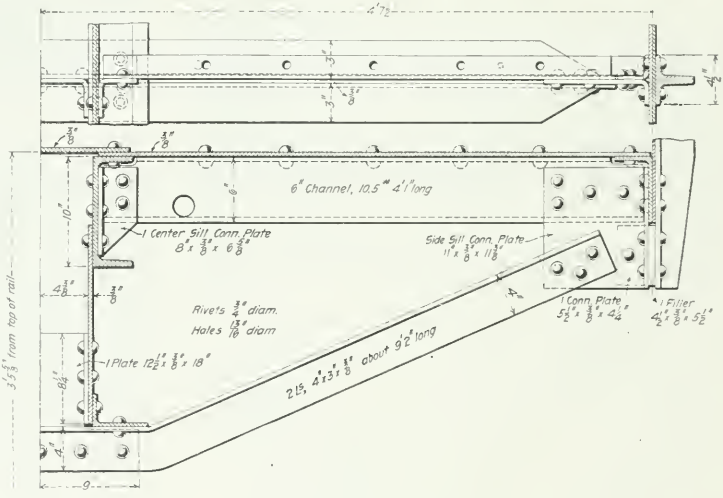
Some interesting data have been recorded showing the train resistance in the tunnel. At a speed of 44 miles an hour it requires about 400 h.p. more to haul a train in the tunnel than in the open. On the 0.7 per cent. grade at the south end it was found that the locomotive would not run down the grade by gravity if alone, but would with a train behind it. At the normal running speed of 33 miles an hour the extra resistance is about 15 lbs. per ton when the train is running in the direction of the ventilation current; in the opposite direction it is slightly greater.

Current for operating the line is obtained from power houses at both ends of the tunnel, use being made of the water power originally installed for operating the machinery used in driving the tunnels. At Brique 1,200 h.p. is available and at Iselle 1,500 h.p.

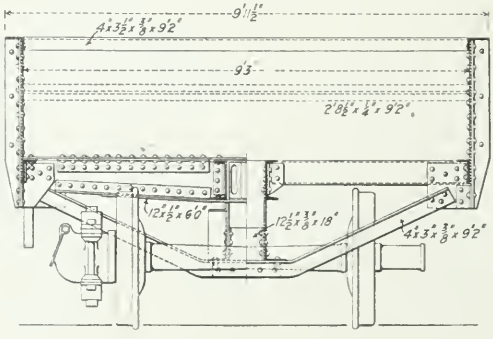
### Steel Gondola for the Newburgh & South Shore.

The Middletown Car Works has recently delivered to the Newburgh & South Shore, an industrial road of the American Steel & Wire Co. in the suburbs of Cleveland, a number of 50-ton all-steel gondolas for carrying ore, billets and bundles of wire. They embody a number of interesting departures in steel car design which are clearly shown in the accompanying drawings. The center sills, as will be seen, are 10-in., 28.8-lb. wide flange channels, continuous from end sill to end sill and reinforced in the center with a $\frac{3}{8}$-in. web plate carrying a bottom flange angle 5 in. x 3 in. x $\frac{3}{8}$ in., the whole forming a fish-belly girder $20\frac{1}{2}$ in. deep at the center. The web plate is secured to the channel web by a single row of rivets. Any load carried by the center sills in excess of their capacity is transmitted to the plate girder sides by three cross-bearers which are shown in detail in one of the drawings. These consist of two angles

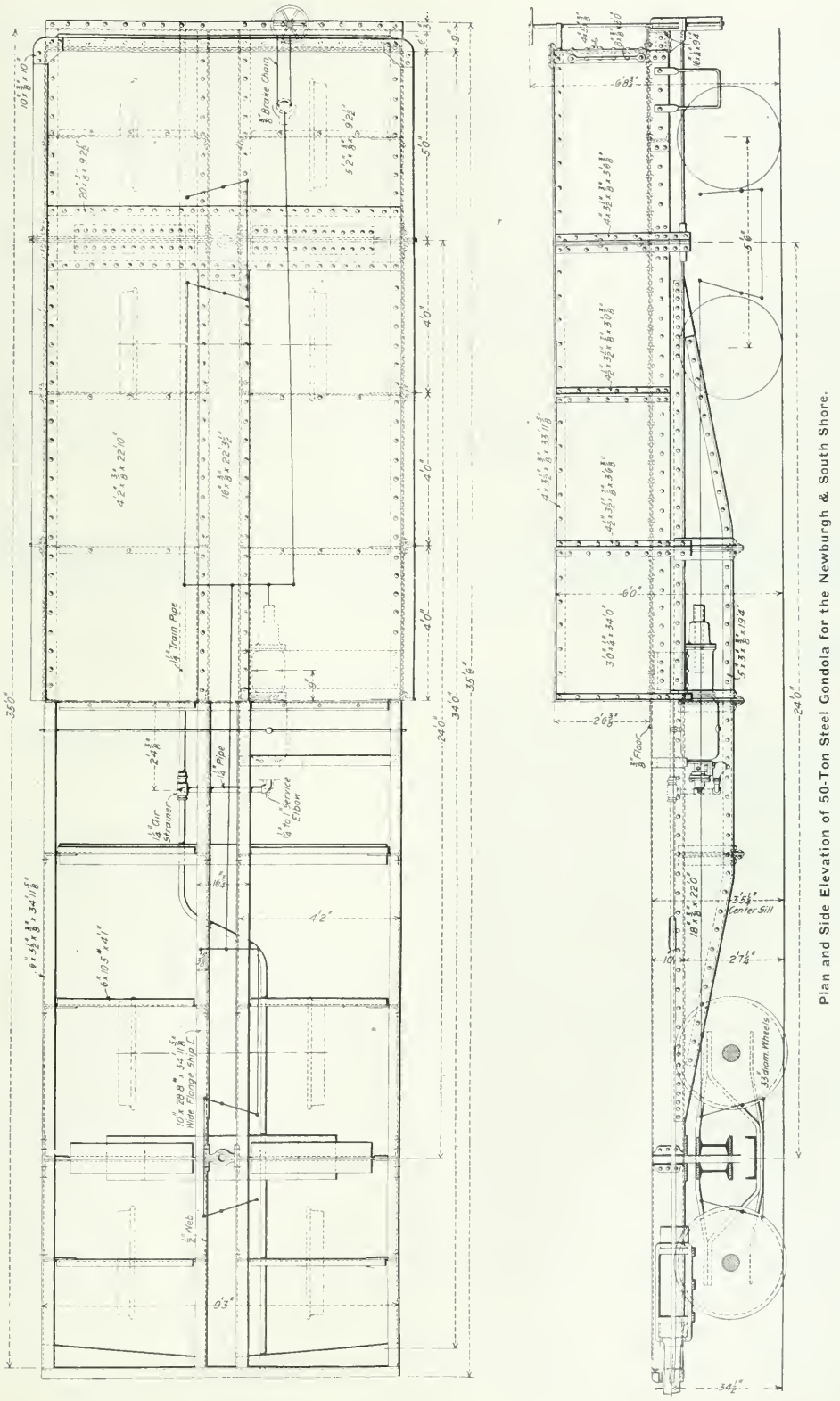
50-Ton Steel Gondola for the Newburgh & South Shore.


6" Channel, 10.5 lbs. 4'1" long
1 Center Sill Conn. Plate
Side Sill Conn. Plate
Rivets ¾" diam.
Holes ⅞" diam
1 Plate 12½" x ⅜" x 18"
2 L's, 4" x 3" x ⅜" about 9'2" long
1 Conn. Plate
1 Filler
3'5½" from top of rail

Detail of Cross-Bearer.




Half Cross-Sections at Bolster and Center.




Plan and Side Elevation of 50-Ton Steel Gondola for the Newburgh & South Shore.

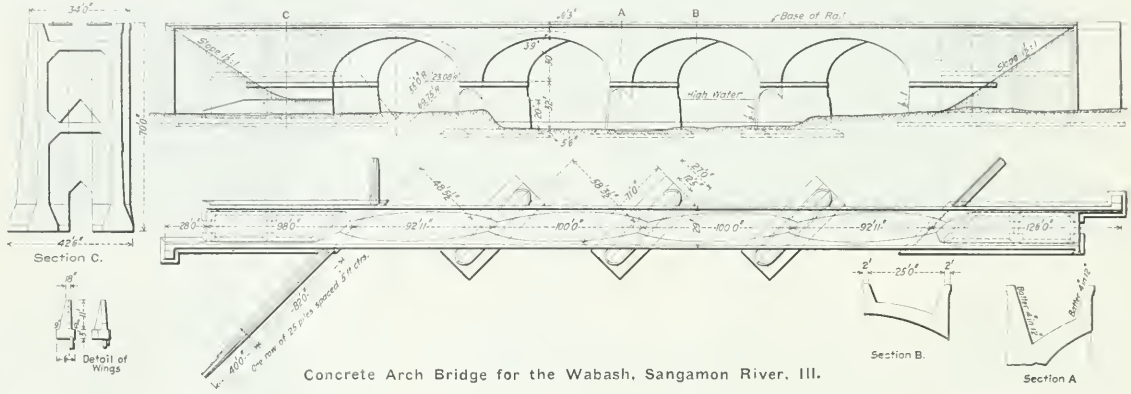
4 in. x 3 in. x ⅜ in. secured to gusset plates at their outer ends and passing across and under the center sills. The vertical stiffeners in the sides are T iron and divide the side, which is a single ¼-in. plate 3 ft. x 34 ft., into eight panels. The sides have an inside flange angle at the bottom 6 in. x 3½ in. x ⅜ in. and a top finishing angle 4 in. x 3½ in. x ⅜ in. The principal advantage in using heavy channels in the built-up center sills, aside from the additional stiffness obtained against vertical bending, is in the continuous draft sill thus obtained which simplifies the attachments of the draft gear and brings the center line of draft nearer to the center of section of the whole member.

The cars are mounted on arch bar trucks with double I-beam bolsters and 33-in. wheels. They weigh 37,500 lbs.

We are indebted to Mr. George I. King, Vice-President, Middletown Car Works, for the drawings.

## Concrete Bridge of the Wabash Over Sangamon River.

Relocating, to reduce grades and improve alinement, and double-tracking a stretch of several miles of its line, is a part of large improvement work the Wabash is doing at Decatur, Ill., to relieve congested conditions and provide adequate facilities to meet present and prospective requirements at that point. An interesting feature of this relocation and double-tracking work is the construction of a large concrete bridge over the Sangamon river, about 3½ miles east of Decatur, work on which is now in progress. A plan and elevation of the bridge and certain detail features are illustrated herewith.



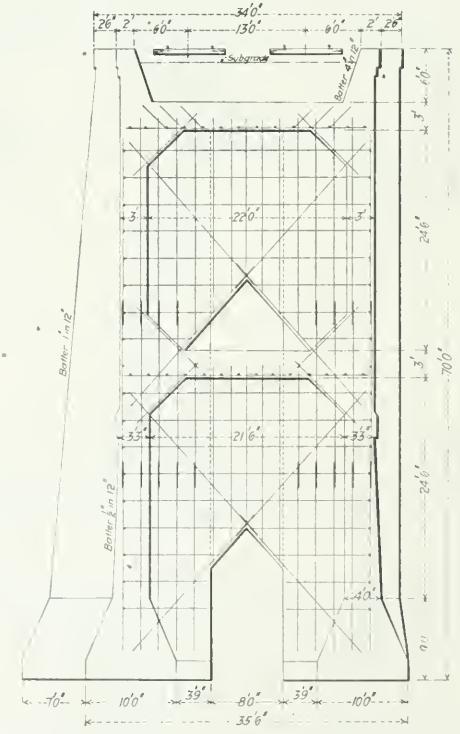

Concrete Arch Bridge for the Wabash, Sangamon River, Ill.

The bridge is on a skew of 45 deg., and its total length, out to out of abutments, is 637 ft. 10 in. There are four spans, the central or channel arches being 100 ft. c. to c. of piers, and the shore spans 92 ft. 11 in. The arches have a rise of 30 ft. and a total height above bed of stream for the channel spans of 62 ft. The bridge is designed for a loading of two consolidation locomotives of Cooper's E-50 class, followed by a train load of 5,000 lbs. per lineal foot of track, with impact added.

The foundations have a spread of 71 ft. by 27 ft. and rest on piling, there being 259 piles for each pier, spaced 3 ft. on centers longitudinally, and 2 ft. 6 in. between rows. On account of the large area over which they are spread the pier footings are reinforced with 1-in. corrugated steel bars. The arches, however, are designed as a plain concrete structure and carry only enough steel bars to take care of the temperature stresses.

The feature of chief interest in the design of the bridge is the abutments. They extend back a total distance of 126 ft., measured on the bridge center line, and are hollow. The track is carried on a slab 2 ft. 4 in. thick, and two cross walls and a lower slab, 24 ft. 6 in. below the top slab, furnish the requisite stability and strength and divide the abutment interior into four chambers. The abutments rest on piling, there being 395 piles for each, and are fullly reinforced with the 1-in. corrugated bars, details showing the bar arrangements in the cross wall included in the drawings. Openings are left in the cross walls at the bottom of each chamber for removing the forms. These openings are 8 ft. high and extend up to and conform to the position of the diagonal reinforcing rods. The rear lower chamber will be filled with earth to withstand the earth pressures from the sides and back of the abutment.

The quantities of material for the bridge are as follows: 1,500 cu. yds. dry excavation, 3,700 cu. yds. wet excavation, 31,840 lineal feet of piling, 8,416 cu. yds. of plain concrete, 4,568 cu. yds. of partly reinforced concrete, 2,918 cu. yds. of fully reinforced concrete, and 192 tons of 1-in. corrugated steel bars. The cost of the bridge will be about $177,000, and it is expected to have it done by June, 1907. The bridge was designed under the direction of Mr. A. O. Cunningham, Chief Engineer of the Wabash. Wm. P. Carmichael Company, Williamsport, Ind., is the contractor.




Cross-Section Showing Abutment Cross-Wall Reinforcing Rods (All 1-in. Corrugated Bars).

## Foreign Railroad Notes.

The Great Northern Piccadilly-Brompton "tube"—underground railroad—in London was opened for business last week. By this line there will be a nine-mile underground line from Hammersmith to Finsbury Park, with a new system of through fares between the tramways and the tubes, old and new. The new tube is fully 100 ft. below Piccadilly, and has cost over $1,000,000 a mile.

The Austrian State Railroads contemplate establishment of regular automobile stage-coach lines from certain stations to places a few miles distant. This is especially desired for summer excursion traffic in the mountains, where the resorts are, many of them, inaccessible by rail. In the Tyrol no less than 30 places have asked for such lines, and many of them are willing to guarantee the cost of working them.

## The Kansas City, Mexico & Orient.

This road is being built by A. E. Stilwell, of Kansas City, the promoter of the Kansas City, Pittsburg & Gulf Railroad, now the Kansas City Southern. Mr. Stilwell took the project up shortly after he lost control of the Pittsburg & Gulf, in 1899. It is to extend from Kansas City through Kansas, Oklahoma, Texas and Mexico to Topolobampo on the gulf of California, a distance of 1,659 miles, and will provide a short route for traffic from the central part of the United States to a Pacific port. The portions completed and in operation aggregate 409 miles, divided as follows:

| From | To | Distance |
|---|---|---|
| Wichita, Kan. | Clinton, Okla. | 193 miles. |
| Sweetwater, Tex. | Knox City, Tex. | 77 " |
| Chihuahua, Mex. east | | 66 " |
| El Fuerte, Mex. | Topolobampo | 73 " |

The right has been secured to operate over the Chihuahua & Pacific from Chihuahua to Minaca, a distance of 122 miles, leaving 1,128 miles of track still to be laid. Of this amount grading is practically completed on 383 miles, located as follows:

| | | |
|---|---|---|
| Between | Emporia, Kan., and Eldorado, Kan. | 62 miles. |
| " | Clinton, Okla., and Knox City, Tex. | 161 " |
| " | Sweetwater, Tex., and San Angelo, Tex. | 75 " |
| " | End of track 66 miles east of Chihuahua and Conchos R. | 45 " |
| " | Bocoyna, Mex., and El Fuerte, Mex. | 40 " |

Concrete abutments and piers and culverts have been built between Emporia and Eldorado, and steel spans are delivered for river crossings on this stretch. Most of the smaller openings on the other stretches have been built. The bridges will be built as the track reaches them.

The heaviest grading is between Bocoyna and La Junta in the

Map of the Kansas City, Mexico & Orient.

crossing of the Sierra Madre mountains. A location has been adopted on each of the stretches which have not been graded.

The operating divisions and maximum grades and curves will be as follows:

| | Distance. miles. | Grades, per cent.— Eastb'nd. | Westbound. | Curves |
|---|---|---|---|---|
| Kansas City to Wichita, Kan. | 204 | 5/10 | 5/10 | 4 degrees |
| Wichita to Fairview, Okla. | 127 | 5/10 | 5/10 | 4 " |
| Fairview to Diaz, Tex. | 162 | 1 | 1¼ | 4 " |
| Diaz to San Angelo, Tex. (2 div.) | 218 | 1 | 1 | 4 " |
| San Angelo to Ft. Stockton, Tex. | 166 | 1 | 1 | 4 " |
| Ft. Stockton to El Oro, Tex. | 145 | 1 | 1 | 4 " |
| El Oro to Chihuahua, Mex. | 169 | 1 | 1 | 4 " |
| Chihuahua to Bocoyna, Mex. | 179 | 2 | 2 | 10 " |
| Bocoyna to La Junta, Mex. | 172 | 2½ | 2½ | 12 " |
| La Junta to Topolobampo | 117 | 1 | 1 | 8 " |

An elevation of 1,507 ft. will be reached in Kansas, 1,854 ft. in Oklahoma, 5,095 ft. in Texas and 7,970 ft. in Mexico.

The roadbed in embankment has a width of 15 ft. at crown with slopes of 1½ to 1, and in excavation a width of 20 ft. at base and slopes of 1 to 1, except that rock cuts have slopes of ¼ to 1. Bridges are designed to carry two consolidation engines each weighing 136 tons, followed by a uniform load of 4,000 lbs. per lineal foot. Timber trestles have 14-ft. panels and three-ply chords, consisting of 8-in. x 16-in. stringers. All bridges in Mexico are to be metal on stone or reinforced concrete supports, or reinforced concrete culverts. Ties are 6 in. x 8 in. white, post or burr oak, or burnettized short leaf yellow pine. All rail is 70-lb. A. S. C. E. standard section, in 30 or 33-ft. lengths connected by four-hole angle bars in which bolts are staggered.

By means of the Kansas City Outer Belt & Electric Ry., which is being built by Mr. Stillwell, connection will be made with nearly every steam railroad entering Kansas City.

It is expected that freight revenue will be derived largely from agricultural products of Kansas and Oklahoma, live stock of Oklahoma and Texas, and high and low-grade ores from mines which will develop along the route in Mexico, and also from traffic that will be interchanged with steamship lines operating between the Orient and the Pacific coast. A considerable portion of the Kansas City, Mexico & Orient will be a pioneer road. Practically all the existing lines crossed by it in Texas are east and west lines, but in Mexico, its general direction is westerly and the lines crossed are north and south roads.

A survey has been made for a branch about 180 miles long from San Angelo to Del Rio, Texas, to provide a direct city of Mexico connection.

## The True Perspective of the Supply Department.

BY ERNEST J. M'VEIGH,
Storekeeper, Grand Trunk Railway.

The article under this heading in the *Railroad Gazette* of Dec. 29, 1905, interested the writer very much, and he has waited in the hope of seeing something further on the subject, either in agreement or disagreement with Mr. Yeomans' proposition, but apparently the paper has not created the interest that it deserved.

That a supply agent reporting to the General Manager would be of great economic value, everybody who has knowledge of the subject of railroad supplies is likely to admit, unless he happens to be in a position where the appointment of such an officer would seem to clash with his interests; but a move in the direction of apparently increasing the cost of handling the supplies requires very little opposition to kill it. The attitude of the human mind in regard to the question of supply is most peculiar, and to the student who may be so fortunate as to possess a sense of humor, extremely funny. From the laborer who doles out his scanty wages with growls and kicks for household expense, to the General Manager of a great railroad system, it may seem to be a far cry, and yet one touch of nature makes them kin. To both, the everlasting outlay is an evil thing they would forget if they could, but unfortunately they cannot, as it happens to be the great question of the world, and must be faced. In the home, in business, in the army and wherever man moves and has his being, we cannot eliminate the evil fact that there are expenses to be met, so there is nothing for us to do but to face them and keep them under subjection lest they devour us. It has been a source of wonder to the observing man for years past that the supply department of our railroads has improved so slowly.

Some years ago a writer on this subject asked this question, "why is it that a railroad company will count its money three times as it comes in, and follow up an item of five cents until someone makes good, while the same company has hundreds and even thousands of dollars worth of material going to waste for want of attention"? At that time I could see just that condition of affairs very close to me, but I could not answer the question.

I have devoted a good deal of thought to the matter since that time, and I think I can see a few reasons why these conditions still prevail to a greater or less extent. In no business in the world can it be so truly said that improvements must come from the top as in the business of railroading, and there are very few men at the top of the railroads of America who have had practical knowledge of the details of handling supplies. Their training has generally been in departments where they naturally have looked on the supply department as the enemy, and when they become managers and must keep the balance on the right side of the ledger they are more than ever convinced that it is an evil thing, and listen with impatience to any reference to increasing the cost of its supervision. To appoint a supply agent in addition to the purchasing agent and storekeepers would appear to such an officer amounting simply to an increase in expenditure, and he would not be in a position to know just what the right man in that position could do. Each railroad has its own plan of handling supplies, and it is a fact much to be regretted that each is satisfied with its own particular plan. While they are satisfied, there will be no improvement.

Let us glance at two examples. On one system, the organization consists of the purchasing agent and his staff, whose jurisdiction covers the ordering and delivery of material on requisitions sent him. Then, for 2,000 miles of line there is a general storekeeper who requisitions, receives and distributes all supplies other than stationery, fuel and ties, and all local storekeepers and men in charge of material are nominally under his charge and report to him. His jurisdiction is in fact nominal, for the reason that most of these men are compelled to attempt the impossible, and serve two masters; the man on the spot who uses the material, and the general storekeeper many miles away. Which one do you think the local storekeeper will cater to? Here it is that the general storekeeper loses his grip, as it is humanly impossible for him, encompassed with heavy detail at headquarters, to know the conditions and requirements on his 2,000 miles of road, and he is

sending out supplies on requisitions approved by men who know little and care less about actual requirements, and whose motto is, "get all the stuff we think we may need, and then get a little more." It is true that the general storekeeper may send out one of his assistants on an occasional inspection trip, but this is only a case of the blind leading the blind, for what chance has the assistant had to make a study of the situation? Without a full knowledge of the matter, his time is wasted.

It is pleasant to talk of co-operation, and in theory co-operation can be made to solve most of these troubles. But, unfortunately, we never get much beyond theory in that line, and it is as well to deal on a basis of fact, and not expect the men whose business lies in maintenance of way, in repairs and renewals of bridges and buildings, repairs to cars, repairs to engines, and running trains, to take an interest in supplies, further than to see that each follows the maxim and gets all he requires and a little more.

Now enters the supply agent, who reports to the General Manager and has jurisdiction over all stocks. We will start out with the presumption that he possesses the requisite qualifications. That is, he is simply a practical man in the matter of supplies, and can recognize all items of railroad material when he sees them (there are 3,400 of these items, so he must have had some experience), and has a good working knowledge of the road he is going to work on, and a knowledge of the requirements of that particular road as well as a general knowledge of the money value of stock required per mile of average road, or division of road. His duties are to visit regularly all points where material may be stored, examine it carefully, consult with the men in charge, receive their complaints, criticise quality of material, carry with him a list of requirements from point to point and redistribute as he finds a surplus in one place and a shortage in another. He must inspect scrap bins and report where material is being put into scrap when it could be re-used with profit, and he must see that all scrap is shipped promptly, and that it is not allowed to lie around stations, section houses and yards.

Then there are hand-car houses and section houses to be cleared out, and the collection of material that drops from engines and cars must be moved; material that the track men will keep, in spite of all orders to the contrary. Also, all material that each year becomes obsolete owing to changes in equipment must be picked out, and special attention must be given to air and steam heat, hose and couplings. In this particular alone there is room for large saving of money per year on most of the roads in America, and I think it can be proved that on every thousand miles of road in America there is an unnecessary loss of $2,000 per year in this item alone.

Then comes up the question of the manufacture of supplies. Most railroads now make more or less material to supply their requirements, and as they frequently make up stuff that can be bought in the trade for half the money it costs them to manufacture, this also requires constant attention. Then there are the vans to clean out, once each year, to get surplus supplies from them. The quantity of material found for redistribution in vans alone will amount to more than a good salary. I have cleaned out 12 in two hours, and gotten $450 worth of material that was of no use to the train men (but they had it!) and the stations must not be overlooked; they will repay the gleaner for the time spent in visiting them.

The man appointed to the position of supply agent need not be loaded down with detail. On 3,000 miles of railroad he should not require more than a small office and a stenographer, and his office duties need not go beyond dealing with requisitions that come to him for approval, and his correspondence. We have the machinery for purchasing and distributing the supplies; what we want is someone with knowledge and authority to look after them.

On another system the organization is somewhat different from that which has been outlined. The purchasing agent has full control of the purchasing department and the storekeepers. He divides the system into divisions, and has one storekeeper for each division who handles a general stock, and accounts to the purchasing agent and audit office for the same. But in addition to this, there are motive power, transportation, car and shop stocks into which the general stock is emptied, so that at all times there is 50 per cent. of all new material on the system out of the hands and control of the men whose business is looking after supplies, and under the charge of men whose first duties are the various works pertaining to the operation of the line, and who regard the supply department as the enemy to be made a scapegoat of at all times. It is true that they must account for the goods under their charge when used, but who is to say whether they have twice the quantity on hand that they should have? They will never acknowledge they have enough, but, like Oliver Twist, will ask for more, and not always with as good reason as Oliver had.

Will anyone with knowledge of this subject say there is no room for the supply agent here?

I expect the author of your paper of last December might be inclined to say that I have reduced his important official to the level of a mere inspector, but I don't think we are looking for a kid-gloved official with a large staff compiling useless statistics. What we want is a man of knowledge and experience, who w work, and be a help both to the purchasing agent, the storekeepe and the men who use the supplies, and save the money of the co pany he works for. Money saved is money made, and, speaking g erally, the railroads of this country are in the business to ma money.

## Santa Fe Organization, 1906.

The new "Employees' Magazine" of the Atchison, Topeka Santa Fe prints the organization chart of the system, shown he with. Like that of most of the great American railroad syste the Santa Fe organization cannot be classed as being either clea departmental or divisional, but it is a mixture of the two, w jurisdictions sometimes interwoven. Take the case of the chief en neer. He is a departmental officer on the chart shown, reporti his forces to the president and not to the operating department, for example, in the remarkable divisional organization of the I nois Central, where the chief engineer reports to the assista general manager. But from the fact that he is chief engineer of t entire system, his work must necessarily border on that of the c sulting engineer, who is a staff officer without a "departmen strictly speaking; reporting also to the president. The subordina chief engineers, presumably directly responsible for field work, co also under the jurisdiction of the operating department—as it right and natural that they should—together with their assistan including the bridge engineer of the system. In the Pennsylva organization (*Railroad Gazette*, July 13, 1906), which may be tak as a type of the divisional, the general manager's jurisdiction d not extend over the chief engineer nor the chief of motive pow both of these officials being staff officers to the second vice-pre dent direct. But the Pennsylvania general manager has author over the general superintendent of motive power (the active he as differentiated from the chief of motive power, responsible design) over the chief engineer of maintenance of way, with wh he is directly concerned, and, through his general superintender over all the "help" needed to keep his railroad in order, as well to operate it.

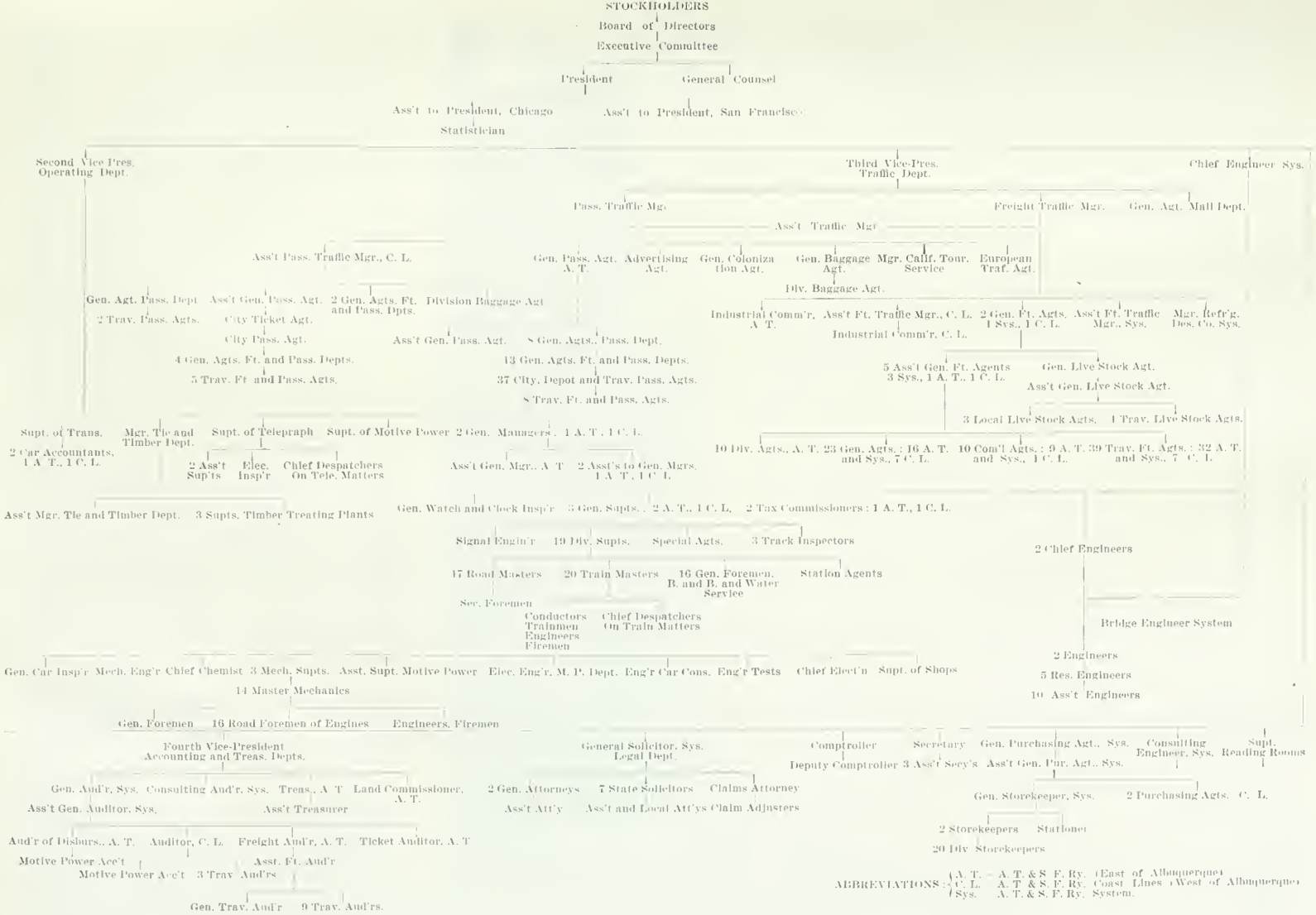
The question whether a given organization is departmental divisional resolves itself, at the last analysis, into a listing of officials who report direct to the general manager and his super tendents, in comparison with those who are staff officers reporti to the president or to a vice-president. The following table co pares the Santa Fe and Pennsylvania organizations of 1906 w the departmental organization devised for the Rock Island syst in 1904, but subsequently changed for the divisional one now

| Officer | Santa Fe, 1906. Officers in left hand column are as below | Pennsylvania, 1906. under jurisdic | Rock Islan Dept. organ zation of 1 |
|---|---|---|---|
| Supt. of Motive Power.. | 2d Vice-Pres. | 2d Vice-Pres. / Gen. Manager. | Gen. Manag |
| Chief Engineer ..... | President.* | 2d Vice-Pres. | 4th Vice-Pre |
| Eng. Maint.-of-way ..... | Chief Engineer. / Gen. Manager. | Gen. Manager. | 4th Vice-Pre |
| Ass't Engineer ..... | Chief Engineer. / Gen. Manager. | 2d Vice-Pres. | Chief Engin |
| Eng. Bridges & Buildings | Chief Engineer. / Gen. Manager. | 2d Vice-Pres. | Eng. M. of-W |
| Division Engineer ..... | Chief Engineer. / Gen. Manager. | General Supt. | Eng. M. of W |
| Signal Engineer ..... | Chief Engineer. / Gen. Manager | Gen. Manager. | Eng. M.-of-W |
| Bridge Engineer ..... | Chief Engineer. / Gen. Manager. | Chief Engineer. / 2d Vice-Pres. | Eng. M.-of-W |
| Master Mechanics ..... | 2d Vice-Pres. | General Supt. | Gen. Manag |
| Supt. of Telegraph ..... | 2d Vice-Pres. | Gen. Manager. | Gen. Manag |
| Supt. of Transportat'n.. | 2d Vice-Pres. | Gen. Manager. | Gen. Manag |

*Staff officer. Ass't Chief Engineers report also to the respective G eral Managers.

effect. It will be seen that, of the three, the Pennsylvania lodges greatest amount of control in the hands of the general manager general superintendent, the Santa Fe takes a midway position, wh the Rock Island organization tends to carry authority in spec fields past the general manager, so far as possible. As regards superintendent of transportation, superintendent of motive pow superintendent of telegraph and the master mechanics, the Santa organization is, however, the most strongly departmental of three. If the position of the division engineer be accepted as test—and it makes a very good one—it will be seen that this p of the Pennsylvania organization is straight divisional; of Santa Fe, mixed, and of the 1904 Rock Island, straight departmen

Although the respective arguments for the two types of org ization have often been discussed in the *Railroad Gazette*, it n be well to repeat, in brief summary, that the position of the depa mentalists is based on the belief that, in a great system embrac eight or ten thousand miles of line, no one man can be found a to handle in an expert manner such diverse problems as those lating to motive power, road maintenance, and train operation.


STOCKHOLDERS
Board of Directors
Executive Committee
President
General Counsel
Ass't to President, Chicago
Statistician
Ass't to President, San Francisco
Second Vice Pres. Operating Dept.
Third Vice-Pres. Traffic Dept.
Chief Engineer Sys.
Pass. Traffic Mgr.
Freight Traffic Mgr.
Gen. Agt. Mail Dept.
Ass't Traffic Mgr.
Ass't Pass. Traffic Mgr., C. L.
Gen. Pass. Agt. A. T.
Advertising Agt.
Gen. Colonization Agt.
Gen. Baggage Agt.
Mgr. Calif. Tour. Service
European Traf. Agt.
Div. Baggage Agt.
Gen. Agt. Pass. Dept
Ass't Gen. Pass. Agt.
2 Gen. Agts. Ft. and Pass. Dpts.
Division Baggage Agt
2 Trav. Pass. Agts.
City Ticket Agt.
City Pass. Agt.
4 Gen. Agts. Ft. and Pass. Depts.
5 Trav. Ft and Pass. Agts.
Ass't Gen. Pass. Agt.
8 Gen. Agts., Pass. Dept.
13 Gen. Agts. Ft. and Pass. Depts.
37 City, Depot and Trav. Pass. Agts.
8 Trav. Ft. and Pass. Agts.
Industrial Comm'r, A. T.
Ass't Ft. Traffic Mgr., C. L.
2 Gen. Ft. Agts. 1 Sys., 1 C. L.
Ass't Ft. Traffic Mgr., Sys.
Mgr. Refr'g. Des. Co. Sys.
Industrial Comm'r, C. L.
5 Ass't Gen. Ft. Agents 3 Sys., 1 A. T., 1 C. L.
Gen. Live Stock Agt.
Ass't Gen. Live Stock Agt.
3 Local Live Stock Agts.
1 Trav. Live Stock Agts.
10 Div. Agts., A. T.
23 Gen. Agts., and Sys., 7 C. L.
16 A. T.
10 Com'l Agts., and Sys., 1 C. L.
9 A. T.
39 Trav. Ft. Agts., and Sys., 7 C. L.
32 A. T.
Supt. of Trans.
Mgr. Tie and Timber Dept.
Supt. of Telegraph
Supt. of Motive Power
2 Gen. Managers, 1 A. T., 1 C. L.
2 Car Accountants, 1 A. T., 1 C. L.
2 Ass't Sup'ts
Elec. Insp'r
Chief Despatchers On Tele. Matters
Ass't Gen. Mgr., A. T.
2 Asst's to Gen. Mgrs. 1 A. T., 1 C. L.
Ass't Mgr. Tie and Timber Dept.
3 Supts. Timber Treating Plants
Gen. Watch and Clock Insp'r
3 Gen. Supts., 2 A. T., 1 C. L.
2 Tax Commissioners: 1 A. T., 1 C. L.
Signal Engin'r
19 Div. Supts.
Special Agts.
3 Track Inspectors
2 Chief Engineers
17 Road Masters
20 Train Masters
16 Gen. Foremen, B. and B. and Water Service
Station Agents
Sec. Foremen
Conductors Trainmen Engineers Firemen
Chief Despatchers On Train Matters
Bridge Engineer System
2 Engineers
5 Res. Engineers
10 Ass't Engineers
Gen. Car Insp'r
Mech. Eng'r
Chief Chemist
3 Mech. Supts.
Asst. Supt. Motive Power
Elec. Eng'r, M. P. Dept.
Eng'r Car Cons.
Eng'r Tests
Chief Elect'n
Supt. of Shops
14 Master Mechanics
Gen. Foremen
16 Road Foremen of Engines
Engineers, Firemen
Fourth Vice-President Accounting and Treas. Depts.
General Solicitor, Sys. Legal Dept.
Comptroller
Secretary
Gen. Purchasing Agt., Sys.
Consulting Engineer, Sys.
Supt. Reading Rooms
Deputy Comptroller
3 Ass't Secy's
Ass't Gen. Pur. Agt., Sys.
Gen. Aud'r, Sys.
Consulting Aud'r, Sys.
Treas., A. T.
Land Commissioner, A. T.
2 Gen. Attorneys
7 State Solicitors
Claims Attorney
Gen. Storekeeper, Sys.
2 Purchasing Agts. C. L.
Ass't Gen. Auditor, Sys.
Ass't Treasurer
Ass't Att'y
Ass't and Local Att'ys
Claim Adjusters
2 Storekeepers
Stationer
20 Div. Storekeepers
Aud'r of Disburs., A. T.
Auditor, C. L.
Freight Aud'r, A. T.
Ticket Auditor, A. T.
Motive Power Acc't
Asst. Ft. Aud'r
Motive Power Acc't
3 Trav. Aud'rs
Gen. Trav. Aud'r
9 Trav. Aud'rs.
ABBREVIATIONS: A. T. — A. T. & S. F. Ry. (East of Albuquerque)
C. L. — A. T. & S. F. Ry. Coast Lines (West of Albuquerque)
Sys. — A. T. & S. F. Ry. System.

Organization of the A. T. & S. F. Ry. 1906—Lines East and West of Albuquerque.

the other hand, advocates of the divisional organization say that these three elements are inseparable, and must be handled by one strong arm if harmony and success is to be looked for. There is obvious truth in both points of view, and as a result it is hard to find an American railroad organization that is a pure example of either type. As a nation, we lean to the divisional, while the characteristic British organization is sharply departmental, the head of the motive power department ranking almost with the general manager, corresponding in rank to our president, and often reporting to nobody but his directors.

## Compound Locomotive for the Kansei Railway, Japan.

The American Locomotive Company has recently completed three eight-wheeled, two-cylinder compound locomotives at the Pittsburg works for the Kansei Railway of Japan. Aside from the compound feature, the engines have a few points of interest that are not usually found in American locomotives. The most striking of these is the arrangement of the wheels beneath the tender. The gage of the Japanese road being but 3 ft. 6 in. the engine is lighter than those now built for similar service in this country and weighs only 43 tons, or the equivalent of an older class with 17-in. by 24-in. cylinders. The tender is correspondingly small and has a capacity of but 2,400 gals. of water and five tons of coal. This is carried on three pair of wheels, two set in a light diamond truck and one at the front held rigidly in the pedestal. In this there is a radical difference from English practice, where the three pair of wheels are usually put in the pedestals, forming a rigid wheel base for the tender. This might almost be called the Americanizing of the English design.

A second modification of English practice is to be found in the attachment of the forward wheel guards. These, instead of being fastened to the engine frame, are attached to the frame of the forward truck. This is a logical method in so far as the maintenance of the guard directly over the rail is concerned, but if an obstruction on the track were to be encountered, especially if it were on but one rail, it would seem that a derailment would be much more apt to occur than if the blow were to be received by the engine frame, as in the case of the English locomotive or American pilot.

The tubes of the engine are exceedingly short (9 ft. 4 in.) so that the distance from the center of the forward drivers to the center of the cylinders is cut down to 9 ft. 5 in., which has had its corresponding effect on the length of the connecting rod, which is only 5 ft. 8 in. long, or on a ratio of less than three to one of the stroke; proportions that are rarely met in modern construction. By drawing the truck center back, it also produces that stocky appearance of the engine that is so marked a feature of some Austrian designs where the same thing is done in order to lessen the weight on the drivers and thus keep them within the allowable load limits.

The forward drivers are about the same distance ahead of the firebox as in the older type of American engines (15 7/16 in.), which gives a clearance for the eccentric straps and no more; while the side rod is shortened to correspond to the length of the firebox, which is 66 in.

For the old American locomotive working on a 4-ft. 8½-in. gage, and of about the same cylinder capacity as this engine, the heating surface would have been about 1,200 sq. ft., or a trifle more. Here it is 1,044 sq. ft., but the steam pressure is higher, 180 lbs., as against a probable 140 lbs. in the engine referred to, so that there is an increase of 28 per cent. in steam pressure to compensate for a loss of 12.5 per cent. in heating surface.

In the proportions of the cylinders there seems to have been a reversion to original practice. The ratio of the high to the low-pressure is as 1 to 2.16, which is somewhat less than that used when the two-cylinder compound was first exploited, or that recommended by Herr von Borries in his earlier designs when it was made 1 to 2.2.

The springs for the driving wheels are all underhung with the equalizer below the bottom frame rail. The frame is of the standard bar form and the firebox rests directly upon it with expansion plates instead of the usual buckle plates. There is one waist plate at the guide yoke, thus completing the resemblance to the design of American locomotives that were standard 30 years ago; but from which it has departed in the diameter of the boiler, the steam pressure, the headlight, dome and width of firebox.

The following are some of the principal dimensions of these engines:

| | |
|---|---|
| Cylinders, H. P., diameter | 17 in. |
| Cylinders, L. P., diameter | 25 " |
| Piston, stroke | 24 " |
| Gage of track | 3 ft. 6 in. |
| Wheel base, driving | 7 " 6 " |
| " " total | 20 " 0 " |
| " " engine and tender | 38 " 5⅝ " |
| Weight in working order | 86,000 lbs. |
| " on drivers | 52,400 " |
| " engine and tender | 139,900 " |
| Heating surface, tubes | 963 sq. ft. |
| " " firebox | 81 " |
| " " total | 1,044 " |
| Grate area | 13.25 " |
| Boiler, fuel | Soft coal |
| " pressure | 180 lbs. |
| Axles, driving journals | 6½ in. x 7½ in. |
| Axles, tender journals | 3¾ in. x 7 in. |
| Firebox, length | 66 in. |
| " width | 28⅞ " |
| " thickness, crown sheet | ½ in. |
| " thickness, side and back sheet | 9/16 in. |
| " thickness tube sheet | ⅝ in. |
| " water space front | 3 5/16 in. |
| " water spaces sides | 2½ in. |
| " water space back | 3 in. x 4 in. |
| Tubes, material | Brass |
| " number | 228 |
| " diameter | 1⅝ in. |
| " length | 9 ft. 4 " |
| Smokestack, diameter | 12¾ " |
| Smokestack, above top of rail | 12 ft |
| Tank capacity, water | 2,400 gals. |
| Tank capacity, coal | 5 tons |
| Tractive power | 14,350 lbs. |

Narrow-Gage Compound for the Kansei Railway, Japan.

| | |
|---|---|
| Weight on drivers / Tractive power | = 3.65 |
| Total weight / Tractive power | = 6.0 |
| Tractive effort x diam. of drivers / Heating surface | 853.0 |
| Heating surface / Grate area | = 79.0 |
| Firebox heating surface / Total heating surface | = 0.077 |
| Weight on drivers / Heating surface | = 50.2 |
| Total weight / Heating surface | = 82.3 |
| Vol. of 2 equivalent simple cylinders / Heating surface | 5.2 cu. ft. |
| 2 equivalent simple cylinders / Grate area | = 207.7 |
| 2 equivalent simple cylinders | = 2.55 |

In the fitting of the engine cast-iron is used for the boxes and cast-steel for the driving wheel centers. The firebox is of copper with copper staybolts and the tubes of brass. It has the automatic

vacuum and hand brakes on both the driving wheels and the tender. The valves are of the balanced Richardson type, with 5-in. travel and 7/8-in. lap for the high-pressure, and 6-in. travel and 1 1/16-in. lap for the low-pressure, with an exhaust clearance of 1/8 in. In setting the high-pressure has a lead of 1/16 in. and the low-pressure 1/32 in. A double exhaust pipe is used. The tender frame is of 7-in. steel channels and is carried on wheels of 36 in. diameter.

## Cost of Steam Shovel Work.*

BY JOHN C. SESSER,
Engineer of Construction, Chicago, Burlington & Quincy Railway.

In the rebuilding of railroads throughout the country, the railroads are doing or organizing to do their steam-shovel work with company forces and equipment. That they are better fitted and able to do this work from 25 to 30 per cent. cheaper than the price for which it conid be contracted is a fact without question.

Among the various jobs of grade reduction work which were done on the Burlington System during the season of 1906, there were two on the Beardstown-to-Centralia Division, known as the Big Shoal and Little Shoal cut-offs, respectively.

### BIG SHOAL CUT-OFF.

The Big Shoal cut-off was a change of alinement and grades between Sorento and Reno, Ill. On this cut-off there were 318,711 cubic yards of earth to be moved, of which 251,711 cubic yards were steam-shovel work. Bids were asked of the larger contractors of this country for this grading, and, while their prices per yard were reasonable, they were higher than that for which the company could do the work. Consequently it was decided that the company should do the work with its own forces and equipment.

On this work two temporary trestles were built, having a total length of 2,961 ft. and an average height of 40 ft. The material for the embankment was hauled from the north, an average distance of one and one-half miles. The average depth of cut was 15 ft. The material handled was clay. On account of numerous springs encountered, both material and steam-shovel pit were very wet, which delayed this work to some extent. At times the clay would leave the dipper in chunks as large as the dipper itself. This made the dumping of cars from the high trestle rather dangerous, and necessitated the locking of the cars to the trestle before they were dumped.

The work being entirely separated from the main line, where boarding cars would have been impracticable, bunk houses were built for the men employed on this work. These houses were constructed out of the ordinary rough lumber, matched lumber being used for the flooring only. The camp consisted of a bunk house for the laborers, cook house, bunk house for the shovel, engine and bridgemen, commissary, bath and oil house. The bunk house for the laborers was 16 x 62 x 10 ft. high. This building accommodated seventy-two men. One single row of bunks was built on each side of the building, and a double row through the center. These bunks were 6 x 2 ft. 6 in. wide. This left an aisle of 3 ft. 6 in., which was ample.

The bunk house for the engine, bridge and shovelmen was 16 x 56 x 10 ft. high. This building was divided into three compartments, so as to keep each class of men by themselves. Bunks were built to accommodate 20 shovelmen, 16 bridgemen and 20 trainmen.

The cook house was 16 x 110 x 10 ft. high, with the kitchen (16 x 24 ft), in the center. The dining rooms were at either end of the building. The room for the laborers, at one end, would accommodate 80 men, and the room at the other end 60 men, which was used by the shovel, train and bridgemen only.

The commissary was a small building, 18 x 24 ft., in which was kept supplies for the men, kitchen, etc.

Board was furnished the men for $3.75 per week by the boarding contractor for the system.

Water was suppliled to the shovel by a two-inch pipe line, laid on the ground outside of the digging line. At every hundred feet this pipe line had a "T" with a tap, and by means of a long rubber hose water could be supplied the shovel at all times, thus avoiding the usual delay of siphoning water which, in double-shift work, is an item worth consideration. This pipe line was also extended to the cook and bunk houses, thus supplying water for cooking and washing purposes.

The temporary trestle built was designed to carry a loaded train of five-yard dump cars before being filled, and the engine in service only after the trestle had been filled. Each bent consisted of two soft wood piles, bracing and cap. Second-hand material was used throughout, with the exception of the bracing. Two 8 x 16-in. stringers were used per span, which were built 13 ft. The stringers were recovered, the balance of the material buried in the embankment.

The following reports show the cost to the railroad company of this steam-shovel work. In these reports the cost of each kind of work in connection with the steam shovel grading is given. Where equipment of this kind is used, it is taken as a fair average.

Comparing these two reports as to final cost, it is interesting to note that the cost per yard in place on either job is precisely the same. While the equipment and organization were, in a way, about the same at both places, the material handled and the general layout of the work were very different.

FINAL REPORT, BIG SHOAL STEAM SHOVEL WORK.

*Equipment.*

1 65-ton Bucyrus steam shovel.
2 Switch engines (Class "E"), weight on drivers, 30 tons.
43 Five yard dump cars.
1 Jordan spreader.

(All yardage, cross-section measurements.)

*General.*

| | |
|---|---|
| Date shovel commenced work | April 27 |
| Date shovel completed work | Nov. 2 |
| Date shovel commenced night shift | June 20 |
| Date shovel completed night shift | Oct. 26 |
| No. of days steam shovel on work | 190 |
| No. of nights steam shovel on work | 129 |
| Total | 319 |
| Total days worked by steam shovel | 140 |
| Total nights worked by steam shovel | 88 |
| Total days worked by steam shovel (10-hr. shift called a day) | 228 |
| Shovel laid up due to rain and Sundays (shifts) | 57 |
| Shovel delayed on account of moving shovel and shovel failure (shifts) | 23 |
| Waiting for grading of temporary track (shifts) | 11 |
| Percentage of days of shovel service shovel delayed | 25 per cent. |
| Total car output, day shift | 47,862 |
| Total car output, night shift | 27,377 |
| Total | 75,239 |
| Cubic yards handled, day shift | 160,121 |
| Cubic yards handled, night shift | 91,590 |
| Total | 251,711 |
| Cubic yards, per car | 3.35 |
| Cubic yards per day (10-hr. shift called a day) | 1,104 |
| Percentage of night-shift output to day-shift output | 84 per cent. |
| Length of haul, average distance | 1½ miles. |
| Material, where dumped | Temporary trestle |
| Kind of material | Wet clay |
| Condition of pit | Wet |

COST.

*Equipment, Etc.*

| | Value. | Depreciation. Per cent. | Depreciation. Amount. |
|---|---|---|---|
| 1 Second-hand steam shovel | $5,000.00 | 10 | $500.00 |
| 2 Second-hand Class "E," switch engines | 4,400.00 | 5 | 220,00 |
| 43 Second-hand 5-yd. dump cars | 5,052.50 | 10 | 505.25 |
| 1 Jordan spreader | 1,800.00 | 5 | 90.00 |
| Total | | | $1,315.25 |
| Bunk house: Net cost of material | | | $757.18 |
| Net cost of labor | | | 387.68 |
| Total | | | $1,144.86 |
| Water Supply: Net cost of material | | | $191.43 |
| Net cost of labor | | | 81.17 |
| Total | | | $272.60 |
| Grand total cost of equipment used | | | $2,732.71 |

*Cost Steam Shovel Service—Labor.*

| | |
|---|---|
| Total cost steam shovel service | $6,228.54 |
| Cost per cubic yard | .024 |
| Total cost engine service (2 engines) | 6,417.33 |
| Total cost per yard | .026 |
| Total cost car repairing and blacksmithing | 771.47 |
| Total cost per yard | .003 |
| Total cost of lighting for night work | 184.62 |
| Total cost per yard | .001 |
| Total cost dumping cars | 4,265.51 |
| Total cost per yard | .017 |
| Total cost of all labor steam-shovel service | $17,867.47 |
| Total cost per yard | .071 |

*Cost of Shovel, Engines, and Car Supplies.*

| | |
|---|---|
| 369 gals. valve oil used, at 50 cts. per gal. | $184.50 |
| 500 gals. black oil used, at 18 cts. per gal. | 90.00 |
| 51 gals. signal oil used, at 34 cts. per gal. | 17.34 |
| 4,946 gals. kerosene used, at 10 cts. per gal. | 494.60 |
| 754 gals. gasoline used, at 17 cts. per gal. | 128.18 |
| 1,040 tons coal used by shovel, at $1.48 per ton | 1,539.20 |
| 1,339 tons coal used by engines, at $1.48 per ton | 1,981.70 |
| 800 lbs. waste used, per 6 cts. per lb. | 48.00 |
| Total cost of supplies | $4,483.52 |
| Total cost per yard | .018 |
| Grand total cost shovel work (labor) | $17,867.47 |
| Grand total cost shovel work (supplies) | 4,483.52 |
| Grand total cost | $22,350.99 |
| Per yard | .089 |

*Temporary Trestle.*

| | |
|---|---|
| Total cost of trestle | $9,007.80 |
| Length of trestle | 2,961 ft. |
| Average height | 40 ft. |
| Cost per lineal foot (labor) | $1.30 |
| Cost per linear foot (matecial) | 1.74 |
| Total cost per linear foot | $3.04 |
| Total cost per yard | .036 |

(Cost includes labor for removing stringers.)

*Track Work.*

| | |
|---|---|
| Total cost of all labor | $11,582.31 |
| Total cost per yard | .046 |
| Value of track supplies | 7,338.76 |
| Depreciation and actual cost of work | 856.11 |
| Total cost of track work | $12,438.42 |
| Total cost per yard for all track work | .049 |

SUMMARY OF COST.

| | Total. | Per yard. |
|---|---|---|
| Equipment, etc. | $2,732.71 | $0.010 |
| Steam shovel service | 22,350.99 | .089 |
| Temporary trestle | 9,007.80 | .036 |
| Track and track work | 12,438.42 | .050 |
| Supervision and engineering | 610.38 | .002 |
| Total | $47,140.30 | $0.187 |

*Reprinted from Bulletin 81, November, 1906, American Railway Engineering and Maintenance-of-Way Association.

OUTLINE OF FORCE.

*Day Shift.*

| | |
|---|---|
| 1 General foreman, at | $118.50 per month |
| 1 Steam shovel engineer, at | 125.00 per month |
| 1 Steam shovel cranesman, at | 90.00 per month |
| 1 Steam shovel fireman, at | 55.00 per month |
| 6 Steam shovel pitmen, at | 19 cts. per hour |
| 1 Conductor, at | 103.50 per month |
| 2 Brakemen, at | 69.00 per month |
| 2 Enginemen, at | 4.00 per day |
| 2 Firemen, at | 2.40 per day |
| 1 Track Foreman, at | 75.00 per month |
| 1 Assistant foreman, at | 55.00 per month |
| 10 Laborers' dumping cars | 16 cts. per hour |
| 38 Laborers on track, at | 16 cts. per hour |
| 1 Watchman, at | 45.00 per month |
| 1 Timekeeper, at | 45.00 per month |
| 1 Pumper, at | 45.00 per month |

*Night Shift.*

| | |
|---|---|
| 1 Steam shovel engineer, at | $125.00 per month |
| 1 Steam shovel cranesman, at | 90.00 per month |
| 1 Steam shovel fireman, at | 55.00 per month |
| 6 Steam shovel pitmen, at | 20 cts. per hour |
| 1 Conductor, at | 103.50 per month |
| 2 Brakemen, at | 69.00 per month |
| 2 Enginemen, at | 4.00 per day |
| 2 Firemen, at | 2.40 per day |
| 1 Assistant track foreman | 55.00 per month |
| 8 Laborers, at | 1.75 per day |
| 1 Watchman, at | 1.75 per day |
| 1 Lightman, at | 1.75 per day |
| 1 Pumper, at | 45.00 per month |

COST PER DAY.

| | Labor. | Supplies. | Total. |
|---|---|---|---|
| General foreman | $2.28 | .... | $2.28 |
| Steam shovel service | 22.09 | $5.50 | 27.59 |
| Engine service | 22.08 | 9.00 | 31.08 |
| Car repairing | 4.40 | .... | 4.40 |
| Dumping cars | 19.00 | .... | 19.00 |
| Track foreman | 2.88 | .... | 2.88 |
| Assistant track foreman | 2.11 | .... | 2.11 |
| Track work | 62.70 | .... | 62.70 |
| Timekeeper | 1.73 | .... | 1.73 |
| Pumper | 1.73 | .65 | 2.38 |
| Watchman | 1.60 | .... | 1.60 |
| Total | $142.60 | $15.15 | $157.75 |

COST PER NIGHT.

| | Labor. | Supplies. | Total. |
|---|---|---|---|
| Steam shovel supplies | $22.69 | $5.50 | $28.19 |
| Engine service | 22.08 | 9.00 | 31.08 |
| Assistant foreman | 2.11 | .... | 2.11 |
| Dumping cars | 14.00 | .... | 14.00 |
| Lighting | 1.75 | 2.34 | 4.09 |
| Pumping | 1.73 | .70 | 2.43 |
| Watching | 1.75 | .... | 1.75 |
| Total | $66.11 | $17.54 | $83.65 |
| Total day and night | $208.71 | $32.69 | $241.40 |

PROGRESS.

| Month. | Yards Day. | Yards Night. | Yards Total. |
|---|---|---|---|
| May | 30,766 | ..... | 30,766 |
| June | 26,744 | 8,292 | 35,036 |
| July | 33,874 | 25,324 | 59,198 |
| August | 34,478 | 28,722 | 63,200 |
| September | 19,200 | 14,900 | 34,100 |
| October | 17,430 | 11,981 | 29,411 |
| Totals | 162,492 | 89,219 | 251,711 |

(All yardage cross-section measurements.)

COMMENT.

A comparative statement of the work done by company forces with that for which it could be contracted, is as follows:

If done by contractor with steam shovel outfit:

| | |
|---|---|
| 251,711 cu. yds. earth, at 26 cts. | $65,444.86 |
| Actual cost to the company | 47,140.30 |
| Saving | $18,304.56 |

The factor of time would also have had to be considered had the work been done this way.

It is the opinion of the writer that the cost of this work could have been materially reduced had twelve-yard dump cars been used instead of the five-yard. In the judgment of the writer, the five-yard car is too light in construction for the service required in handling heavy material, such as was handled on this work.

On account of complying with the enginemen's schedule, there was expended on this work $431.20, for which we received no service. This is about 10 per cent. of the cost of the supplies.

The cost of this work to the company could have been reduced somewhat if we had not been handicapped in being governed by schedules, and also if we had had the same freedom in the handling of labor, supplies and commissary as does the general contractor.

LITTLE SHOAL CUT-OFF.

The Little Shoal cut-off was a change of alinement and grades between Ayers and Durley, Ill. On this work there were handled 188,240 cubic yards of material.

A temporary trestle was built, having a total length of 2,142 ft., and an average height of 35 ft.

Material for the embankment was hauled an average distance of one-half mile.

The material handled was about 40 per cent. hardpan, it being about as hard a material as the shovel could dig without resorting to blasting.

On this work both shovel and engines were handled over 6 per cent. grades and 16-degree curves very easily.

*Equipment.*

1 65-ton Bucyrus steam shovel.
2 Switch engines (Class "E"), weight on drivers, 30 tons.
36 5-yd. dump cars.
1 Jordan spreader.

*General.*

| | |
|---|---|
| Date shovel commenced work | May 21 |
| Date shovel completed work | Sept. 30 |
| Date shovel commenced night shift | May 22 |
| Date shovel completed night shift | Sept. 30 |
| No. of days steam shovel on work | 133 |
| No. of nights steam shovel on work | 132 |
| Total | 265 |
| Total days worked by steam shovel | 96 |
| Total nights worked by steam shovel | 103 |
| Total days worked by steam shovel (10-hr. shift called a day) | 199 |
| Shovel laid up due to rains and Sundays (days) | 52 |
| Shovel delayed on account of moving shovel and shovel failure (days) | 14 |
| Percentage of the 199 days of shovel service delayed | 16 per cent. |
| Total car output, day shift | 29,774 |
| Total car output, night shift | 23,116 |
| Total | 52,890 |
| Cubic yards handled, day shift | 105,818 |
| Cubic yards handled, night shift | 82,422 |
| Total | 188,240 |
| Cubic yards per car | 3.56 |
| Cubic yards per day (10-hr. shift called a day) | 946 |
| Percentage of night shift output to day shift output | 78 per cent. |
| Length of haul, average distance | ½ mile |
| Material, where dumped | Temporary trestle |
| Kind of material | 39 per cent. hard pan and clay |
| Condition of pit | Wet |
| Grand total cost of shovel work (labor) | $14,528.87 |
| Grand total cost of shovel work (supplies) | 3,607.38 |
| Total | $18,136.25 |
| Total cost per yard | .096 |

PROGRESS.

| Month. | Yards Day. | Yards Night. | Yards Total. |
|---|---|---|---|
| May | 9,724 | 5,251 | 14,975 |
| June | 32,268 | 25,364 | 57,632 |
| July | 25,778 | 19,883 | 45,661 |
| August | 24,018 | 20,602 | 44,620 |
| September | 14,077 | 11,275 | 25,352 |
| Totals | 105,865 | 82,375 | 188,240 |

(All yardage cross section measurements.)

Total yardage handled, 188,240, of which 39 per cent., or 72,900 cu. yds., would classify as loose rock, it being as hard a digging material as the shovel could stand without resort to blasting.

If done by contractor with steam shovel outfit:

| | |
|---|---|
| 188,240 cu. yds. at 26 cts. | $48,942.40 |
| Actual cost to company | 35,204.91 |
| Saving | $13,737.49 |

It is a certainty, had this work been let to a contractor, it would have been necessary to make some allowance on account of hard material, which would make the saving considerably more. Also, there is the factor of free transportation and freight, which would also be given them.

This cost includes all items of freight, supplies, labor and any others that are possible to include that should be charged to this work. It has been the intention in estimating same to get as close an estimate of actual cost to the company as possible.

SUMMARY.

The limits to which a shovel will work is a most important consideration in planning and estimating work of this kind. It is not economy to work the shovel to its extreme limit in lift and reach. The shovel used on this work, at times, loaded the 5-yd. cars on a loading track which was 9 ft. 2 in. higher than the shovel track, with the track centers 22 ft. Loading at such height is very slow work and is liable to wreck the cars badly on account of the lack of clearance for the return of the dipper after emptying.

When there is more than one cut to be made and where time is the all-important factor, 7 ft. difference in elevation between the shovel and loading tracks allows rapid work and gives better results.

In laying out steam-shovel work considerable can be saved at times by taking advantage of the natural conditions of the work as they exist. The track arrangement and the future track arrangements as the work progresses is a thing that is oftentimes neglected and causes serious delays to the shovel. On very few jobs has the writer seen the shovels work to their capacity, on account of poor track arrangement and the consequent inability to keep the cars to the shovel. One must have good running track over the entire work. With good track and proper arrangement, ideal conditions for a maximum shovel output are obtained.

## The Track Foreman.*

There were in 1905 about 326,000 employees in the Maintenance of Way and Structures department of American railroads, and close to 65,000 of these were foremen, on the basis of one foreman for every five employees. Of this body of foremen—equal numerically to the present enlisted strength of the United States Army—nearly 40,000 were section or track foremen. The balance, about 25,000, had charge of masons, plumbers, carpenters, bridgemen, painters, signalmen, etc., foreman of maintenance employees to every 1,250 inhabitants. Such is the foreman under discussion in point of

*Extracts from a paper read before the Engineers' Club of Philadelphia, June 2, 1906, by S. W. Kapp, Division Engineer of the Lehigh Valley, at Easton, Pa.

numbers. The Irish foreman is perhaps the type most familiar. In many cases he is almost illiterate, but he usually makes himself understood. We are all familiar with the story of the foreman who heeded his instructions to be brief in making his reports to his superior with such aptitude that the cut diamond, "Off again, on again, gone again, Finnegan," was given to us. Almost matching this in brevity is the telegram, "The cow that No. 3 killed yesterday is not dead yet, what shall I do with her? Michael Grady."

A foreman during an inspection of his territory by some of the officials representing a new management and a more liberal policy as to expenditures, was chided for the poor condition of his track in spite of extra expense incurred recently to secure improvement. He quickly made his excuse and at the same time turned the situation into a humorous one by remarking: "You should have been here when the trains were running on the shadow of the telegraph wire!" He further explained the previous conditions by alleging that had the fences not been in good shape at that time, the trains could not have been kept on the right of way.

While the Irish type is perhaps the most interesting the others are not uncommon, English, Dutch, German, Scandinavian, Italian and African examples being frequently met with. All have their good qualities. The types other than the Irish are usually found in communities where the particular nationality is or has been a very considerable portion of the population. It is often the case that the men under a foreman are of his nationality. Almost invariably the foreman begins his railroad career as a laborer on the lowest rung of the ladder. The laborer who displays an interest in his work and a tendency to act as a leader, is from time to time given charge of one or more men for odd jobs. If successful with such minor responsibilities, he is at last made a sub-foreman or assistant foreman. . . . The progression from laborer to foreman requires, even under favorable conditions, a considerable length of time, say from three or four years to as much as eight or ten.

This trade requires a knowledge of many things which comes only with long and patient experience with them, and the knowledge of many other things through association.

What are these things that are so difficult to master? The knowledge of the effect of temperature, wind, moisture, friction, chemical action, stress, motion of trains, and passage of time on the materials of construction and maintenance, and of the action to be taken to eliminate the effects of these ever-present agents. In addition, that almost sixth sense—railroad intuition—must be acquired thoroughly.

As some of these items are named, see how many you know how to combat; not what to suggest to try, but what if tried will surely answer the purpose.

*Temperature.*—Expansion and contraction of rail; breaking of telegraph wires in cold weather; frost heaving track unevenly; ice obstructing drainage lines; freezing of water lines and connections; breaking of rail in cold weather; the condensation of atmospheric moisture in the cups of oil lamps and on the relay and other contacts used in electric signal connections; the action of frost on exposed masonry, fences, poles, signals and signs; expansion and contraction of bodies of concrete or other masonry; formation of sleet on wires and signals; throwing down rocks in cuts; formation of ice in rock cuttings; fire in cinder banks and coal piles.

*Wind.*—Action on snow; on sand; on both mixed; on bodies of water; on floe ice; on fences, poles, signals and signs; or trees along the tracks; on fire on or near the right of way.

*Moisture.*—High water in large and small streams; cutting of embankments by current; undermining of masonry; softening of roadbed; landslides in cuts and on embankments; formation of ice jams; springs in cuts and under the roadbed; decreased insulation on wire lines for telegraph and signals.

*Friction.*—Surface and curve wear of rails; the cutting of rails into cross-ties and switch-ties; the cutting of spikes against the rail; the wear of switches and frogs; the wear of parts of an interlocking; ice or frost forming under the rails, decreasing the frictional resistance to spreading, and throwing more pressure against the spike.

*Chemical Action.*—Action of salt air and salt water from refrigerator cars, on rails, splices, spikes, bolts and fittings; on bridge iron, and paint also; effect of locomotive gases on structures; cars and maintenance of primary and storage batteries.

*Stress.*—Deterioration of iron and steel structures under vibration and loading; creeping of rails from wave motion under traffic; creeping and pulling of rail under changes of temperature; deterioration of rail, frog and switch fastenings under vibration and stress.

*Movement of Trains.*—Line and surface of track; superelevation of outer rail on curves; easements and runoffs of superelevation at ends of curves and points of compounding, maintenance of gage; adjustment of frogs, switches and switch stands; vertical curves at breaks in profile.

*Passage of Time.*—When cross-ties, switch-ties and ridge-ties have reached the point when they should be renewed; condition of timber in bridges and buildings on account of age; deterioration and renewal of ballast; deterioration of insulation on wires and cables; deterioration of underground pipes.

These are some, but not all, of the physical problems which at one time or another confront the foreman and demand some solution or palliation.

In addition the foreman must be posted on the operating rules, conditions and practices affecting the running of trains; he must acquire a general knowledge of the peculiarities of equipment and their effects on his work; he must become familiar with the requirements as to the shipment, receipt and inspection of material; he must learn to make repairs and renewals, and do his work without unnecessary interference with the movements of trains—the most of it must be done without any interference; learn to discriminate carefully between the many calls for his attention so as to take care of what is most important from an operating or maintenance standpoint, as the case may be; and maintain amicable relations with the railroad company's neighbors, his inferiors and superiors, and his fellow employees.

Is it any wonder that to attain a good working knowledge of the treatment of the major portion of these items requires years of experience? And is not recognized efficiency in the premises worthy of being classed skilled labor as much as any journeyman mechanic? And what do you suppose the compensation for such service is? From the statistical reports of the Interstate Commerce Commission, the section foreman averaged for 1903-1904 as little as $1.78 per day, or $53.40 per month. We know that track foremen have received as low as $40 per month and as high as $85 and $90 per month, according to location. It is, of course, understood that foremen of labor of other classes than trackmen receive generally better compensation.

The average wage of section foremen of $1.78 per day does not compare very favorably with other mechanics' wages of from $2 to $5 per day, according to trade and location. Attempts have been made by section foremen sporadically to form organizations to compel better wages. The necessary isolation of the men has, however, generally defeated such movements. It is manifestly difficult to secure cohesion and concentrated action when there is only one man for every six miles of railroad and one man per one hundred square miles of country.

This unfavorable comparison in the matter of compensation, coupled with inability to force recognition by combination, is driving the younger men into other occupations as laborers and apprentices. The effect of this is beginning to be painfully manifest. We see our foremen growing old with little or no material developing to fill the gaps. Unless the logic of the situation is realized by those in authority very shortly and the disparity of wages corrected voluntarily, it will be, and is already, a serious problem to know which way to turn for men willing and competent to continue the work of the maintenance of our railroads. They will, of course, be maintained after a fashion, but on a gradually descending scale of efficiency.

Mr. Kapp then goes on to rehearse the great variety of things that a track foreman has to look after, and continues:

This responsibility never ceases day and night, summer and winter, year in and year out. The mere recital of the many items of responsibility is of itself quite formidable. To live with them and under them for a term of years; to have them brought home to you one at a time or in groups by actual happenings—some of these happenings causing loss, damage, personal injury and death; to be haled before the courts in connection with litigation of claims for loss, damage and personal injury, and be examined and cross-examined as to these many items of responsibility and their bearing on the case in hand—truly the responsibility does not lessen. * * * Such is the burden of the foreman—in times of flood and high water; in extremes of temperatures; in blizzards and snowstorms—felt most keenly when others seek shelter from the elements; and with all this, inadequate compensation to him and the men under him.

At times the force available for doing the work required decreases either through inability to hire the necessary laborers on account of the low rate of pay, or through actual reduction of force to meet some necessity—temporary or otherwise—for decreased expenses.

In addition to the limitations as to the kind and amount of labor provided, the materials furnished for repairs and renewals are also restricted, sometimes temporarily and sometimes for considerable periods. Under such conditions the material that is furnished is often so grudgingly provided that it can almost be inferred that it is desred to let the property deteriorate.

How, then, does he get along? The work which is required to be done and for which he is responsible can be divided into a number of classes according to importance. Let us name a few: Necessary for safety; necessary for operation; necessary by statute and ordinance; necessary by deed requirement; necessary for proper maintenance; necessary for economical maintenance; necessary for appearances; necessary for improvement as to any one of the above; necessary to please the public; necessary to please individuals of

the public necessary to please officials of the railroad; necessary to please individual railroad officials. When labor and materials are limited, the judgment of the foreman must assert itself and eliminate such items of work from his programme as cannot be accomplished. This elimination takes place even in violation of some of the many rules and instructions. As the rules and instructions can be divided into classes similar to those just mentioned in connection with work to be done, these violations necessary to keep the quantity of work within the labor available need not approach matters affecting safety, unless the limitations as to force and material are severe and long-continued. * * * It is safe to say that no road ever puts enough money into its maintenance to satisfy all the demands as to necessary work classified above. * * * The maintenance of the track of the railroads in the United States is accomplished with the labor of about one trackman per mile of track. Such a result is quite wonderful. One man working a little over three hundred ten-hour days per annum can replace the necessary cross-ties, rails, fastenings, frogs, switches, ballast, cut the grass and weeds, handle all the required material both new and old, keep the ditches open, adjust the fastenings, maintain the gage by respiking and adzing, raise a portion of the track, put in ballast, raise joints, surface track, maintain line of the rails, remove snow and ice, and take care of the hundred and one things demanding attention! This is made possible by what has come to be called "organization."

It is pertinent to consider how many units one man can effectively direct and control. Experience seems to indicate that from five to fifteen men represent the range, according to ability.

To illustrate the effect of organization on the efficiency of labor, this example will serve. The work was loading a certain class of material on railroad cars from the track level. The cars were placed on a long track, the material being piled alongside. A force of about one hundred men under one foreman loaded the material with shovels for a period. Later another group of men of about the same number were put at the same work. In this case there was a foreman for less than every ten men. The laborers were paid the same hourly rate in both cases, and were of the same class of men. The result was that notwithstanding the fact that the wages of the numerous foremen went into the labor cost of handling the material, the additional quantity loaded in the latter case was enough to keep the cost per ton of loading down a little more than half what it was in the first case. This is, of course, rather an unusual comparison. It shows plainly the benefit of closer supervision and control.

It will not be amiss to call attention to the similarity between the foreman and the engineer. Both start with material and labor and by proper combination produce the finished work. Both are by training, and should be by nature, leaders of men. The same necessities produced both. The foreman is an engineer. The engineer is a foreman. The largest success in life as far as engineers are concerned, seems to fall to those who can organize and lead men. Many never get beyond the consideration of things. Things without men are as nothing. Let us study men. Let us be foremen and we will be engineers. All honor to the foreman!

DISCUSSION.

BENJAMIN FRANKLIN.—I have nearly always found that, as Mr. Kapp observed, most track foremen are old men. In personal contact with them, I have found that I could learn a good deal, especially in regard to the alinement of track, superelevation of the outer rail, and the fine art of laying special work.

WILLIAM GOWIE.—I once asked a track foreman how much expansion he allowed for that hot day (the temperature was 105 degs.), and he said: "We don't allow nothin'; we just push it together." Of course he was an Irishman. And I would like to know how many of these foremen know anything about stress and strain, temperature, motion, friction, etc., etc. There are very few foremen who can give you all the information you need. Their motto is generally: "Do the best you can."

MR. KAPP.—I believe that track foremen, as a body, know more about the proper elevation of the outer rail than do engineers. Engineers have developed the theory of the outer rail on the basis of centrifugal force. The foremen developed their theory of elevation from watching the trains go around the curves. Many a foreman will watch a track while the cars go by, and if the cars sway or oscillate he knows the job is wrong, and he works at it until he gets it right. As to the amount of elevation, it is always a compromise. The theoretical elevation of the outer rail is, ninety-nine times out of a hundred, wrong, in the case in hand, and the foreman can generally make a better adjustment than can the engineer.

Many foremen can put up better track and line than engineers. All the alining that need be done around a railroad can be accomplished by the use of a 2-ft. rule and a string about 100 or 125 ft. long. Stakes can be set out so that you can see before you start just how much a track is to be thrown, and all the obstacles to a correct line can be eradicated, and the cost can be reduced to a small amount, as compared with the cost of a corps of engineers to run a line as they think it ought to be run. I have seen foremen get very angry because some one attempted to tell them that he could better the line on a curve, and I doubt if many engineers could do it better than those same foremen, and put up superelevations and easements. I know of several 6-degree curves where trains are operated at speeds of sixty and sixty-five miles per hour without occasioning any comment or unpleasantness, these curves being maintained by foremen without the assistance of engineers.

Replying to the question as to what kind of men make the best foremen, I think that it has been the custom on several railroads in appointing foremen to select them from among their carpenters, they, as a rule, having had a range of experience which makes them very valuable.

## Southern Pacific Steamship "Momus."

The new Southern Pacific steamship "Momus" started her first regular trip from New York to New Orleans on December 12. Except for the engines, the "Momus" and the "Antilles" are sister ships of the twin screw turbine steamer "Creole," described in the *Railroad Gazette* of November 2. The "Momus" is 440 ft. long, 37 ft. deep from the upper deck and has 53 ft. beam. She draws, when loaded, 26 ft. Her dead weight carrying capacity is 4,500 gross tons; displacement, 16,000 gross tons, and gross tonnage about 7,000 tons. She has three double ended and four single ended boilers, whose working pressure is 234 lbs. The engines driving the single screw are triple expansion with cylinders 34 in., 57 in. and 104 in. in diameter with 63 in. stroke. She will carry 152 first-class passengers, 58 second class passengers and about 500 steerage passengers. The hull, which has a double bottom, is divided into 22 water tight compartments, and the cargo holds can carry about 335,000 cu. ft. of freight. The "Momus," as well as the "Antilles" and "Creole," is designed for a sea speed of 16 knots per hour.

New Southern Pacific Steamship "Momus."

The last word on the preservation of wood is supposed to have been said by Dr. Malenkovic, of Vienna, who has published a book on the subject (Die Holzkonservirung im Hochbau), which discusses the chemistry of wood, the organisms, vegetable and animal, which destroy it, the various means of preventing such destruction, and the present condition of the art of impregnating timber. Another scientific man, this time a Hungarian, Dr. Tuszon, has published a pamphlet on the organisms which destroy a single species of wood, the European red beech; but he has added a summary of the materials and methods now used for wood preservation, in which he says that it has only recently been found possible to secure a complete impregnation of heart timber with certain mineral salts, so that a reaction to tests can be had on fibers from any part cut out. Fluoride of iron, and especially fluoride of zinc, seem to be the salts he refers to. But even this author is said to have failed to describe the latest effective process, used by Wolman, who, to prevent the destructive effect on fibers of an excess of acids due to the decomposition of mineral salts, adds to the solution of salts a weak organic acid, such as acetate of ammonia, which can be done without any permanent precipitation. The free mineral acids are then converted into acetic acid, which does not injure the wood and soon evaporates.

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

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## CAR AND LOCOMOTIVE OUTPUT IN 1906.

The car famine of the last two months has not been caused by lack of effort on the part of the railroads to obtain new equipment, for the returns from the car and locomotive builders in the United States, Canada and Mexico give an output far in excess of any previous year. The railroads began giving large orders for equipment fifteen months ago, and the record-breaking output of last year was largely due to the greatly increased production during the last three months of the year. The demand eased off late last spring, chiefly because of high prices and the fact that all the works were booked to their full capacity for six or eight months ahead, making it impossible to give deliveries for immediate needs. Since the end of the summer, however, it has increased again, and orders are being given for delivery nine months or a year hence. Official returns from the 38 car building companies on the North American continent (estimating two small plants not heard from) give the total number of railroad cars built during 1906 as 243,670. This includes subway and elevated cars, but does not include electric street and interurban cars. In addition to this total, the railroads have built in their own shops a large number of cars, both freight and passenger, but no estimate has been made of these. Of the manufacturers' output, 240,503 cars were for freight service, and 3,167 for passenger service; 236,451 were for domestic use, and 7,219 for export. This is an increase of 45 per cent. over the record-breaking output of 1905, and of 259 per cent. over the output of 1904. Canada built 7,059 freight cars and 83 passenger cars, and Mexico built 203 freight and 6 passenger cars. The increase in the Canadian output over last year is 230 per cent. All of the builders have shared alike in the tremendous increase. A number of the companies reported this year the number of unfilled orders on their books. Most of them have more cars on order than they have built during the entire year with their plants working at their maximum capacity. This is the best indication of the enormous demand for rolling stock and the utter inability of the railroads to get the cars they need. The following table shows the *Railroad Gazette's* compilation of the number of cars built during the last eight years; totals for 1905 and 1906, including Canada:

| Year. | Freight. | Passenger. | Total. |
|---|---|---|---|
| 1899 | 119,886 | 1,305 | 121,191 |
| 1900 | 115,631 | 1,636 | 117,267 |
| 1901 | 136,950 | 2,055 | 139,005 |
| 1902 | 162,599 | 1,948 | 164,547 |
| 1903 | 153,195 | 2,007 | 155,202 |
| 1904 | 60,806 | 2,144 | 62,950 |
| 1905 | 165,455 | 2,551 | 168,006 |
| 1906 | 240,503 | 3,167 | 243,670 |

The locomotive output is quite as phenomenal. The 12 builders in the United States and Canada turned out 6,952 locomotives during the year, of which 6,232 were for domestic use and 720 for export. This is an increase of 27.3 per cent. over last year's total of 5,491. These figures do not include locomotives built in railroad shops, or locomotives rebuilt or repaired. There were built 237 electric locomotives and 292 compounds, as against 140 and 177, respectively, last year. The Canadian output was 217. The following table shows the number of locomotives built during the last 15 years; totals for 1905 and 1906, including Canada:

| | | | | | |
|---|---|---|---|---|---|
| 1892 | 2,012 | 1897 | 1,251 | 1902 | 4,070 |
| 1893 | 2,011 | 1898 | 1,875 | 1903 | 5,152 |
| 1894 | 695 | 1899 | 2,473 | 1904 | 3,441 |
| 1895 | 1,101 | 1900 | 3,153 | 1905 | 5,491 |
| 1896 | 1,175 | 1901 | 3,384 | 1906 | 6,952 |

The cost of cars and locomotives has increased considerably during the year. Estimating the average cost of freight cars at $1,050, the total spent for freight cars amounts to $252,525,000. For passenger cars at $8,000, the cost was $25,336,000, and for locomotives at $14,500, the cost was $101,384,000. The total amount spent by the railroads for new rolling stock and motive power thus approximates $380,000,000, an increase over last year of about 45 per cent.

## RAILROAD BUILT IN 1906.

Official returns from most of the railroad companies in the country, supplemented by our own records and figures furnished by the State Railroad Commissions, show that approximately 5,623 miles of new railroad line have been built in the United States during the calendar year 1906. These figures include 57 miles of new main track relocated, but do not include second, third or fourth track, sidings or electric lines. The total is 28 per cent. more than was built in 1905. This large increase reflects, in part, the preliminary work carried out last year, when active construction was resumed, following the retrenchment policy generally observed in 1904. It also shows the new movement toward the Pacific coast, and the noteworthy prosperity of the present year. A number of lines which had completed grading in 1905, but were unable to get rails, have done their track laying this year, but the mileage thus accounted for is offset by the fact that several large projects which it was expected would be well advanced were prevented from adding any considerable amount of new mileage in 1906, owing to the continued scarcity of material and labor. The scarcity and high price of labor has become a serious problem to builders, especially on the Western lines, where agriculture, mining and the trades offer unusual inducements,

and at San Francisco extraordinary wages are being paid skilled and unskilled labor, attracting forces away from the Western Pacific and all new railroad work in that territory. Track has been laid on the Chicago, Milwaukee & St. Paul's Pacific extension for only about 39 miles, leaving almost the entire line to be finished; the Western Pacific has laid 113 miles of its line from Salt Lake City to San Francisco, which is to be 840 miles long (exclusive of branches), and over 1,000 miles remain to be built on the Kansas City, Mexico & Orient. In Canada, the Canadian Pacific is building nearly 1,000 miles, while the Canadian Northern and Grand Trunk Pacific plan to build a large number of branch lines in addition to work now under way. In Mexico, the Southern Pacific has large plans for new lines to develop the west coast, but the filing of survey maps with the Mexican Government is not yet finished, and construction work has hardly been begun.

New main track mileage is reported in 44 states and territories, including Alaska, where 15½ miles of new track were built. Texas leads the list, with track laid on 635 miles, an increase of 297 miles over 1905, largely due to the building of branch lines to keep pace with the agricultural development of the state, and to the new lines of the Colorado & Southern, and the cut-off of the Houston & Texas Central on its Fort Worth-Houston line.

South Dakota, which built 116 miles last year, is second this year, with 388 miles. Louisiana is third, with 334 miles, and Nevada is fourth, with 282 miles. The largest decrease reported is in North Dakota, where only 247 miles were built, as compared with 520 miles in 1905. Illinois and Oklahoma Territory also each show at least 100 miles less than last year. The largest decrease in 1905 was in Missouri, where 270 miles were built in 1904, only 49 miles in 1905, and 30 in 1906. In addition to the four states already mentioned which lead the list, Arkansas, North Dakota, Florida and Wyoming each built over 200 miles, while Idaho, Georgia, Nebraska, Mississippi, Utah, New Mexico, Wisconsin, California, Minnesota, Virginia, Illinois, Pennsylvania, Colorado, Washington and Indiana, in descending order, built over 100 miles of main line in 1906. No new mileage was reported in Connecticut, Delaware, Iowa, Maryland, New Hampshire, Rhode Island or Vermont.

The number of miles built in Canada was 1,007, a decrease of 174 miles as compared with 1905, when 1,181 miles were built. Last year the large increase was due principally to the extensive building of the Canadian Northern, 600 miles, and the Canadian Pacific, 277 miles. These two lines added largely to their mileage in 1906, but do not monopolize the showing as they did in 1905. In 1906 the Canadian Northern built 183 miles and the Canadian Pacific 268. On the new transcontinental line of the Grand Trunk Pacific, track laying will be started early in 1907 on the section from Winnipeg west to Edmonton, 790 miles, where most of the grade is ready for the rails.

Mexico shows an increase of 58 miles, or about 24 per cent.; the mileage built amounting to 296 miles, as against 238 in 1905.

The following table shows our figures for mileage built in the United States during the last fourteen years:

| | | |
|---|---|---|
| 1893.....3,024 | 1898.....3,265 | 1903.....5,652 |
| 1894.....1,760 | 1899.....4,569 | 1904.....3,832 |
| 1895.....1,428 | 1900.....4,894 | 1905.....4,388 |
| 1896.....1,692 | 1901.....5,368 | 1906.....5,623 |
| 1897.....2,109 | 1902.....6,026 | |

## RECEIVERSHIPS AND FORECLOSURE SALES IN 1906.

The mileage of roads that went into the hands of receivers during 1906 is small, as would be expected during a period of such widespread prosperity; in fact, the figure is, with the exception of 1901, the smallest since 1881. The results are really about the same as in 1905, although the mileage of bankrupt roads then was tremendously increased by the Cincinnati, Hamilton & Dayton and Pere Marquette troubles, which, of course, were the results of gross manipulation of the credit of the companies rather than of their unsuccessful operation. During the year six roads went into receivers' hands; the first of these, the Toledo Railway & Terminal, as a direct result of the Cincinnati, Hamilton & Dayton receivership. The $3,500,000 4½ per cent. bonds of this company were guaranteed by the C., H. & D. and the Pere Marquette jointly. The January 1, 1906, interest was defaulted and Judson Harmon, Receiver of the other two roads, was appointed Receiver two days later. The Chicago Terminal Transfer company has been in trouble since 1904, when the Lake Shore, the Rock Island and the New York, Chicago & St. Louis moved into the La Salle street station and terminated their contracts with it for use of the Grand Central station. Interest has been in default since 1905. It is believed that J. J. Hill has already or will ultimately acquire control of the company and the high market price of its bonds argues some favorable outcome from its present troubles. The other companies are comparatively unimportant. The Velasco, Brazos & Northern went into the hands of a receiver in February, and was sold in July to satisfy a judgment of $236,000. The Peoria & Pekin Terminal is operated by both steam and electricity. It has two lines of road between Peoria, Ill., and Pekin, and has trackage rights over five miles of street railway in Peoria. When the receiver was appointed it was alleged that the company had $150,000 floating debt. The Peoria Railway Terminal Company was recently incorporated to take over the Peoria & Pekin Terminal as soon as the affairs of the old road are wound up, which it is expected will soon be done. The Union & Glenn Springs is a Virginia road, owned by a cotton company. The New Jersey & Pennsylvania runs from Whitehouse, N. J., to Morristown.

*Receiverships.*

| Name. | Mileage. | Bonds. | Stock. | Date of receivership. |
|---|---|---|---|---|
| Toledo Railway & Terminal..... | 31 | $3,825,000 | $3,100,000 | Jan. 3. |
| Velasco, Brazos & Northern*.... | 20 | 200,000† | 200,000† | Feb. 2. |
| Union & Glenn Springs ..... | 22 | ..... | 50,000 | ..... |
| New Jersey & Pennsylvania..... | 27 | 1,000,000§ | 145,000 | Mar. 1. |
| Chicago Terminal Transfer..... | 84 | 15,140,000 | 30,000,000 | Apr. 16. |
| Peoria & Pekin Terminal ..... | 21 | 977,000 | 600,000 | Oct. 27. |
| Total ..... | 204 | $21,142,000 | $34,095,000 | |

*Sold under foreclosure, July 3.
†Authorized.
§Authorized, but not issued. $20,000 bonds of subsidiary outstanding.

With the exception of the largest road in the list, the more important foreclosures during the year were merely the necessary formalities of finally taking over smaller roads by stronger systems. The St. Louis & North Arkansas, the largest in the list, was never in the hands of a receiver. The semi-annual interest was defaulted in July, 1905, and January, 1906, and then the bonds were deposited with a reorganization committee. This committee, consisting of D. R. Francis and others, bought in the road a few months later, and reorganized the company as the Missouri & North Arkansas. The Nashua, Acton & Boston had been operated by the Boston & Maine for some time, and has now been bought by a subsidiary of the Boston & Maine, the Concord & Montreal. The Dillsburg & Mechanicsburg, a Pennsylvania road, has been operated by the Cumberland Valley since 1873, the last named company owning all the bonds. It was bought by the Cumberland Valley. The Maricopa & Phoenix & Salt River Valley was bid in by the Southern Pacific, which owned the stock and most of the bonds. The Michigan, Midland & Canada has been operated by the Michigan Central, and was sold to New York Central interests to satisfy a judgment of $921,000.

*Foreclosures.*

| Name. | Mileage. | Bonds. | Stock. | Date of sale. | Selling price. |
|---|---|---|---|---|---|
| St. Louis & North Arkansas. | 128 | $3,065,500 | $1,702,500 | May 29. | $2,000,000 |
| Brooklyn & Rockaway Beach | 3 | 338,000 | 150,000 | May 2. | 400,000 |
| Berkeley Railroad ..... | 10 | 6,000* | 115,000 | July 23. | 10,000 |
| Nashua, Acton & Boston... | 20 | 500,000 | 500,000 | Mar. 7. | 320,000 |
| Dillsburg & Mechanicsburg | 10 | 100,000 | 89,800 | Feb. 3. | 50,000 |
| Sioux City, Homer & Southn | 6 | 200,000 | 500,000 | Sept. 26. | 16,700 |
| Velasco, Brazos & Northern. | 20 | 200,000 | 200,000 | July 3. | 80,000 |
| Michigan Midland & Canada | 15 | 323,635 | 300,000 | Feb. 23. | ..... |
| Maricopa & Phoenix & Salt River Valley ..... | 42 | 618,000 | 1,000,000 | Oct. 15. | 778,750 |
| Total .... ..... | 254 | $5,345,135 | $4,442,300 | | |

*Floating debt.

## A CAR DIVERSION PENALTY.

At last one of the worst phases of the car-interchange evil—wrongful diversion of borrowed cars—is to be attacked directly, and we shall see whether the evil is too big to attack or too small to catch; whether traffic men will be able to show that it cannot be corrected without destroying good business or the operating men will say that diversions are so elusive and the diverters so sly that it is impossible to run down and bring to the light each important case.

A half a dozen prominent roads have agreed that from the beginning of the present month and until July 1, next, they will pay each other $5 each for every car wrongfully diverted. Now there will be something doing besides discussing averages and swapping glittering generalities. Five dollar bills are not likely to be paid out for either the use or misuse of freight cars without some pretty definite knowledge of the actual reasons for and against the

payment in each individual case. The roads in the agreement are the Erie, the Pennsylvania (both east and west lines) and the Baltimore & Ohio; the Chicago, Milwaukee & St. Paul and the Kansas City Southern; and the Union Pacific and its allied lines (the Harriman system). The Diversion Agreement was formulated by the Car Hire Committee, of the Car Hire Agreement, which is a supplement to the Per Diem Rules Agreement, which rules were formulated by the Car Service Committee of the American Railway Association. (To trace this list clear back to the "house that Jack built" would take too much space—we have enumerated the titles thus far in order that the reader may have some idea of the status of the Diversion Agreement). Only roads owning 1,000 or more freight cars have been invited to join this agreement, and we understand that probably no more will be taken in. Obviously there will be a great amount of correspondence in settling the cases which will come up in the first month or two, and it would be easy to overload the clerical machine at the outset so that it would quickly be clogged by internal friction. The definition of diversion, as formulated in the agreement, is as follows:

Foreign cars must be returned promptly to their owners as follows:

1. Loaded to or via the home road.

   If such load is not available, cars of immediate connections must be delivered to the home road; cars of other roads must either be loaded to an immediate connection of the car owner or be delivered to the home route.

2. Delivered empty to a connection for loading to the home road or home route, to be returned within four days. Such deliveries shall be indicated on the junction report by the words "For home loading."

3. Forwarded to a foreign road when received consigned to that road.

   Any other delivery to a foreign road will be a diversion for which a diversion penalty of $5.00 must be paid to the owner of the car.

   If the enforcement of these rules shall result in a considerable empty mileage without compensating loaded mileage, the case shall be adjusted on the basis of 3 cents per empty car-mile, to be paid by the roads responsible.

All disputes arising under this agreement shall be settled by the Car Hire Committee.

This agreement is to terminate on July 1, 1907, unless it shall be extended, modified or dissolved, by the vote of the majority of the signers thereto, owning two-thirds of the cars represented, such action to be taken at a meeting of said signers, called by the Car-Hire Committee on ten days' previous notice. In case the agreement is extended, subscribers may withdraw by giving three months' previous notice in writing to the Secretary of the Car Hire Committee.

Mr. Hale, chairman of the Car Hire Committee, thus becomes, it will be seen, the chairman of the arbitration committee of the Diversion Agreement. Fortunately the duties of the arbitration committee under the Per Diem Agreement of 1902 now take up much less time than formerly, so that Mr. Hale and his committee will, no doubt, be able to attend to the calls on them; though the work will by no means be an easy one. Mr. Hale has had to open an office in New York City (at the headquarters of the American Railway Association) and another officer has been appointed to relieve him of some of his work on his own road. One of his first duties will be to get a bigger letter head, to hold the names of all his employers, some of whom are named above. In spite of this multiplicity of titles, however, there is no danger that his physical (or mental) head will get "big." Its constantly normal condition, whatever confusion of tongues may be encountered, is one of the best assurances that the present experiments will be made to succeed, if success is in them.

## THE ELEMENTS OF VALUE IN A STREET RAILWAY.

The settlement of the long-pending controversy between the city of Chicago and its two great street railways, which is reported in another column, affords a notable illustration of judicious management of a most troublesome problem. Some of the numerous knotty questions that had to be dealt with were settled by ordinary bargaining—give and take—because it was impossible to find a more rational basis; but in spite of this, the report of the special valuation commission, Messrs. Arnold, Cooley and du Pont, constitutes one of the most interesting features in the history of the matter, for although even these conscientious and careful engineers were obliged to decide some of the questions referred to them by rule of thumb, their report is instructive as giving some indication of why they did so. It is an excellent example of methodical dealing with a subject which at first seems to defy systematic treatment.

This commission was appointed by a committee of the city council to test the inventories presented by the railroads, and to report as to their reasonableness. The commission appears to have had no detailed instructions. After a good deal of study the conclusion was reached that the only satisfactory way to decide what should be considered the true net earnings of the lines was to assume that they would always be 30 per cent. of the gross receipts; and in trying to estimate the cost of the track and overhead structures per mile, the commission was again forced to abandon its elaborate studies of the values of different sections, and to measure the value of each and every line by the average cost per mile of construction throughout all of that company's lines in the city. Nevertheless the frank and businesslike tone of the report gives a feeling of confidence that the commission has done the wisest thing possible. It is, of course, impossible for the superficial observer to form an intelligent opinion as to the equity of the bargain which has been made between the city and the roads, but the fact that an agreement has been reached tends to sustain the fairness of the valuation.

The commission had to do its work in about five months, and therefore engaged about 50 assistants. Mr. Arnold, who was elected chairman of the commission, had a hand in appraising the Chicago street railways in 1902. To avoid any criticism as to local prejudice, engineers from Detroit and Toledo were called into consultation. In estimating the value of real estate and also of horses and some other kinds of property, outside experts were called in; and on the legal status of the ordinances and certain other relations between the roads and the cities, the advice of lawyers was used.

The report begins with a discussion of certain preliminaries that had to be cleared up. One of these was the question whether the cable railways should be considered as operating cable systems, or as useful only to be converted into electric roads. It was finally decided that the lines on Wells street, and in the western and southern parts of the city, should be considered as railways, and those in the other parts of the city as scrap. The question of allowance for pavements laid by the companies was settled by the lawyers.

In valuing the physical property the commission took account of legal expenses, including those incurred in securing right of way; interest during construction; brokerage; and the usual allowance for contingencies, all these together making an addition of 10 per cent. to the physical property.

The franchises of the companies were in a state of confusion. The different lines of road are running under 407 franchises, and these expire at all sorts of dates.* To estimate the value of a franchise it is necessary to know the earnings of the line, but there is no record from which to compute the earnings of the separate lines. The city has in the past granted extensions of certain lines, and it was claimed by the railroads that in authorizing an old and a new line to be worked together, the city had extended the franchise of the older one. The commission finally decided, however, that it was not important to value small franchises separately, whether they had or had not expired, for the city now proposes to buy the lines, and the only question is as to how long a period must be estimated as likely to elapse before the city can or could purchase the lines under the law. The courts have not yet decided as to the city's rights in this matter. If it were to proceed to acquire by eminent domain, from 12 to 24 months would be required, and the commission finally decided that an average of 18 months should be adopted; that is to say, it is assumed that in 18 months the city could take the railways in spite of the stockholders. Franchises which contain an undisputed date of expiration are estimated as good for the unexpired terms of their grants.

In trying to apportion the gross receipts of the companies by streets and divisions, the commission found that nothing could be done; but the records of car mileage could be thus divided, and it was decided to apportion receipts on the basis of car mileage. This is the strongest dose of pure assumption that we find in the report, for it implies that on each and every line the number of cars run has been maintained at a fair proportion of the number of passengers desiring to be carried. In the congested district in the congested hours this must be a violent assumption, we should think.

The railways issue transfers equal in number to about 40 per cent. of the total passengers carried, and it became important to estimate how much traffic these represented. All that could be done, however, was to conclude that the northbound transfers would equalize the southbound, and thus offset each other.

The value of a franchise also includes an estimate of the present worth of net earnings of future years. The estimates of earn-

*The Chicago City Railway operates 219 miles of track, and the Chicago Union Traction Company, 486 miles.

ings were based on Arnold's law of increase, accepted by the railroads in 1902; and the present value of such earnings, taken at the middle of each year, was computed on the basis of 5 per cent. compound interest.

It was claimed that when the franchise on a particular street had expired the remaining franchises on that street were, therefore, valueless; but the commission believes that this is not a live question, for the people are bound to have good service when they can get it, and the lines will be kept running somehow.

The main conclusions of the report are named under two heads: value of franchises and value of physical property. For the franchises, four different valuations are given; first, on the assumption that the city could take the roads in 12 months; second, on an assumed period of 18 months, and, third and fourth, on periods of 24 months and 36 months. As before stated, the commission believes 18 months to be the right assumption. Having followed the principles outlined, the values of the lines of the two companies are found to be—

| | Without paving. | With paving. |
|---|---|---|
| Chicago City | $20,536,510 | $22,369,068 |
| Chicago Union Traction | 26,116,237 | 28,625,714 |
| | $46,652,747 | $50,994,782 |

The main terms of the agreement between the city and the companies are given in another column. The mayor had hoped for 60 per cent. of the profits instead of 55 per cent., and the officers of the railways, who had wanted about 73 millions (together), held out for 53 millions till the last minute; but the newspapers report both sides as expressing cheerful acquiescence in the final bargain.

## November Accidents.

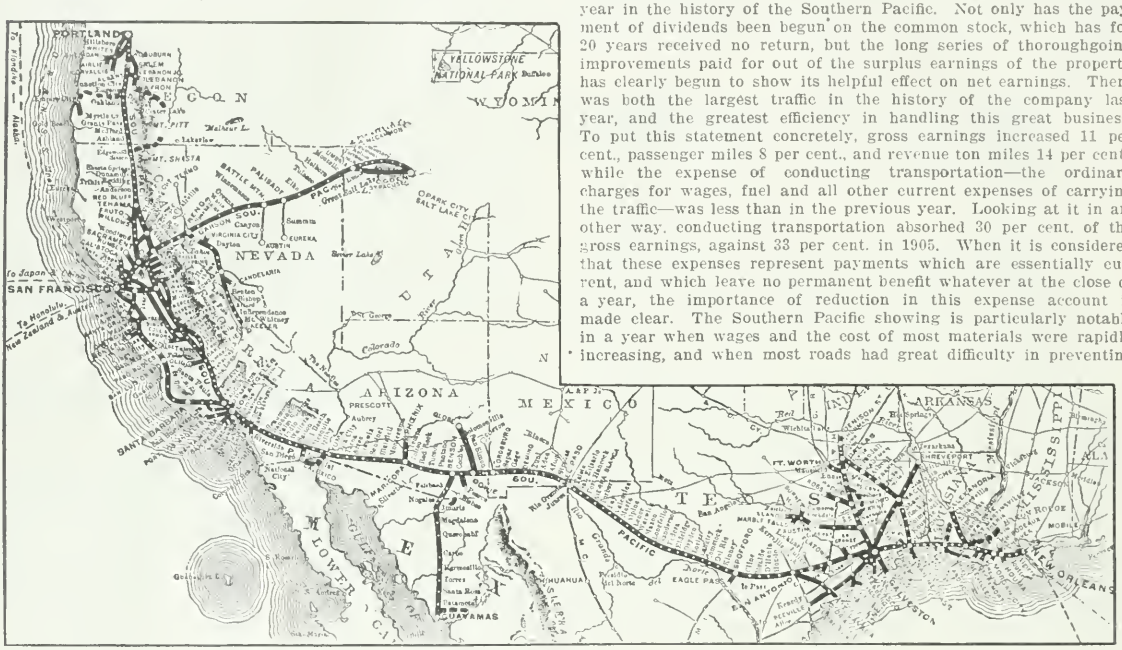
The condensed record of the principal train accidents which occurred in the United States in the month of November, printed in another column, contains accounts of 37 collisions, 28 derailments, and 2 other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

| | Place. | Nov. | Killed. | Injured. |
|---|---|---|---|---|
| 1. | Quinnisec Junction, Mich. | 1st | 4 | 10 |
| 2. | Ellsworth, Minn. | 3d | 0 | 16 |
| 3. | Liberty, Pa. | 9th | 1 | 2 |
| 4. | Loveland, Ohio | 9th | 1 | 10 |
| 5. | Eureka, Mo. | 11th | 0 | 12 |
| 6. | Woodville, Ind. | 12th | 48 | 37 |
| 7. | Grassy Sound, N. J. | 14th | 0 | 14 |
| 8. | Ripley, Tenn. | 17th | 3 | 3 |
| 9. | Stanley, Wis. | 26th | 2 | 1 |
| 10. | Lawyer, Va. | 29th | 7 | 10 |
| 11. | Bloomington, Ill. | 30th | 1 | 14 |

Sixty-seven accidents is a large number for a single month, considering that we throw out all that are of minor importance. The average number in our record for the past 10 months has been 47.2, and the average number treated as "prominent" has been 8.5, each month, as compared with 11 now. In March, May, July, August and October there were notable disasters, and the aggregate killed in these (one accident in each of the months named) was 127. Now we have a month with two notable cases, Woodville and Lawyer. These two are the only ones in the present list which appear to be out of the ordinary. They have been discussed in past issues, and there is not likely to be any further information of value concerning them until the Government report appears. The number of electric car accidents reported in the newspapers of the United States in November was 10; one person killed, 28 injured.

## Southern Pacific.

The past year is in more than one sense an especially important year in the history of the Southern Pacific. Not only has the payment of dividends been begun on the common stock, which has for 20 years received no return, but the long series of thoroughgoing improvements paid for out of the surplus earnings of the property has clearly begun to show its helpful effect on net earnings. There was both the largest traffic in the history of the company last year, and the greatest efficiency in handling this great business. To put this statement concretely, gross earnings increased 11 per cent., passenger miles 8 per cent., and revenue ton miles 14 per cent., while the expense of conducting transportation—the ordinary charges for wages, fuel and all other current expenses of carrying the traffic—was less than in the previous year. Looking at it in another way, conducting transportation absorbed 30 per cent. of the gross earnings, against 33 per cent. in 1905. When it is considered that these expenses represent payments which are essentially current, and which leave no permanent benefit whatever at the close of a year, the importance of reduction in this expense account is made clear. The Southern Pacific showing is particularly notable in a year when wages and the cost of most materials were rapidly increasing, and when most roads had great difficulty in preventing their conducting transportation total from increasing over the previous year's figure. The reason that the Southern Pacific could carry a so much larger traffic at less expense than the smaller traffic of the year before lies in the years of steady and continuous building up of the transportation machine. The old Southern Pacific was by no means a first-class railroad. Hundreds of miles of its through line furnished no traffic at all, and the line itself was an expensive one to operate. Under the present management not only has traffic been developed to a remarkable degree, both by encouragement of local industries and the establishment of the only through traffic route under one management from the Atlantic to the Pacific (from San Francisco to New Orleans over the Southern Pacific; from New Orleans to New York on steamship lines controlled by the company), but the railroad itself has been turned into a through line in the modern use of the term. Heavy rails have replaced light ones; heavy locomotives and high capacity cars, light and small equipment; grades and curvatures have been cut down, new sidings laid, new yards laid out, terminal facilities extended and new branches built. The Southern Pacific to-day operates nearly 10,000 miles of line and has the second largest gross earnings of any railroad in the country. It was able last year to operate its rail lines on 63.31 per cent. of its gross earnings.




Southern Pacific.

In contrast to the decrease in expense of conducting transportation, both maintenance accounts show considerable increases. Maintenance of way increased over $2,500,000, or 19 per cent. Of this increase, $1,800,000 was for reserve for future maintenance, renewals, etc., a new charge to operating expenses. In connection with this charge, however, as also in regard to the same charge mentioned in the annual report of the Union Pacific, it must be remembered that this money has probably not yet been spent on improvement of the lines, but is reserved for future expenditures of this sort. It would, of course, be perfectly possible to reduce ordinary

maintenance of way expenses in the succeeding fiscal year by this amount. It is probable, however, that a similar charge will be made each year in the future, with the result that as long as this policy is continued such charges represent a direct additional maintenance expense. The rest of the increase was due to the expenditure of $536,000 in several times moving the Southern Pacific tracks on the side of the Salton basin, and in finally building about 40 miles of new line above the original location. These changes were necessitated by a crevasse of the Colorado river near Yuma, Ariz., which caused a continuous flow of that stream into the Salton sink about 75 miles farther north, converting that basin into a salt lake about 45 miles long, about 15 miles wide, and with an extreme depth of about 80 feet. This break occurred early in 1905. The efforts to divert the course of the river to its former channel were described in the *Railroad Gazette* of November 9, 1906. Maintenance of way and structures cost $1,744 per mile of main and second track, against $14,761 in 1905. This covers 164 miles of second track.

Maintenance of equipment increased $1,296,000, or 10 per cent., mainly as a result of a much larger charge than in 1905 for equipment destroyed, condemned or sold. This item was $2,200,000, larger by $1,369,000 than in 1905. There was a new charge of $313,000 for future maintenance, renewals, etc., similar to the corresponding charge under maintenance of way. The average cost of repairs per unit of equipment was as follows: Locomotives, $3,531, against $3,473 in 1905; passenger cars, $883, against $920 in 1905; freight cars, $104, against $85 in 1905. All of these charges are large, but particularly the cost of freight car repairs. There were 127 locomotives (over 8 per cent. of the total), 47 passenger cars, 3,389 freight cars and 103 road service cars destroyed, condemned or sold during the year. Their replacement by better equipment was the principal cause of the large increase of 59 tons, or 19 per cent., in the average trainload east of El Paso, and 30 tons, or 8 per cent., on the lines west. The trainload for the system, including both revenue and company freight, was 383 tons, against 341 tons in 1905. The gain in efficiency of operation is shown in another way by the fact that though there was an increase of 10 per cent. in ton mileage, there was a decrease of over 1 per cent. in revenue freight train miles. There have been ordered 154 locomotives, 130 passenger cars, 3,000 refrigerator cars and 4,400 other freight cars; also three steel passenger and freight steamers of 10,000 tons displacement and other miscellaneous floating equipment; all at an aggregate cost of about $17,000,000.

The Southern Pacific is remarkable among railroads in that coal and coke make up less than 3 per cent. of its total tonnage. Products of mines other than coal, ores, stone and sand, however, make up 16 per cent. of the total. Lumber furnished 17.5 per cent. last year, against 15 per cent. in 1905, an increase in tons of over 1,000,000. Manufactures account for 15 per cent. and also merchandise and miscellaneous for 15 per cent. of the whole tonnage. The latter of these two classifications increased some 150 per cent. over 1905.

The principal results of the last two years' operations are summed up in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 1,192 | 9,138 |
| Passenger earnings | $29,224,510 | $26,412,631 |
| Freight earnings | 63,908,981 | 57,759,312 |
| Gross earnings | 99,123,550 | 89,403,632 |
| *Gross earnings | 105,632,550 | 99,515,158 |
| Maint. way and structures | 16,319,683 | 13,731,801 |
| Maint. of equipment | 14,286,111 | 12,989,732 |
| Conducting transportation | 29,683,882 | 29,691,601 |
| Operating expenses | 62,752,771 | 58,530,015 |
| *Operating expenses | 68,120,893 | 63,664,235 |
| Net earnings | 36,370,779 | 30,873,617 |
| *Net earnings | 37,511,656 | 31,850,923 |
| *Net income | 19,192,647 | 12,431,973 |
| Dividends | 7,716,125 | 2,769,431 |
| *Year's surplus | 11,118,837 | 3,426,798 |

*Including water lines and the Southern Pacific Terminal Company.

## NEW PUBLICATIONS.

*The Economics of Railroad Construction.* By Walter Loring Webb. New York: John Wiley & Sons, 1906. Cloth, 339 pages. Price, $2.50.

It is somewhat difficult to give an impartial estimate of Mr. Webb's new book because the temptation is strong to compare it chapter by chapter with Wellington's classic work of twenty years ago, which, despite the progress of engineering in this and many other fields, still stands by itself, unassailable, unimpeached. A good part of Wellington's data is now antiquated and of comparatively little value to modern engineers, but the data are of far less importance than the fundamental theories deduced therefrom and so clearly propounded and elaborated. Webb has introduced some new data, but he has evolved no new principles or improved upon the old. Nor can it be said that he has brought the "Economic Theory of Railway Location" up-to-date, for this obviously could not be done in a book hardly one-quarter the size of its predecessor.

While the author in his introduction says that he is writing from the standpoint of the constructing or operating engineer, the opening chapters dealing with the non-technical phases of the subject, statistics, organization, capitalization, valuation and estimation of volume of traffic are more satisfactory reading than the later chapters dealing with the strictly engineering problems. The somewhat complex study of valuation is written of briefly but clearly, but the conclusions arrived at in the following chapter on estimation of volume of traffic are vague and unsatisfactory. Such a subject cannot be treated with justice within the limits of 7,000 words.

In discussing the operating and physical elements of the problem the same method is used throughout. Taking the classification of operating expenses adopted by the Interstate Commerce Commission as a basis and using the percentages of each to the total as given by the statistics of the last ten years the effect of any element in the problem on each of the items is estimated and the total effect, expressed as a per cent. of the operating expenses, is used in determining the money value per train mile from the average cost per train mile for the United States. This method is not original nor are the actual figures employed of much value in working out a concrete problem, for the percentages in any individual average will probably vary widely from the general average. Wellington used a somewhat different classification, but this does not affect the conclusions he derived. That elusive factor, train resistance, enters into the solution of a number of the problems discussed and one chapter is devoted to it. Whether from design or not, the author avoids championing any one of the numerous formulæ presented. Unfortunately the book is full of typographical errors, some of minor importance and many seriously affecting the argument. To the careful reader this gives at once a bad impression.

*The Workings of Railroads.* By Logan G. McPherson, Lecturer on Transportation at Johns Hopkins University. Published by Henry Holt & Co., New York. 282 pages, 5 in. x 7 in., cloth. $1.50.

Mr. McPherson, well known to the readers of the *Railroad Gazette* from connections he has had with the Baltimore & Ohio and with the Southern Railway, has gotten up from a course of lectures, which he delivered at Johns Hopkins University in the spring of 1906, a book which he describes as a primer of railroad working and management. Mr. McPherson believes, with Mr. Acworth, of England, that the need at this time for books giving, as this one does, a clear presentation of first principles, is fully as great as the need for more advanced and highly specialized works on transportation. In this we heartily concur. He addressed his class, not only as students, but also as voters who were ultimately going to shape the economic legislation of the country, and his book is written for voters rather than for specialists. We wish that all voters would read it. While covering much familiar ground, it puts a great deal of information into small space, and is at once easy to read and interesting. The chapter headed "Correlation," showing in some detail the actual start of a railroad day, presents a vivid picture of the multitude of little things that have to be organized and harmonized to make a road run and to enable it to do business.

# CONTRIBUTIONS

### The Overcrowding of Passenger Trains.

Chicago, Ill., Dec. 13, 1906

TO THE EDITOR OF THE RAILROAD GAZETTE:

Apropos of the interesting tabulation of the seating capacity and number of passengers on 22 trains on the New Haven road, given in your issue of December 7th, would it not be pertinent to inquire how many passengers remained on those trains to their journey's end? Without this fact it seems to me that it is impossible to make a comparison between the average of 359 passengers for the 22 trains with the average of 81 passengers per train "retained" by the New Haven company for its whole system last year. Train loads of suburban passengers begin to thin out very rapidly after the first stop, and out here I have known trains whose seating capacity was taxed beyond the limit at the start to run between the last stations without a single passenger. Except with some approach to crowding at the initial station it is practically impossible to make suburban traffic pay. Some railroad authorities go to the extent of saying that it does not pay anyway, except indirectly through the building up of freight traffic along the line. This, I think, however, is to be taken with several grains.

SLASON THOMPSON.

### Railroad Organization.

New York, Dec. 26, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest the article in your last issue on "Railroad Organization." As you say, "the characteristic British organization is sharply departmental, the head of the motive power department ranking almost with the general manager, corresponding in rank to our President, and often reporting to nobody but his directors." As you further say, "the Pennsylvania organization is straight divisional." It has been characterized as the "two-czar"

system, all the power being lodged in the hands of the general manager and the division superintendent.

I think you correctly state the advantages of the two systems, the one confiding to experts the handling of such diverse problems as those relating to motive power, road maintenance and train operation, the other seeking for harmony and success by the control of one strong arm over the three elements held to be inseparable. Many attempts have been made to secure the advantages of the two types, usually by having one officer report to two or more superiors, and as a rule this has not worked well. The Rock Island organization of 1904 was an effort to secure these advantages by a separation along what seemed to be the natural lines of cleavage. If you ask the Superintendent of Transportation how often he would like to consult with the Superintendent of Motive Power, he will say several times a day; if you ask him as regards the Engineer of Maintenance of Way he will say once a month. To move traffic, the superintendent should have the vehicles and men to make the movement with. He can do it very well on a road furnished him.

After all, this works out all right in marine matters. Consider the traffic on the Great Lakes. Here we have a waterway with its complications of the Detroit river, St. Clair canal and the Soo locks, maintained and signaled by the government, while the traffic is moved by captains in full charge of their ships and crews.

F.

## Tempering High Speed Steel.

At a recent meeting of the Master Blacksmiths' Association, Mr. Geo. Lindsay, in discussing annealing of high speed steel, said he had been called upon to make a forging of this material at short notice and it occurred to him that, if the exclusion of air was the most important thing in the process, it would be well to try a lead bath. Accordingly, a piece of 4-in. pipe about 12 in. long was welded solid at one end to form the pot, which was filled two-thirds full of lead. The lead and the pot were raised to a high temperature, the steel was placed in it and they were allowed to cool together. After it had cooled down to the melting point of lead, or about 630 deg. Fahr., it was reheated sufficiently to remove the steel, which was then allowed to cool slowly. After this treatment it could be cut, in a lathe, like ordinary carbon steel. The suggestion is made as a convenient shop wrinkle.

The same speaker said that in hardening this peculiar metal it was necessary to forge it, lay it down to cool and then heat it again, but not far back from the cutting edge. Great care must be taken in the heating, notwithstanding the common opinion that it cannot be made too hot. Too rapid heating is apt to fuse the edges, so that they will become brittle and crumble. The steel should be given time to absorb the heat. Another danger in rapid heating is that the blast is apt to get through the coke of the fire and oxidize the edges. When the tool is removed from the fire the scale should be carefully removed and the air applied at the back, especially in the case of lathe tools. For milling cutters, taps, reamers and similar tools, where long and slow heating is required, a furnace is almost indispensable, though hollow fires may be made to do good work. An oil bath should be used for cooling, and the temper drawn as in carbon steel.

## The New York Connecting Railroad.

The Pennsylvania Railroad and the city of New York have at last come to terms regarding a franchise for the important project of a belt line through Brooklyn and Queens and over the East river at Ward's Island to a connection with the New York, New Haven & Hartford at Port Morris. At a conference between the mayor and other city officials and Vice-President Samuel Rea, of the Pennsylvania, held December 21, the important details of the grant were agreed upon and as soon as a complete draft can be drawn up it will be signed and accepted by both parties; work can then go ahead immediately.

The relation of the New York Connecting Railroad to the other improvements now being made by the Pennsylvania in and around New York will be understood by a study of the accompanying map. President A. J. Cassatt in a letter to the Mayor last January outlined the company's extensive plans as follows:

The work upon the Pennsylvania station in Manhattan and the extension by the Pennsylvania, New York & Long Island Railroad of the Pennsylvania Railroad System from Jersey City into Manhattan and through it to Brooklyn and Queens boroughs has progressed so far that it is now necessary to prepare for the efficient handling and distribution of the traffic which such extension and new station must bring to New York. Intimately and necessarily connected with this traffic are the proposed developments of the passenger and freight facilities of the Long Island Railroad in the boroughs of Brooklyn and Queens and the proposed construction of the link to be called the New York Connecting Railroad and intended by means of its bridge over the East river to establish for Brooklyn and Queens direct railroad communication with New England and the North. The Pennsylvania Railroad owns the shares of stock of the Pennsylvania, New York & Long Island, and a majority of the shares of the stock of the Long Island Railroad, and it and the New York, New Haven & Hartford, equally own the shares of stock of the Connecting Company.

The proposed facilities include:

1. The establishment for the Pennsylvania, New York & Long Island Railroad of a great terminal to be called "Sunnyside Yard" between Jackson and Thompson avenues in Queens. It is to be upwards of one mile long, to average nearly a third of a mile wide, and to include an area of about 8,712 city lots, or about 400 acres. This yard will be of prime necessity to efficient operation of the new system in Manhattan and to proper care of the great additional traffic which we believe our improvements will bring to the city. There is, within the Borough of Manhattan, no suitable place for so great a terminal yard. The site chosen is almost entirely open and unused land; and, apart from its great advantage to Manhattan and Brooklyn, its establishment in Queens, with the business incidental to it, must very considerably increase the general volume of business in that borough. The publicity of our intentions has already materially enhanced the value of neighboring real estate.

2. The elimination of grade crossings on the railroads owned or leased by the Long Island Railroad. These costly changes include the lines from Flatbush avenue station out to the Brooklyn borough line, from our Long Island City station to Jamaica and from that station by the Manhattan Beach line through East New York around to the Bay Ridge terminal, there connecting, by the proposed straight and relatively short ferry across the Upper Bay, with the Pennsylvania freight terminal at Greenville, N. J. The latter improvement includes also the branch line to Manhattan Beach. The work is to be done under requirement of an act of the legislature, which, apart from the elimination of grade crossings, provides no facilities to the railroad companies. They are to contribute one-half of the expense and the city the other half up to the limit of $5,000,000. As the cost will materially exceed that limit, the investment of the companies for this purpose will be greater than one-half. Like improvement in Queens has already been suggested by the authorities of Queens, and is under consideration by the railroad companies.

3. While eliminating the grade crossings, we have deemed it wise to greatly enlarge the facilities for freight distribution in the boroughs of Brooklyn and Queens. The present facilities are antiquated and insufficient, and provide for only a part, and it is believed, a small part, of the trunk line traffic which it is to the interest of the companies and of the city should be brought to and carried from those boroughs. We desire, therefore, to improve and extend our lines within their limits. And our further plan is to provide ready for use upon the completion of the Connecting Railroad between Queens and Bronx boroughs, ample local delivery yards in Brooklyn and Queens in addition to those already existing. The sites of the new or substantially new yards are as follows:

(*a*) Freight terminal at Bay Ridge, between 64th and 66th streets, extending from Fourth avenue to the bay.

(*b*) Delivery yard at Fifth avenue and 65th street, Bay Ridge.

(*c*) Delivery yard at Fifteenth avenue and 60th street, Bath Junction.

(*d*) Delivery yard on Gravesend avenue (Parkville).

(*e*) Delivery yard at Manhattan Beach Junction, East Sixteenth street and Avenue I.

(*f*) Delivery yard, Vandeveer Park, Flatbush avenue.

(*g*) Delivery yard at Paerdegat Basin near Canarsie. This is convenient to the contemplated municipal improvement of Jamaica Bay.

(*h*) Delivery yard at Rockaway avenue.

(*i*) Freight terminal at East New York.

(*j*) Delivery yard at Bushwick Junction.

(*k*) The construction of a new freight terminal at Third street and Hunter's Point avenue, and of a freight delivery yard north of Hunter's Point avenue.

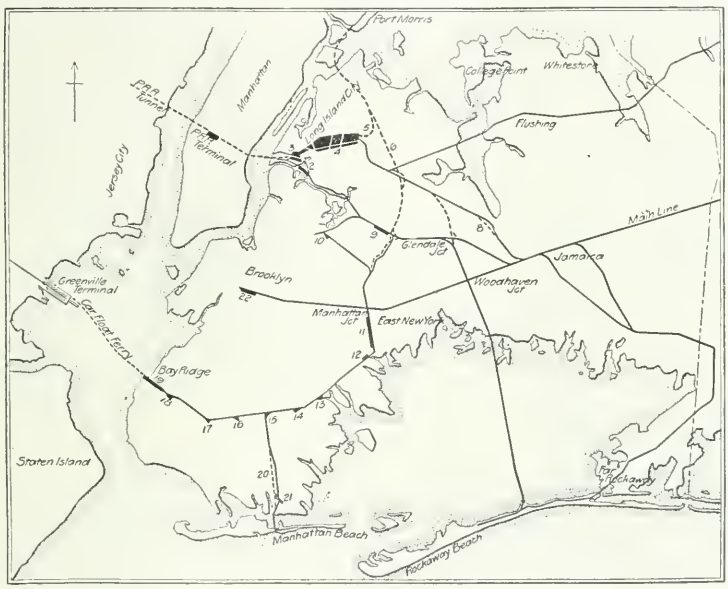
In connection with these improvements is the enlargement of the freight terminal yards at Flatbush avenue, the existing freight yard at Varick avenue, Bushwick; the enlargement of the terminal at Sheepshead Bay, and also the improvements on the north side of Newtown Creek between Van Alst avenue and Pearsall street, by the construction of bulkheads, piers, tracks and other features of a water front freight terminal.

The justification for so great and costly an enlargement of freight and passenger facilities must, of course, be found in future increase of business incident to such new facilities as well as to the establishment of the short, direct car float ferry from Greenville to Bay Ridge and to the proposed railroad connection between Queens borough and the New Haven system in Bronx borough. The disadvantages of the insular isolation of Brooklyn and Queens thus brought to an end, their great natural advantages should lead at

once to a vast and profitable development of their manufacturing and commercial traffic with the rest of the United States.

4. The completion of the Atlantic avenue improvement. This includes not only the removal of railroad tracks from the surface of that avenue at the joint expense of the railroad company and the city, but a large and very expensive improvement at the sole cost of the company of the passenger and freight terminal at Flatbush avenue. This point will tend more and more to be a great and probably for the future the most important point of distribution of passengers within Brooklyn. When the Connecting Railroad shall be finished, residents of Brooklyn and Queens will travel by that route without change of cars to New England and the North and East as well as to the West and South, by way of the Pennsylvania terminal in Manhattan.

5. The Connecting Railroad is to be 12 miles long, to run through a part of Queens borough as yet half rural, although recently much developed by the promise of these improvements, and, by a bridge authorized by the state and federal governments to cross the East river at Ward's and Randall's Islands. Its completion is obviously the key to the development thus proposed of commercial and manufacturing traffic in Brooklyn and Queens. We intend to connect this railroad by a short, direct line with the




Map of the New York Connecting Railroad.

1. Newtown Creek development.
2. New freight connection from North Shore Yard to Montauk Division.
3. New freight terminal.
4. Sunnyside Yard.
5. Connection from New York, Connecting R. R. to Sunnyside Yard.
6. New York Connecting Railroad.
7. Glendale cut-off between Main Line and Rockaway and Montauk Divisions.
8. Maple Grove cut-off.
9. Freight yard, Bushwick Junction.
10. Freight terminal, Varick Ave., Bushwick.
11. Freight terminal, East New York.
12. Freight delivery yard, Rockaway Ave.
13. Freight delivery yard, Paerdegat Basin.
14. Freight delivery yard, Vanderveer Park, Flatbush ave.
15. Freight delivery yard, Manhattan Beach Junction.
16. Freight delivery yard, Parkville.
17. Freight delivery yard, Bath Junction.
18. Freight delivery yard, Bay Ridge.
19. Freight terminal yard, Bay Ridge.
20. Change of line, Brighton Beach improvement.
21. Terminal, Sheepshead Bay.
22. Freight terminal yard, Flatbush Ave.

"Tunnel Line," thus permitting a new and direct all rail communication with New England and the north for Manhattan as well as for Queens and Brooklyn.

6. Construction of the Montauk cut-off, which is a new freight line connection for the Long Island Railroad from the North Shore yard to the Montauk division. This is indispensable to rapid and adequate movement of freight.

7. Construction of the Glendale cut-off between the main line, Montauk division and Rockaway Beach division of the Long Island Railroad. This is necessary for improved passenger service and to give direct connection with the tunnels to Manhattan.

8. The Maple Grove cut-off, straightening and improving the main line of the Long Island Railroad at Union avenue, Hillside drive and Lefferts avenue.

The history of the struggle for a franchise from the city for the New York Connecting is interesting. The first application of the Connecting Company for a franchise was presented to the Rapid Transit Commission on June 11, 1903, and was referred to the committee on plans and contracts. After some months of consideration of the details of the plan the committee reported a form of franchise on June 16, 1904, just a year later. This was submitted for the approval of the Board of Aldermen, as the charter then required, and referred to the proper committee. One hearing was held, after which came prolonged and unexplained delay. Before the end of the second year the protest of Brooklyn and Queens against the "hold up" became clamorous, and the Pennsylvania Railroad joined in a general movement to secure legislation that would transfer from the Aldermen to the Board of Estimate and Apportionment all control of franchises. The object was to secure a fair court, and the businesslike attention given franchise subjects by the Board of Estimate, coupled with the ending of the recurrent scandals about matters in the hands of the Aldermen, has more than justified the passage of the charter amendments resulting from the agitation.

On April 18, 1905, after the passage in the lower house of the Legislature of the charter amendments in question, the Aldermen returned the Rapid Transit Board's certificate to the Connecting Company with their disapproval, proposing five amendments and demanding that these be incorporated in the franchise before their approval could be given. The amendments were of slight consequence except one, which would compel the road to carry passengers between any points on its line for 5 cents, thus bringing it within the local rapid transit business. The company pointed out that it could neither accept this, nor two other minor suggestions, but the action of the Aldermen was not treated seriously.

On November 16, 1905, after the new legislation had become effective, the company renewed its application before the Rapid Transit Board and further meetings and conferences followed, in the course of which all of the details were again discussed. On March 1, 1906, the Plans and Contract Committee made a report of a form of franchise under which a flat payment of $100,000 was to be made to the city and annual payments of $25,000 for ten years and $50,000 a year for the succeeding 15 years. At the end of 25 years under the charter the figures of compensation to the city must be readjusted. Under other clauses of this proposed certificate the company agreed to assume every charge of any nature that could possibly come from the carrying out of its plans, and to relieve the city of any expense whatever. The company felt, and stated publicly, that the annual rates were much too high, in view of the great benefit the building of the road would confer, indirectly, upon the city and the element of risk in the company's new undertaking. It agreed, however, to the Rapid Transit Commission's proposals. A conference committee of that board and the Board of Estimate and Apportionment was appointed, with Mr. McGowan as chairman. The committee and the company then commenced the negotiations which have just ended.

Under the terms of the franchise as agreed upon the company will pay to the city 10 per cent. more than the amounts proposed by the Rapid Transit Commission, namely, $110,000 in two yearly payments, $27,500 a year for the first ten years and $55,000 a year for the next 15 years. The width of the right of way over or under any street or road now open or in use or hereafter to be opened across the route of the railroad company shall not exceed 100 ft. in width. The plans for the proposed bridge and for all passenger stations shall be submitted to the Municipal Art Commission for its approval. None of the property of the railroad company shall in any way be used for advertising purposes.

The definition of local passenger traffic is changed to include the carriage of passengers between any two points within the present limits of the city of New York, excepting only such transference of passengers traveling beyond the limits of the city as may be necessary in the carrying on of the business of the various connecting roads. It leaves the question of passenger rates to be settled by the Board of Rapid Transit Commissioners, the Board of Estimate and Apportionment and the Mayor, whenever in the future the company is able to use this road for such a purpose. Under the terms of the original contract, however, the definition of the local traffic would have permitted any of the connecting roads to have charged such fare as they pleased between any point on the road of this company and any point on the road of one of the connecting lines within the limits of the city without obtaining the consent of the local authorities. Under the amended definition of local traffic not only the question of passenger rates on this road alone, but the question of passenger rates on this line when used in con-

nection with other connecting roads within the city limits, is left to the local authorities for adjustment. No modification of any of the terms or conditions of the contract shall be valid unless approved by the Board of Estimate and Apportionment and the Mayor of the city of New York.

In addition any alteration which is required to be made to any sewerage or drainage system on account of the construction or operation of the road is to be made at the sole cost of the railroad company. In case a dispute arises concerning the necessity for such alteration, the matter is to be referred to the Supreme Court for determination.

The sums which are to be paid to the city as compensation for the franchise are specifically declared to be in addition to all taxes in order to avoid any misunderstanding such as has arisen in similar cases.

The approval of the Board of Estimate and Apportionment or its successors and of the Mayor is required to render effective all readjustments of terms at the end of the 25 year period.

The Appellate division of any department through which a portion of the road may run is made the final arbiter of the compensation to be paid.

Pending the granting of the franchise the railroad company has prepared complete plans for all of the details of construction and is in a position to begin work almost immediately. The plans for the East river bridge are complete and have been approved by the War Department and all of the right-of-way has been secured.

## Railroad Built in 1906.

*Table Showing Mileage Built in 1906, Classified by States.*

| States. | No. of Cos. building. | 1906. | No. of Cos. building. | 1905. |
|---|---|---|---|---|
| Alabama | 8 | 81.9 | 4 | 103.08 |
| Alaska | 1 | 15.5 | 2 | 13.0 |
| Arizona | 3 | 47.81 | 1 | 45.47 |
| Arkansas | 19 | 260.24 | 11 | 198.51 |
| California | 11 | 139.47 | 6 | 34.27 |
| Colorado | 8 | 113.36 | 4 | 83.15 |
| District of Columbia | 1 | 1.0 | .. | ..... |
| Florida | 12 | 205.75 | 4 | 10.8 |
| Georgia | 7 | 182.9 | 6 | 120.0 |
| Idaho | 6 | 184.4 | 5 | 109.7 |
| Illinois | 9 | 119.41 | 8 | 249.49 |
| Indiana | 6 | 101.03 | 3 | 171.79 |
| Indian Territory | 2 | 99.4 | 4 | 98.4 |
| Iowa | .. | ..... | 3 | 15.2 |
| Kansas | 3 | 53.12 | 2 | 21.6 |
| Kentucky | 7 | 34.57 | 5 | 76.45 |
| Louisiana | 12 | 333.84 | 10 | 99.8 |
| Maine | 4 | 44.71 | 2 | 65.26 |
| Maryland | .. | ..... | 1 | 40.7 |
| Massachusetts | 1 | 4.5 | 1 | 1.0 |
| Michigan | 3 | 24.8 | 9 | 87.76 |
| Minnesota | 6 | 138.07 | 5 | 108.29 |
| Mississippi | 8 | 165.14 | 5 | 120.5 |
| Missouri | 4 | 20.5 | 3 | 48.99 |
| Montana | 1 | 26.0 | .. | ..... |
| Nebraska | 3 | 174.55 | 1 | 47.0 |
| Nevada | 4 | 282.05 | 3 | 86.99 |
| New Jersey | 1 | 2.67 | 3 | 9.9 |
| New Mexico | 2 | 151.0 | 3 | 122.5 |
| New York | 3 | 95.02 | 4 | 49.68 |
| North Carolina | 4 | 34.0 | 8 | 124.5 |
| North Dakota | 2 | 247.47 | 4 | 520.73 |
| Ohio | 4 | 61.0 | 3 | 84.06 |
| Oklahoma Territory | 2 | 36.0 | 3 | 154.4 |
| Oregon | 7 | 61.11 | 5 | 68.42 |
| Pennsylvania | 14 | 117.72 | 8 | 76.7 |
| Rhode Island | .. | ..... | 1 | 3.5 |
| South Carolina | 3 | 41.0 | 2 | 28.0 |
| South Dakota | 6 | 388.23 | 4 | 116.0 |
| Tennessee | 6 | 65.0 | 5 | 151.2 |
| Texas | 18 | 631.67 | 9 | 338.5 |
| Utah | 6 | 153.52 | 5 | 66.02 |
| Vermont | .. | ..... | 1 | 5.0 |
| Virginia | 5 | 121.27 | 2 | 13.96 |
| Washington | 5 | 103.06 | 3 | 49.5 |
| West Virginia | 5 | 78.78 | 8 | 165.23 |
| Wisconsin | 5 | 141.84 | 7 | 142.65 |
| Wyoming | 3 | 206.95 | 2 | 40.85 |
| Total, United States | 250 | 5,623.33 | 198 | 4,388.03 |
| Canada | 15 | 1,007.05 | 11 | 1,180.86 |
| Mexico | 8 | 296.5 | 5 | 238.42 |

### UNITED STATES.

#### ALABAMA.

| | |
|---|---|
| Atlanta & St. Andrews Bay—Dothan south to Alabama Florida state line | 16.00 |
| Central of Georgia—Henry Ellen to Margaret | 13.00 |
| Haynesville & Montgomery—Tyson to Haynesville | 9.00 |
| Louisville & Nashville—Birmingham Mineral division, Blue Creek extension | 1.12 |
| Mobile & Western—Mann to Mission Church | 14.00 |
| Seaboard Air Line—Mining spur near Ohatchie | 4.50 |
| Southern—Extension of Littleton branch, near Flat Top, 4.00 miles; Woodlawn-Bessemer cut-off, 3.28 miles; total | 7.28 |
| Sumpter & Choctaw—Bellamy to Nix | 17.00 |
| | 81.90 |

#### ALASKA.

| | |
|---|---|
| Council City & Solomon River—John's Creek to Penelope Creek | 15.50 |

#### ARIZONA.

| | |
|---|---|
| Arizona & Colorado (A., T. & S. F.)—Mile post 50.47 to mile post 80.18 | 29.71 |
| El Paso & Southwestern—Corta to Lowell | 3.10 |
| *Gila Valley, Globe & Northern—From San Carlos towards Fort Thomas | 15.00 |
| | 47.81 |

*Change in location of old main line.

#### ARKANSAS.

| | |
|---|---|
| Cache Valley—Walnut Corner to Walcott, 3.00 miles. Walnut Ridge to Walnut Corner, 2.00 miles; total | 5.00 |
| Crittenden—Shell Lake to Heth, 5.00 miles; Shell Lake to Parkin, 8.00 miles; total | 13.00 |
| De Queen & Eastern—Provo to Dierks | 10.00 |
| Fourche River Valley & Indian Territory—From Camp C to Camp D | 4.40 |
| Doniphan, Kensett & Searcy—Kensett to Doniphan | 1.80 |
| Freeo Valley—Mile post 18 to mile post 22 | 4.00 |
| Gurdon & Fort Smith (Mo. Pac.)—From connection with Arkansas Southwestern, 50 miles east of Antoine, northeast to near Caddo Gap | 30.50 |
| Jonesboro, Lake City & Eastern—Osceola branch—Dell to Osceola, 19.50 miles; branch to Luxora, 2.00 miles; total | 21.50 |
| Louisiana & Pine Bluff—Hattig to Dollar Junction | 2.50 |
| Manila & Southwestern—Culberhouse to Lunsford | 5.00 |
| Prescott & Northwestern—Elberta to Helbig | 7.00 |
| Perla Northern—Between Perla and Whittington | 7.00 |
| Rock Island, Arkansas & Louisiana (C., R. I. & P.)—From 35 miles south of Haskells to Crossett, 72.30 miles; Eldorado branch, from main line to Eldorado, 36.00 miles; total | 108.30 |
| Rogers Southwestern—Rogers to Springtown | 21.10 |
| St. Louis, Iron Mountain & Southern (Mo. Pac.)—From Eudora to Arkansas-Louisiana state line | 7.80 |
| St. Louis Southwestern—Chicatawba to Blytheville | 1.25 |
| Saline Bayou & Southern (Pine)—Not specified | 4.00 |
| Thornton & Alexandria—Calhoun to Hampton | 3.00 |
| Warren & Ouachita—Mile post 13 to Burks | 3.00 |
| | 260.24 |

#### CALIFORNIA.

| | |
|---|---|
| Barnwell & Searchlight (A., T. & S. F.)—Extension north to California-Nevada state line | 3.00 |
| Bay Shore (So. Pac.)—Between San Francisco and San Bruno | 3.85 |
| Butte County—Gallagher to North Valley | 15.00 |
| California Northeastern (So. Pac.)—Weed toward Klamath Falls | 24.80 |
| Coast Line (So. Pac.)—Between Santa Cruz and Davenport | 4.86 |
| McCloud River—From a point three miles beyond Bartle to McGavle | 11.40 |
| Nevada-California Oregon—Madeline north | 9.00 |
| Sacramento Southern (So. Pac.)—Sacramento toward Walnut Grove | .52 |
| Southern Pacific—Wye to Hamilton | 11 04 |
| Western Pacific—North Tesla Junction to Stockton, 2.50 miles; South Tesla Junction, west 7.10 miles; in city of Oakland, 1.40 miles; total | 11.00 |
| Yosemite Valley—Not specified | 45.00 |
| | 139.47 |

#### COLORADO.

| | |
|---|---|
| Argentine Central—Waldorf to Mt. McClellan, 5.00 miles; Owsley mine to connection with main line, 0.50 mile; Waldorf to Vidler Tunnel, 0.50 mile; total | 6.00 |
| Arkansas Valley (A., T. & S. F.)—Lamar to Bent, 13.70 miles; Wiley to Big Bend, 4.10 miles; Lays Junction to May Valley, 3.50 miles; Rocky Ford to Columbine, 16.10 miles; Swink to Shelton Junction, 5.40 miles; Holly to Bristol, 13.50 miles; total | 56.30 |
| Colorado & Southeastern—Clelland Junction to Murray Junction | .76 |
| Colorado & Southern—Bellevue to Ingleside, 9.04 miles; Plummers to Mahood, 8.66; total | 17.70 |
| Denver, North Western & Pacific—Sulphur Springs, west to Kremmling | 18 60 |
| Silverton—Yankee Girl Mine to Joker Tunnel | 3.00 |
| Silverton Northern—Eureka to Animas Forks | 4.00 |
| Union Pacific—Washington mine to Grant coal mines | 7.00 |
| | 113.36 |

#### DISTRICT OF COLUMBIA.

| | |
|---|---|
| Philadelphia, Baltimore & Washington (Penn.) | 1.00 |

#### FLORIDA.

| | |
|---|---|
| Apalachicola Northern—River Junction towards Apalachicola | 20.00 |
| Atlanta & St. Andrews Bay—Alabama-Florida state line south to Cottondale | 15.00 |
| Atlantic Coast Line—Newberry branch, Newberry to Wilcox | 20.00 |
| Birmingham, Columbus & St. Andrews Bay—Chipley to Warsaw | 12.00 |
| Charlotte Harbor & Northern—Boca Grande to Gasparilla, 7.00 miles; Pearl River to Hull, 3.00 miles; total | 10.00 |
| Florida East Coast—Homestead to Jew Fish Creek, 20.00 miles; on Key Largo, 17.00 miles; total | 37.00 |
| Florida West Shore (S. A. L.)—Manatee to Bradentown | 1.12 |
| Georgia, Florida & Alabama—Havana to Quincy, 12.00 miles; Carrabelle to Camp Mill, 0.88 mile; total | 12.88 |
| Live Oak, Perry & Gulf—Day to Hampton Springs, 32.00 miles; Hampton Springs to Rigler Creek, 10.00 miles; Mayo Junction to Alton, 14.00 miles; total | 56.00 |
| Plant City, Arcadia & Gulf—Munninger Junction to Nickolds | 6.75 |
| Tallahassee Southeastern (S. A. L.)—not specified | 11.00 |
| Tampa Northern—Tampa to Hillsboro River | 4.00 |
| | 205.75 |

#### GEORGIA.

| | |
|---|---|
| Atlanta, Birmingham & Atlantic—Monk to La Grange | 60.00 |
| Central of Georgia—Greenville north to Newnan | 23.70 |
| Douglas, Augusta & Gulf—Hazlehurst to Brixton | 30.00 |
| Flint River & Gulf—Ashburn to Bridgeboro | 32.00 |
| Gainesville Midland—Jefferson to Athens | 18.00 |
| Georgia Coast & Piedmont—Weefannie north to Glenville, 15.00 miles; Hilton Junction west to Foxtown, 3.00 miles; total | 18.00 |
| Louisville & Nashville—Alaculsey spur, Crandall to Alaculsey | 1.20 |
| | 182.90 |

#### IDAHO.

| | |
|---|---|
| Oregon Short Line—Nampa to Nampa sugar factory | 2.20 |
| Pacific & Idaho Northern—From a point 3.65 miles north of Council to Evergreen | 12.60 |
| Payette Valley—Payette to New Plymouth | 15.00 |
| Spokane International—Eastport to Idaho Washington state line | 122.00 |
| Washington, Idaho & Montana—Harvard east | 9.00 |
| Yellowstone Park (O. S. L.)—Marysville to mile post 40 | 23.60 |
| | 184.40 |

#### ILLINOIS.

| | |
|---|---|
| Aurora & DeKalb—Aurora to Cortland | 26.00 |
| Chicago & Alton—Iles to Murrayville | 34.30 |
| Chicago & Illinois Midland—Pawnee to Taylorville | 17.00 |
| Cleveland, Cincinnati, Chicago & St. Louis—Tilton to Danville | 2.21 |
| Coal Belt extension (Mo. Pac.)—From connection with Coal Belt northeast to White Ash | 2.54 |
| Herrin & Johnston (Mo. Pac.)—From connection with Coal Belt near Herrin east Johnston City | 3.86 |
| Illinois Central— Op Zeigler Herrin branch in Williamson and Franklin counties | 2.50 |
| Macomb & Western Illinois—Macomb to Littleton | 26.00 |
| Wabash Southern (Mo. Pac.)—Zeigler northeast | 5.00 |
| | 119.41 |

INDIANA.

Chicago & Wabash Valley—Range Line to Dawiddie ..... 3.00
Chicago, Cincinnati & Louisville—Griffith to Hammond at Illinois state line ..... 7.74
Chicago, Indiana & Southern—Indiana Harbor to Dune Park ..... 15.70
Evansville, Suburban & Newburgh—From junction with Newburgh to Boonville ..... 15.00
Indianapolis Southern (Ill. Cent.)—Unionville to Switz City ..... 41.59
Indianapolis & Louisville (C. I. & L.)—Wallace Junction west, 5.00 miles; from point 22½ miles west of Wallace Junction to mile post 33½, 11.00 miles; from 45 miles west to Victoria, 2.00 miles; total ..... 18.00
101.03

INDIAN TERRITORY.

Eastern Oklahoma—Davis to Sulphur ..... 9.40
Oklahoma Central—Lehigh to Purcell ..... 90.00
99.40

KANSAS.

Denver, Enid & Gulf (A. T. & S. F.)—Kiowa to Sun City ..... 39.76
Midland Valley—Oklahoma-Kansas state line to Silverdale ..... 6.00
Topeka & Northwestern (Union Pac.)—Emmett to Onaga ..... 7.36
53.12

KENTUCKY.

Carrollton & Worthville—Carrollton to Worthville ..... 10.00
Chesapeake & Ohio—Marrowbone to Hillier ..... 7.80
Grafton & Upton—Not specified ..... 2.12
Illinois Central—Wickliffe to Winford ..... 3.80
Kentucky Valley—Providence to Blackford ..... 15.40
Louisville & Nashville—Cumberland Valley division, extension up left fork of Straight Creek, 2.45 miles; Major branch near Olcott, 2.20 miles; total ..... 4.65
*Louisville & Nashville—Between Corbin and Saxton ..... 10.80
54.57

LOUISIANA.

D'Arbonne Valley—Extension west to Pennington ..... 5.00
Engelwood, Alexandria & Southwestern—Engelwood to La Clede Bayou ..... 7.50
Jasper & Eastern (A., T. & S. F.)—Mile post 27 through De Ridder to Cravens ..... 32.00
Kentwood & Eastern—Kentwood to Bolivar ..... 10.00
Louisiana & Arkansas—Packton to Tioga ..... 30.46
Louisiana East & West—Bunkie to Little Platte ..... 21.00
Lonisiana Railway & Navigation Co.—Angola to Edenborn, 71.30 miles; Edenborn to New Orleans, 58.00 miles; total ..... 129.30
Mangam & Northeastern—Not specified ..... 1.00
Opelousas Gulf & Northeastern—Melville southwest to Opelousas ..... 23.00
St. Louis, Iron Mountain & Southern (Mo. Pac.)—From Arkansas-Louisiana state line to Calvit ..... 29.58
Sibley Lake, Bistineau & Southern (S., A. & S.)—Extension south ..... 1.00
New Orleans Great Northern—Bogue Chitto River to Louisiana-Mississippi state line, 26.00 miles; Rio Junction to Lawrence Creek, 18 miles; total ..... 44.00
333.81

MAINE.

Franklin & Megantic—Kingfield to Alder Stream ..... 2.50
Schoodic Stream—Junction with Bangor & Aroostook to East Millinocket ..... 8.00
Somerset—Landon to Kineo station on Moosehead Lake ..... 33.00
Washington County—Woodland Junction to Woodland ..... 1.21
44.71

MASSACHUSETTS.

New York, New Haven & Hartford—West Roxbury to Needham Junction ..... 4.50

MICHIGAN.

Boyne City, Gaylord & Alpena—Gaylord to Hallock ..... 7.00
Manistee & Grand Rapids—Dighton to Marion ..... 11.00
Mualsing—Little Lake to Princeton ..... 6.80
24.80

MINNESOTA.

Big Fork & Northern—Northouse to Big Falls ..... 32.00
Duluth & Northern Minnesota—From North Branch Junction north to Schaff Lake ..... 12.40
Duluth, Missabe & Northern—Coleraine Junction to Coleraine, 53.00 miles; Burt mine to Winnifred mine, 1.00 mile; total ..... 54.00
Duluth, Rainy Lake & Winnipeg—Ashawa to mile post 50 ..... 22.00
Eastern of Minnesota—Net increase in mining spurs ..... 5.67
Minneapolis & Rainy River—Marcell Junction to Big Fork ..... 12.00
138.07

MISSISSIPPI.

Delta Southern (Southern)—Extension of Stoneville branch from Percy through Delta City to Richey, 11.18 miles; Elizabeth to Napanee, 6.06 miles; new branch on Birmingham division from Itta Bena to Belzoni, 26.8 miles; total ..... 44.04
Gulf & Ship Island—Columbia division, from a point eight miles south of Silver Creek to three miles north of Columbia ..... 16.50
Liberty White—McComb to Hahnesville ..... 10.00
Mississippi Central—From a point 7.50 miles west of Silver Creek to Brookhaven, 21.50 miles; Hattiesburg towards Scranton, 10.00 miles; total ..... 31.50
Natchez, Columbia & Mobile—Divide to Lowvon ..... 3.50
New Orleans & Great Northern—Louisiana Mississippi state line to Mays Creek ..... 14.00
Southern—Extension from Vardeman to Derma ..... 8.90
Yazoo & Mississippi Valley—From 10 miles beyond Silver City to Holly Bluff, 17.70 miles; from a point one mile beyond Webb to Parchman, 10.70 miles; Helm northeasterly, 0.90 mile; Stoneville easterly, 4.10 miles; Hendon across state farm, 3.30 miles; total ..... 36.70
165.14

MISSOURI.

St. Louis & San Francisco—Winkler to De Camp ..... 6.50
St. Louis Belt & Terminal—Easton avenue to Hanly road, St. Louis ..... 8.00
Sligo Furnace—Dillard to Bixby ..... 10.00
Versailles & Sedalia—Versailles to mines ..... 5.00
29.50

MONTANA.

Yellowstone Park—Bridger to coal mines, 22.00 miles; spur lines, 4.00 miles; total ..... 26.00

NEBRASKA.

Chicago, St. Paul, Minneapolis & Omaha (C. & N.W.)—Hartington to Crofton ..... 15.30
Sioux City & Western (Gt. No. and C. B. & Q. connection)—Between Sioux City and Ashland ..... 85.00
Union Pacific—Stromsburg to Hordville, 17.00 miles; O'Fallons to Lewellen, 57.25 miles; total ..... 74.25
174.55

NEVADA.

Barnwell & Searchlight (A. T. & S. F.)—California Nevada state line north ..... 20.24
Nevada & California (So. Pac.)—Between Hazen and Fallon ..... 14.81
Las Vegas & Tonopah—Las Vegas to Rhyolite ..... 123.00
Nevada Northern—Between Cobre and Ely ..... 124.00
282.05

NEW JERSEY.

West Jersey & Seashore (Penn.)—Cape May division ..... 2.67

NEW MEXICO.

Eastern of New Mexico (A. T. & S. F.)—Between Belen and Texico ..... 71.00
St. Louis, Rocky Mountain & Pacific—Ute Park east to Cimarron, 13.00 miles; Cimarron to Raton, 47.00 miles; Clifton House east to end of track, 17.00 miles; Koehler Junction to Koehler, 3.00 miles; total ..... 80.00
151.00

NEW YORK.

Buffalo & Susquehanna—Between Arcade and Buffalo ..... 40.00
Delaware & Eastern—Union Grove to east branch, 27.52 miles; Andes Junction to Andes, 8.50 miles; total ..... 36.02
New York, Auburn & Lansing—Auburn to Genoa ..... 19.00
95.02

NORTH CAROLINA.

Atlantic & North Carolina (Nor. & So.)—Morehead City to Beaufort ..... 4.00
Raleigh & Southport—Bannlevel to Fayetteville ..... 23.00
South & Western—Spruce Pine to Altapass ..... 5.00
Tennessee & North Carolina—Waterville to Mt. Sterling ..... 2.00
34.00

NORTH DAKOTA.

Dakota & Great Northern (Gt. No.)—Berthold Crosby line, 27.58 miles; Aneta to Devils Lake, 58.62 miles; connection with Midland of Manitoba at Neche, 0.64 mile; Schurmeier cut-off, 4.52 miles; Thorne to Dunseith, 7.61 miles; total ..... 98.97
Minneapolis, St. Paul & Sault Ste. Marie—Drake to Plaza, 97.50 miles; Plaxton to Ambrose, 51.00 miles; total ..... 148.50
247.47

OHIO.

Felicity & Bethel—Felicity to Bethel ..... 9.00
Lorain & Ashland—Wellington to Lorain ..... *22.00
Lorain & West Virginia (W. & L. E.)—Between Lorain and Wellington ..... 15.00
Sugar Creek & Northern (W. & L. E.)—Between Bolivar and Orrville ..... 15.00
61.00

OKLAHOMA TERRITORY.

Kansas City, Mexico & Orient—Custer City to Clinton ..... 13.00
Midland Valley—Foraker to Oklahoma-Kansas state line ..... 23.00
36.00

OREGON.

Astoria & Columbia River—Seaside to Cortwright Park ..... 2.00
Central of Oregon—Union Junction toward Con ..... 6.73
Oregon & Southeastern—Mile post 18 to mile post 20 ..... 2.00
Oregon Railroad & Navigation—Elgin toward Joseph ..... 9.25
Oregon Western (So. Pac.)—Drain toward Marshalfield ..... 20.00
Pacific Railway & Navigation—Hillsboro to mile post 20 ..... 20.00
Southern Pacific—Springfield to Henderson ..... 1.13
61.11

PENNSYLVANIA.

Columbus & Erie (Erie)—Columbus east ..... 2.50
Huntingdon & Broad Top Mountain—Six-Mile Run branch from Riddlesburg to Coaldale ..... 2.00
Ironton—West Coplay to Catasauqua, 2.00 miles; Reliance extension, .50 mile; Ironton extension, .50 mile; total ..... 3.00
Jersey Shore & Antes Fort—Jersey Shore to Nippano ..... 4.50
Monongahela Southern—Bull Run to connection with West side Belt ..... 4.00
New Park & Fawn Grove (Stewartstown)—Between Stewartstown and Fawn Grove ..... 7.00
Pennsylvania—Glen Loch to Thorndale, 10.24 miles; Parkersburg to Shocks Mills, 45.50 miles; South Fork branch at South Fork, 2.00 miles; between Pittsburg and West Brownsville, .23 miles; total ..... 57.97
Pittsburg & Cross Creek (W. P. T.)—Avella up north fork of Coal Creek ..... 3.00
Pittsburg, Summerville & Clarion—Expansion of Brush Run branch ..... 1.00
St. Mary's & Western—St. Mary's to Front Run ..... 10.00
Susquehanna & Eagles Mere—Masten to Hillsgrove ..... 10.00
Thompson's Run branch (W. P. T.)—From West Side Belt at Longview to Monongahela Southern at Millin ..... 3.50
Western Allegheny (B. & L. E.)—Grant City to East Newcastle ..... 8.50
West Side Belt—Extension from Clairton ..... .75
117.72

SOUTH CAROLINA.

Chesterfield & Lancaster—Ruby to Pageland ..... 15.00
Eddy Lake & Northern—Eddy Lake to Brown Swamp ..... 15.00
Seaboard Air Line—From Catawba Valley Railway to Harmony Junction ..... 11.00
41.00

SOUTH DAKOTA.

Chicago, Milwaukee & St. Paul—Saranac to Renner, 21.74 miles; Glenham to a point west of the Missouri River, 39.00 miles; total ..... 60.74
Minnesota, Dakota & Pacific (Minn. & St. L.)—Watertown to Leola, 114.29 miles; Conde to Northville, 23.60 miles; total ..... 137.89
Missouri River & Northwestern—Between Rapid City and Mystic ..... 15.00
Pierre, Rapid City & North Western (C. & N.W.)—Fort Pierre west to Midland, 49.00 miles; Rapid City east to Wasta, 43.32 miles; extension west from Bonesteel, 11.76 miles; total ..... 104.08
South Dakota Central—Wentworth north to Rutland ..... 6.20
White River Valley (C. M. & St. P.)—Presho to Stamford ..... 64.32
388.23

TENNESSEE.

Lonisville & Nashville—Maryville spur, Armona to Maryville, 3.90 miles; Crooked Fork spur, Ellsyth to Roosevelt, 1.60 miles; total ..... 5.50

*Change in location of old main line.

*Louisville & Nashville—Between Greenbrier and Tennessee-Kentucky state line ..... 16.00
Overton County—Algood to Livingston ..... 19.00
Tennessee—Buffalo Creek to Smoky Creek ..... 14.00
Illinois Central—Woodstock to Leewood ..... 7.50
Jackson Southeastern (Ill. Cent.)—Near Jackson ..... 3.00
65.00

TEXAS.

Abilene & Northern—Abilene to Stamford ..... 38.81
Acme, Red River & Northern—Not specified ..... 1.00
Beaumont & Great Northern—Trinity to Onalaska ..... 19.50
Beaumont & Saratoga Transportation—Black Creek to 2 miles beyond Sour Lake Junction ..... 8.00
Beaumont, Sour Lake & Western—Sour Lake to Trinity River ..... 25.00
Burrs Ferry, Browndel & Chester—Rockland to Aldridge ..... 7.70
Galveston, Harrisburg & San Antonio—Cuero to Stockdale ..... 46.00
Houston & Texas Central—Nelleva to Mexia Junction ..... 94.06
North & South Texas—Groveton northwest ..... 3.00
Peach River & Gulf—Midline east ..... 10.00
Pecos & Northern Texas (A., T. & S. F.)—Canyon City to Plainview 56.60
*Southern Kansas of Texas (A., T. & S. F.)—Glazier to Canadian.. 10.00
Texas & Gulf (A., T. & S. F.)—Boren spur ..... 15.00
Texas Central—Stamford to terminus in Fisher County ..... 42.00
Texas City Termiual—Texas City Jupnction to connection with G., C. & S. F. ..... 1.30
Texas Southeastern—Neches River to Blix ..... 8.00
Wichita Valley (Colo. & So.)—Seymour to Stamford ..... 60.70
Trinity & Brazos Valley (Colo. & So.)—Mexia to Belt Junction near Houston, 157.00 miles; Teague, towards Waxahatchie, 32.00 miles; total ..... 189.00
631.67

UTAH.

Oregon Short Line—Hot Springs to Union smelter, 1.20 miles; connection at Salt Lake City with S. P. L. A. & S. L., 1.02 miles; Wellsville branch, Wellsville to Mendon, 5.40 miles; Ogden cut-off, Ogden to Roy, 4.00 miles; total ..... 11.62
Fayette Valley—Fayette to Plymouth ..... 13.00
Rio Grande Western (D. & R. G.)—Revere to Bingham ..... 10.00
Salt Lake & Ogden—Kaysville to Davis-Weber County line, 10.00 miles; in Ogden, 2.00 miles; total ..... 12.00
*San Pedro, Los Angeles & Salt Lake—Near Trent ..... 4.90
Western Pacific—Salt Lake City west to point on Great Salt Lake Desert ..... 102.00
153.52

VIRGINIA.

Blackstone & Lunenburg (N. & W.)—Blackstone to Dillard ..... 5.52
Indian Creek & Pound River—Extension up north fork Pound river 5.00
New River, Holston & Western—Penvir to Boxley ..... 4.00
Norfolk & Western—Speedwell extension between Cripple Creek and Speedwell, 5.28 miles; extension of Big Creek branch between Richlands and coal mines in Tazewell County, 1.18 miles; extension of Coal Creek branch in Tazewell County, .29 mile; total. 6.75
Tidewater—Sewells Point to mile post 100 ..... 100.00
121.27

WASHINGTON.

Northern Pacific—Toppenish, through Sunnyside ..... 17.39
Oregon, Washington & Idaho (O. R. & N.)—Riparia towards Lewiston, Idaho ..... 34.36
Spokane International—Idaho Washington state line to Spokane... 19.00
Tacoma Eastern—Watkins east, 5.60 miles; East Creek Junction to Ladd, 1.90 miles; total ..... 7.50
Washington & Great Northern (Gt. Nor.)—Between International boundary near Molson, B. C., to boundary north of Oroville, Wash. ..... 24.81
103.06

WEST VIRGINIA.

Buffalo Creek & Gauley—Clay east ..... 3.00
Chesapeake & Ohio—Leewood to Lawson, 17.70 miles; Dingess run to Ethel, 3.40 miles; total ..... 21.10
Deepwater—Jenny Gap to Micajah ..... 26.00
Laeger & Southern (N. & W.)—Ritter to mouth of Canebrake Creek.. 24.53
Norfolk & Western—Extension of Clear Fork branch above Coalwood to mines, 1.27 miles; extension of Sand Lick branch, 0.69 mile; extension of Lick Fork branch, 2.79 miles; total, ..... 4.15
78.78

WISCONSIN.

Chicago & North Western—Between Manitowoc and Green Bay, 18.07 miles; Pulaski to Eland Junction, 48.78 miles; between Duck Creek and Gillett, 28.66 miles; total ..... 95.51
Chicago, Milwaukee & St. Paul—McGinnis spur to Klauke's spur.. 6.53
Chippewa Valley & Northern—Not specified ..... 5.00
Fairchild & Northeastern—Bright to Owen ..... 5.00
Wisconsin & Northern—Shawano to Norway Dam, 23.00 miles; Crandon to conection with Minneapolis, St. Paul & Sault Ste. Marie, 7.00 miles; total ..... 30.00
141.84

WYOMING.

Chicago, Burlington & Quincy—Frannie south to Worland ..... 91.00
Union Pacific—Thayer to Superior ..... 9.06
Wyoming & North-Western (C. & N. W.)—Natrona to Lander ..... 106.89
206.95

CANADA.

Brandon, Saskatchewan & Hudson's Bay (Gt. Nor.)—From International boundary to Brandon, Man. ..... 69.45
Canadian Northern—Ridgeville section, from South Junction, Man., west to Emerson Junction, 23 miles; Thunderhill branch, from Thunderhill Junction, Man., west to a point 1.3 miles beyond Benito, 20.1 miles; Melford, Sask., to Prince Albert, 62.40 miles; extension towards Hudson Bay, and lines not specified, 77.50 miles; total ..... 183.00
Canadian Northern Ontario (Can. Nor.)—Toronto to Parry Sound.. 119.00
Canadian Pacific—Highlands to Canada Sugar Refinery, Montreal, 6.00 miles; West Selkirk branch, Winnipeg Beach to Gimli, 9.40 miles; Teuton to Komarno, 8.00 miles; Wolseley-Reston branch, mile post 60 to mile post 122, 62.00 miles; Strassburg north, mile post 202 to mile post 219, 17.00 miles; Pleasant Hills branch, west, mile post 345 to mile post 360, 15.00 miles; Moose Jaw north, 17.00 miles; Beach-Kivin branch, east mile post 50, to mile post 96, 46.00 miles; Nipissing Junction to Temaganei Company's mills, 3.00 miles; Staynerville to Brunets Quarry, 4.00 miles; Guelph to Milverton, 28.50 miles; Bolton Junction to Craighurst, 51.50 miles; total ..... 267.00
Central Ontario—Bancroft, Ont., to one mile north of Bird's Creek 4.00
Halifax & Southwestern—Liverpool, N. S., to Barrington Passage, 84.00 miles; Middletown to Victoria Beach, 40.00 miles; total 124.00
Intercolonial—North Sydney, N. S., to North Sydney Mines ..... 2.50
Klondike Mines—Grand Forks, B. C., to Sulphur Springs ..... 19.00
Midland of Manitoba (Gt. Nor.)—From International boundary to Portage la Prairie, Man. ..... 77.01

*Change in location of old main line.

Morrissey, Fernie and Michel—Extension to yards ..... 0.75
Orford Mountain—Potton Springs, Que., to Mansonville ..... 7.00
Quebec Central—Beauceville, Que., to St. George ..... 9.00
St. Maurice Valley—Three Rivers, Que., to Shawinigan Falls ..... 29.85
Temiskaming & Northern Ontario—Boston, Ont., to McDougall's Chute 45.00
Vancouver, Victoria & Eastern (Gt. Nor.)—From Midway, B. C., to International boundary (near Molson, B. C.) ..... 28.80
1,067.05

MEXICO

Canauea Consolidated Copper Company's Railway—Temosachic, State of Chihuahua, to San Pedro ..... 32.00
Cananea, Yaqui River & Pacific—From a point 15 miles east of Empalme, State of Sonora, on the Sonora River, to Buena Vista, on the Yaqui River, 61.00 miles; branch from Corral towards Alamos, 15.00 miles; not specified, 8.00 miles; total ..... 84.00
Inter-California (So. Pac.)—Calexico towards Yuma, Ariz ..... 15.00
Kansas City, Mexico & Orient—Pichachic, state of Chihuahua, east 5.00 miles; Ataros to Aguatos, 28.00 miles; total ..... 33.00
Linares & Gulf—Between Linares, State of Nueva Leon, and San Jose 32.00
Mexican Central—Saltillo, State of Coahuila, to Paredon ..... 40.00
Panuco Mountain & Monclova—Monclova, State of Coahuila, to Panuco ..... 45.50
Zitacuaro & Jocomusco—Zitacuaro, State of Michoacan, to Galeras.. 15.00
296.50

## Municipal Partnership Between Chicago and Its Street Railroads.

The Mayor of Chicago announces that the long pending negotiations between the city and the two big street railroad companies, the Chicago City and the Chicago Union Traction, have been settled, by a contract which will shortly be formally ratified, and by which the city is to receive a share of the profits of the operation of the lines. The total value of the existing properties of the companies has been agreed upon at about $50,000,000, and after paying 70 per cent. of the income for operating expenses and 5 per cent. on this 50 millions, the remainder is to be divided between the city and the companies, the city to receive 55 per cent. and the companies 45 per cent. The contract provides for the immediate expenditure of large sums for the improvement of the roads, including the substitution of electric traction for cables where cables are still in use. The newspapers estimate that the net profits during the coming year, to be divided between the city and the railroads, will be $2,300,000. This is based on the following figures:

| | |
|---|---|
| Income of companies | $16,000,000 |
| Seventy per cent. for operating expenses and taxes. | 11,200,000 |
| Thirty per cent. fixed charges and profits | 4,800,000 |
| Fixed charges—Five per cent. on $50,000,000 | 2,500,000 |
| Remainder: Net profit for city and companies. | 2,300,000 |
| City's share | 1,265,000 |
| Companies' shares | 1,035,000 |

Mayor Dunne still hopes to see his municipal ownership scheme succeed, but evidently the question of raising the funds for that purpose is one that cannot be settled at present. The city still retains the right under the franchises to take over the companies' property at any time on six months' notice. The agreed valuations are more than 25 per cent. below those which had been fixed by the companies before the negotiations began. The city agrees to an increase in fixed charges when money shall be expended for improvements, and also to allow 5 per cent. brokerage to be paid for raising the money for the improvements. It is said that the needed improvements will cost not far from $40,000,000, and to this cost is to be added 10 per cent. for contractor's profit. Within a year the facilities of the companies are to be increased until the seating capacity of the cars aggregates twice that at the present time. If after twenty years the city does not acquire ownership of the lines it may grant the right to operate to any other company that shall purchase on the same terms as the city. A complete rehabilitation of its property is to be carried out within three years by each company. At least sixty miles of electric track will be rebuilt; new power houses will be built; car barns reconstructed; and the number of double-track up-to-date cars is to be increased as rapidly as possible until the seating capacity is double what it is now.

All of the work of rehabilitation is to be carried out under the supervision of a board of three engineers, which will report the expenditures of the companies to the City Controller monthly. One engineer will be appointed by the city, another by the company, and the third by agreement. In case of disagreement the Appellate Court is to nominate the third engineer.

The two companies are to contribute not to exceed $5,000,000 toward the cost of building a subway for street cars and other traffic in the central business section of the city.

Twenty-one through routes, permitting a passenger to travel from one extreme part of the city to another on the same car for one fare, are to be established. Routes may be changed and new ones established by the City Council, the warrant therefor to be judged by the Board of Engineers.

Universal transfers are to be exchanged and honored by the two companies at all places where their lines cross or connect, except in the congested district.

The motive power is to be electricity throughout, and the Council may after three years require the companies to operate any line by the underground trolley.

Each company is to pave, clean and sprinkle the part of the street it occupies, and may be required for compensation to clean the whole street and run garbage cars.

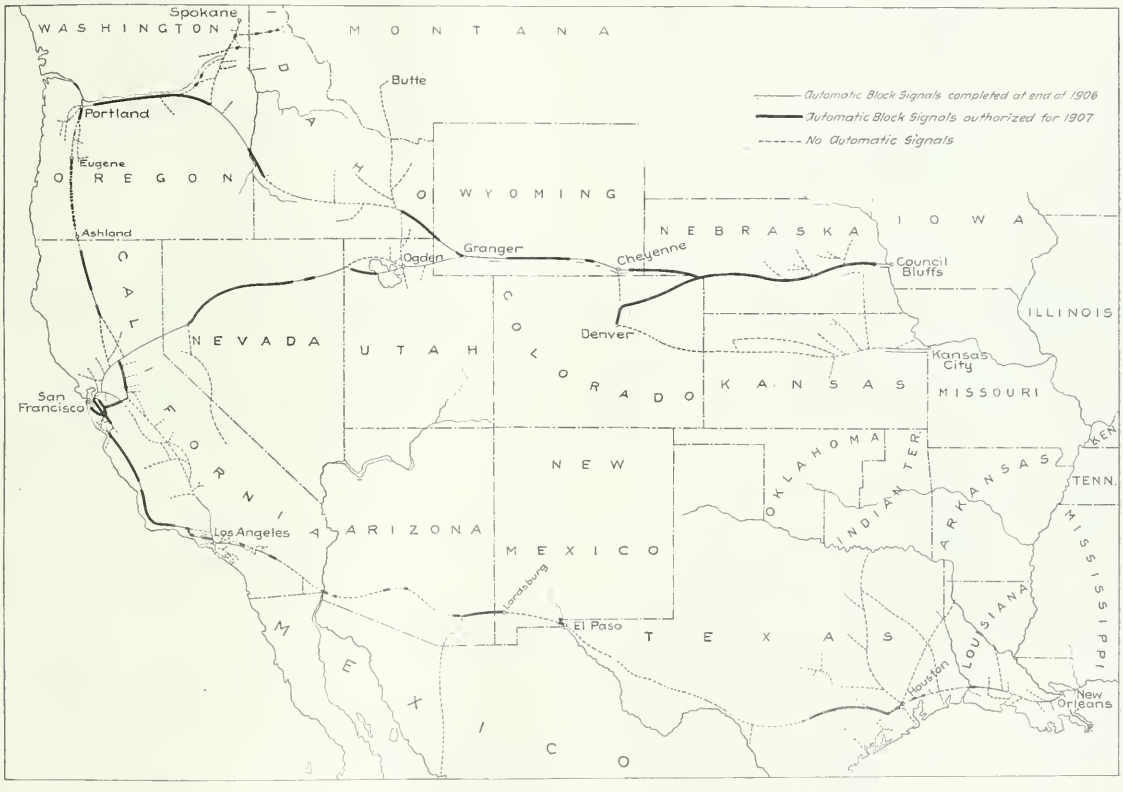
Only single cars are to be operated [no trailers].

### Report on Grantham Derailment.

The British Board of Trade has issued its report on the derailment at Grantham on the night of September 19 last (*Railroad Gazette*, September 28), when the engineman, the fireman, a mail clerk and nine passengers were killed, and four employees and 15 passengers were injured, two of the passengers fatally; but the cause remains undiscovered. The report is by Lieutenant Colonel Von Donop. About the only features which he brings out beyond what was already known are (1) that the front and rear guards did not promptly discover that the train was approaching Grantham, where it was booked to stop, at a dangerous rate of speed and that, therefore, neither of these men was equal to his responsibilities; (2) that the engineman had been off duty, sick, on several occasions, under circumstances giving rise to a suspicion that he may have fallen sick at his post on the night of the disaster. The engineman having been off duty four weeks without the company knowing what was the matter with him, and without a medical examination when he returned to work, the company's methods are held to "call for revision." These are the only prominent criticisms in the report, were to Grantham station; but the inquiries in this direction, including those concerning the possible sickness of the engineman, all end in mystery. The train was running about 50 miles an hour when it went off the track at the crossover, and it broke through a 4-ft. 9-in. parapet of a bridge (over which it was crossing). This parapet was 2 ft. thick for 21 in. up from the roadbed, 18 in. thick for 27 in., and then was surmounted by a coping stone 9 in. high and 18. in. wide.

### Union and Southern Pacific Signal Scheme for 1907.

Mr. Kruttschnitt, Director of Maintenance and Operation of the Union Pacific, the Southern Pacific and their controlled lines, who has already taken everybody's breath away by his bold expenditures for automatic block signals, has laid out a scheme for the coming year which puts in the shade even his own remarkable record. The number of miles of line on which the block signal equipment is now completed is almost 2,000, but by the end of another year it is to be made almost 5,000, nearly all single track. The length of the road on which block signals are authorized to be installed during 1907 is




Automatic Block Signals, Built and to be Built—Union and Southern Pacific.

though the fact that the wrecked cars, after falling down a bank, quickly took fire, is made the occasion to again declare that gas is not a suitable illuminant for railway vehicles. The train consisted of an engine and 12 cars. This engine had taken the train at Peterboro at 10:20 p. m., only 40 minutes before the wreck. It was a comparatively new engine, was in good order and had been run by this engineman a considerable time, and he had considered it a satisfactory engine. There is no doubt that the automatic vacuum brake was properly connected. This engineman had run this train before and had made the station stop at Grantham in proper fashion. There was a persistent story that the engineman had been intemperate, and the fireman, who had fired with him but a few times before, had said to a friend that he was nervous about running with him. But there is good evidence that the runner was sober on that night, and that he had not been addicted to over drinking; so the inspector concludes that this accident was not in any connected with any such cause. In short, the inspector concludes that both the engineman and the fireman were in every way competent to perform their duties. He finds it improbable that they forgot to stop at Grantham. It looks as though they did not realize how close they

2,846 miles, all, we believe, to be automatic semaphore signals. (These companies have very little non-automatic block signaling.) We print herewith a map of the company's lines, on which are shown the sections of road now equipped with automatic block signals, and the sections to be equipped during the coming year. On the line between Ashland, Oregon, and Eugene, a large number of automatic signals are to be erected at curves or stations, leaving the intervening portions of the line to be equipped afterward. This is shown indistinctly on the map.

It will be seen that in another year block signal protection will be provided from Council Bluffs, Iowa, westward through Nebraska, Colorado, Wyoming, Utah, Nevada and California to Oakland, and southward from Oakland and San Francisco to Los Angeles; and then eastward to Pomona Junction. The main line of the Oregon Short Line from Granger, Wyo., northwestward, with its connection, the Oregon Railroad & Navigation Company, will be about two thirds signaled. The other principal sections to be equipped are those from Redding, Cal., northward; from Julesburg to Denver; from Houston, Tex., to Hilda, near San Antonio; and from Lordsburg, N. M., westward to Tucson, Ariz. Following are the total miles

signaled and to be signaled on the different railroads in the system:

*Miles of Automatic Signals.*

| Railroads. | Completed in 1906. | Authorized for 1907. |
|---|---|---|
| Union Pacific | 372.07* | 798.0 |
| Oregon Short Line | 486.90 | 249.0 |
| Oregon R. R. & Navigation Co. | 186.10 | 224.2 |
| Southern Pacific: Pacific system | 691.43† | 1,292.4 |
| Southern Pacific: Atlantic system | 209.75 | 282.0 |
| Total | 1,946.25 | 2,845.6 |

*Includes 212.06 miles double track.
†Includes 97 miles electric train staff.

## Important Changes in Railroad Officers in 1906.

The following list of official changes during the past year is not intended to be complete, but to show the more important executive appointments. A similar list was published in the *Railroad Gazette* of December 29, 1905.

*Atchison, Topeka & Santa Fe.*

May—Victor Morawetz, Chairman of the Executive Committee and General Counsel, resigned as General Counsel.

—W. D. Hines, formerly Vice-President and General Counsel of the Louisville & Nashville, appointed General Counsel.

August—James Dun, Chief Engineer of the Atchison, Topeka & Santa Fe System, appointed Consulting Engineer of System.

—W. B. Storey, Chief Engineer of the Atchison, Topeka & Santa Fe Railroad, appointed Chief Engineer of the Atchison, Topeka & Santa Fe System.

—H. C. Phillips, Chief Engineer of the San Francisco & North-Western, appointed Chief Engineer of A., T. & S. F. Coast Lines.

*Atlantic Coast Line.*

January—H. M. Emerson, Traffic Manager, appointed General Traffic Manager.

September—Alexander Hamilton appointed General Counsel.

*Bangor & Aroostook.*

December—Percy R. Todd, formerly First Vice-President of the N. Y., N. H. & H., elected Vice-President of the Bangor & Aroostook, effective January 1, 1907.

*Boston & Maine.*

September—D. W. Sanborn, General Superintendent, retired.

—C. E. Lee, Assistant General Manager, appointed General Superintendent.

*Buffalo, Rochester & Pittsburg.*

June—W. T. Noonan, General Superintendent, appointed General Manager.

*Canadian Pacific.*

February—W. F. Tye, Chief Engineer, resigned.

*Central of Georgia.*

March—J. T. Johnson, General Superintendent of Transportation, appointed General Superintendent.

June—H. M. Steele, Chief Engineer, resigned.

—C. K. Lawrence, Engineer of Construction, appointed Chief Engineer.

December—W. E. Chester, General Master Mechanic, resigned and office abolished.

—F. F. Gaines, Mechanical Engineer of the Philadelphia & Reading, appointed Superintendent of Motive Power of the Central of Georgia.

*Chicago & Alton.*

January—G. H. Kimball, Chief Engineer, resigned.

—W. D. Taylor appointed Chief Engineer.

October—B. F. Yoakum elected Chairman of the Executive Committee.

—Robert Mather appointed General Counsel.

*Chicago & Eastern Illinois.*

November—H. I. Miller, General Manager, elected President.

—W. J. Jackson, General Superintendent, appointed General Manager.

*Chicago & North-Western.*

January—W. A. Gardner, General Manager, elected Vice-President in charge of operation and maintenance.

—R. H. Aishton, Assistant General Manager of the lines east of Missouri river, appointed General Manager.

July—R. H. Aishton, General Manager, appointed General Manager of the lines east of the Missouri river.

—G. F. Bidwell, Manager of the Nebraska & Wyoming division, appointed General Manager of the lines west of Missouri river.

December—Frank Walters, Assistant General Manager of the lines west of the Missouri river, appointed General Manager of the lines west of the Missouri river, succeeding G. F. Bidwell, resigned.

*Chicago, Cincinnati & Louisville.*

May—H. C. Starr, General Counsel, elected also Vice-President and a Director, succeeding H. A. Christy.

*Chicago Great Western.*

July—W. H. Chadbourn appointed Chief Engineer, succeeding A. Munster, resigned.

*Chicago, Indianapolis & Louisville.*

January—B. A. Taylor, Assistant to the President, appointed General Manager.

*Cincinnati, Hamilton & Dayton.*

March—A. C. Hinckley, General Master Mechanic, appointed Superintendent of Motive Power.

*Cincinnati, New Orleans & Texas Pacific.*

November—Horace Baker, General Superintendent of the Southern district of the Missouri Pacific, appointed General Manager of the C., N. O. & T. P., succeeding W. A. Garrett, resigned to go to the Seaboard Air Line.

*Cleveland, Cincinnati, Chicago & St. Louis.*

April—W. M. Duane, Superintendent of Construction, appointed Chief Engineer, succeeding G. W. Kittredge, transferred to the New York Central & Hudson River.

June—See New York Central Lines.

October—J. Q. Van Winkle, Assistant General Manager, appointed General Manager.

*Colorado & Southern.*

February—J. M. Herbert, First Vice-President, resigned.

*Detroit, Toledo & Ironton.*

September—R. K. Smith, General Manager, resigned.

October—G. K. Lowell, General Superintendent of the Chicago, Indianapolis & Louisville, appointed General Manager of the D., T. & I.

*El Paso & Southwestern.*

August—T. Shumacker appointed Traffic Manager.

*Great Northern of Canada.*

February—F. Nicholls elected First Vice-President, succeeding James McNaught.

*Gulf, Colorado & Santa Fe.*

July—F. G. Pettibone, General Superintendent, elected Second Vice-President and General Manager, succeeding W. C. Nixon, resigned to go to the St. Louis & San Francisco.

*Illinois Central.*

November—J. T. Harahan, Second Vice-President, elected President, succeeding Stuyvesant Fish.

—J. F. Titus, Local Treasurer at Chicago, appointed Assistant to the President in charge of the accounting and treasury departments, succeeding to the duties of J. C. Welling, Vice-President, deceased.

*International & Great Northern.*

June—F. Hufsmith, Superintendent of Motive Power and Rolling Stock, resigned.

—G. S. Hunter, General Foreman, appointed Master Mechanic, succeeding to the duties of Supt. of M. P. and R. S.

*Interstate Commerce Commission.*

July—Nomination of F. K. Lane, of California, succeeding J. W. Fifer, confirmed by the Senate.

—E. E. Clark, Grand Chief of the Order of Railway Conductors, nominated as Commissioner, according to provision of the Hepburn law for two additional Commissioners.

August—J. C. Harlan nominated as Commissioner, making the Board complete.

*Kansas City Southern.*

June—Hermann Sielcken, Chairman of the Executive Committee, elected Chairman of the Board.

—L. F. Loree, formerly President of the Rock Island Company, elected Chairman of the Executive Committee and a Director.

December—E. F. Cost, Second Vice-President and Traffic Manager of the Seaboard Air Line, elected Vice-President of the Kansas City Southern in charge of traffic.

*Lake Shore & Michigan Southern.*

February—W. H. Marshall, General Manager, resigned to become President of the American Locomotive Company.

—E. A. Handy, Assistant General Manager, appointed General Manager.

June—H. F. Ball, Superintendent of Motive Power, resigned to go to the American Locomotive Company.

July—LeGrand Parrish, Assistant Superintendent of Motive Power, appointed Supt. of M. P.

*Lehigh Valley.*

March—J. A. Middleton, First Vice-President, put in charge of the operating department.

—T. N. Jarvis, Freight Traffic Manager, elected Second Vice-President in charge of traffic.

June—A. E. Mitchell, Superintendent of Motive Power, resigned.

—F. N. Hibbits, Mechanical Engineer of the N. Y., N. H. & H., appointed Supt. of M. P. of the Lehigh Valley.

*Long Island.*

June—G. C. Bishop appointed Superintendent of Motive Power and Equipment, succeeding Phillip Wallis.

—D. C. Green, Assistant Secretary, elected Vice-President.

*Mexican Central.*

November—A. A. Robinson, President, resigned.

—Eben Richards, Vice-President and General Counsel, elected Acting President.

*Missouri, Kansas & Texas.*

June—A. H. Joline, Counsel, elected Chairman of the Board, succeeding H. C. Rouse, deceased.

November—A. H. Joline elected President, succeeding F. N. Finney, resigned.

*Nashville, Chattanooga & St. Louis.*

February—E. C. Lewis elected Acting President, succeeding J. W. Thomas, deceased.

March—John W. Thomas elected President and General Manager.

—H. F. Smith elected Vice-President and General Traffic Manager.

—E. C. Lewis elected Chairman of the Board.

*National of Mexico.*

January—W. B. Ryan, Traffic Manager, resigned.

April—J. M. Reid, Chief Engineer of Construction, appointed Chief Engineer, succeeding R. T. Macdonald, resigned.

July—James Farrel, Acting Superintendent of Motive Power and Machinery, appointed Supt. of M. P. and Machinery.

October—M. J. Schneider appointed Superintendent of Motive Power and Machinery.

*New York Central & Hudson River.*

April—G. W. Kittredge, Chief Engineer of the C., C., C. & St. L., appointed Chief Engineer of the N. Y. C. & H. R.

December—Nathan Guilford, Vice-President in charge of traffic, resigned.

*New York Central Lines.*

May—W. C. Brown, Vice-President in charge of operation, elected Senior Vice-President.

June—A. H. Smith, General Manager of the N. Y. C. & H. R., elected also Vice-President in charge of operation and maintenance of all lines east of Buffalo except the Rutland R. R.

—C. E. Schaff, General Manager of the C., C., C. & St. L., elected Vice-President in charge of operation and maintenance of the lines west of Buffalo.

December—G. J. Grammer, Vice-President in charge of the lines west of Buffalo, elected Vice-President in charge of freight traffic on all New York Central Lines, with office at Chicago, Ill.

—C. F. Daly, Passenger Traffic Manager of the N. Y. C. & H. R., elected Vice-President in charge of passenger traffic on all New York Central Lines, with office at New York.

—Ira A. Place, General Counsel of the N. Y. C. & H. R., elected Vice-President in charge of the Legal Department of the lines east of Buffalo.

—A. H. Harris, General Attorney of the N. Y. C. & H. R., elected Vice-President in charge of the Legal Department of the lines west of Buffalo.

*New York, Chicago & St. Louis.*

January—E. E. Hart, Engineer, appointed Chief Engineer.

—A. W. Johnston, General Superintendent, appointed General Manager.

*New York, New Haven & Hartford.*

June—F. T. Hyndman, General Master Mechanic, appointed Mechanical Superintendent, succeeding F. N. Hibbits, resigned to go to the Lehigh Valley.

November—T. E. Byrnes, Assistant to the President, elected First Vice-President, succeeding Percy R. Todd, resigned. See Bangor & Aroostook.

*Norfolk & Southern.*

February—R. E. L. Bunch, Traffic Manager of the Atlantic & North Carolina, appointed Traffic Manager of the Norfolk & Southern.

November—M. J. Perry, President, elected Chairman of the Board.

—F. S. Gannon, Vice-President, elected President.

*Northern Pacific.*

October—David Van Alstyne, Mechanical Superintendent, resigned to go to the American Locomotive Company.

—W. Moir, General Master Mechanic at Tacoma, Wash., appointed Mechanical Superintendent.

*Pennsylvania.*

March—W. H. Brown, Chief Engineer, retired.

—A. C. Shand, Assistant Chief Engineer, appointed Chief Engineer.

*Pere Marquette.*

January—A. Patriarche, Freight Traffic Manager, appointed General Traffic Manager.

February—J. F. Deimling appointed Chief Engineer, succeeding F. H. Alfred.

June—E. K. Woodward appointed Chief Engineer, succeeding J. F. Deimling, resigned.

*Pittsburg & Lake Erie.*

January—Authority of New York Central & Hudson River heads of departments extended over Pittsburg & Lake Erie.

—J. B. Yohe, General Superintendent, appointed General Manager.

*Rock Island Company.*

February—B. F. Yoakum elected Chairman of the Board, succeeding W. B. Leeds, resigned.

November—G. T. Boggs, Assistant Treasurer, elected Vice-President, Secretary and Treasurer.

*St. Louis & San Francisco.*

January—Authority of W. B. Biddle, Third Vice-President in charge of traffic of the C., R. I. & P., extended over the St. L. & S. F.

July—W. C. Nixon, Second Vice-President and General Manager of the Gulf, Colorado & Santa Fe, elected General Manager of the St. L. & S. F.

November—W. C. Nixon, General Manager, elected also Vice-President.

*San Antonio & Aransas Pass.*

February—W. H. McIntyre elected President, succeeding C. R. Hudson.

—W. M. Hobbs, formerly Assistant to the Second Vice-President of the C., R. I. & P., elected First Vice-President and General Manager of the S. A. & A. P.

—M. D. Monserrate, Vice-President and General Manager, elected Second Vice-President.

*San Pedro, Los Angeles & Salt Lake.*

December—F. W. Wann, formerly Vice-President of the C., H. & D., appointed General Traffic Manager of the S. P., L. A. & S. L.

*Seaboard Air Line.*

April—Alfred Walter, Chairman of the Board of the South & Western, elected President of the S. A. L., succeeding J. M. Barr, resigned.

November—W. A. Garrett, General Manager of the C., N. O. & T. P., elected First Vice-President of the S. A. L.

December—Alfred Walter, President, elected Chairman of the Executive Committee.

—E. F. Cost, Second Vice-President and Traffic Manager, resigned to go to the Kansas City Southern.

—L. Sevier, General Freight Agent of the Alabama Great Southern, elected Second Vice-President and Traffic Manager of the S. A. L.

*Southern.*

November—H. B. Spencer, General Manager, elected Sixth Vice-President.

—C. H. Ackert, Fourth Vice-President, appointed also General Manager.

December—W. W. Finley, Second Vice-President, elected President, succeeding Samuel Spencer, deceased.

—John M. Culp, Third Vice-President, elected Second Vice-President.

—C. H. Ackert, Fourth Vice-President, elected Third Vice-President.

—T. C. Powell, Fifth Vice-President, elected Fourth Vice-President.

—H. B. Spencer, Sixth Vice-President, elected Fifth Vice-President.

—Fairfax Harrison, Assistant to the President, elected Vice-President.

*Wisconsin Central.*

October—G. M. Cummings elected Chairman of the Board, succeeding W. L. Bull, resigned.

—W. A. Bradford, Jr., President of the C., C. & L., elected also President of the Wisconsin Central, succeeding W. A. Whitcomb.

—Howard Morris, Vice-President and General Counsel, resigned.

December—H. C. Starr, Vice-President and General Counsel of the C., C. & L., elected to the same position on the Wisconsin Central.

### Rotary Snow Plows on the Denver, Northwestern & Pacific.

The rotary snow plow is a feature of equipment to which faith is pinned by every superintendent of a Rocky Mountain division, but it is doubtful if any other steam road in the West must of necessity rely so heavily upon this class of mechanical snow fighters as the Denver, Northwestern & Pacific, which has in its rolling stock the largest rotary in the world. The Moffat line climbs the Continental Divide just west of Denver and as may readily be imagined the operation of a railroad at an altitude of more than 11,000 ft. above sea level is, during the interval from October 15 to April 15, an undertaking of no mean proportions.

The investment of the Moffat road for rotary plows has been a heavy one, but the operating officials feel that such expenditure is justified if it save more than a proportionate outlay for snow sheds at a cost of $60 per ft. to say nothing of a considerable annual appropriation for repairs. The rotary which ranks as the largest in the world has a wheel or snow screw more than 12 ft. in diameter, equipped in the usual manner with knives for cutting the snow and ice and cone-shaped steel scoops for catching up the loosened material and carrying it around to the funnel through which it is expelled in an oblique direction. The wheel proper is enclosed in a metal hood.

Despite the exceptional size of this rotary, two locomotives provide sufficient power for its propulsion, in contrast to the old-time conditions in the Rockies when as many as seven locomotives were frequently required to force one of the old-fashioned "gougers" through the heavy drifts. The rotary is occasionally operated through barriers of light snow at a speed of twelve miles or more per hour, but when densely packed snow is encountered—mayhap encrusted with ice and with ice formation four or five inches thick scattered through it the speed is reduced to from three to six miles per hour. The wheel is operated, ordinarily, at a rate of from 150 to 250 revolutions per minute. One of the greatest benefits resultant from the introduction of rotary plows in the Rockies has been found in the reduction in the number of casualties among railroad men engaged in fighting the snow.

Rotary Snow Plow, Denver, Northwestern & Pacific.

Side View, Largest Rotary Snow Plow Ever Built.

### Train Accidents in the United States in November.[1]

rc, 1st, 10 p.m., New York Central & Hudson River, Melrose, N. Y., a southbound express train moving slowly was run into at the rear by a following local passenger train, damaging the rear car of the express. Two passengers and one employee were slightly injured. Both trains were those of the New York, New Haven & Hartford which uses the New York Central tracks at this point. The local train had run at excessive speed past an automatic signal set against it.

†bc, 1st, Chicago, Milwaukee & St. Paul, Quinnesec Junction, Mich., butting collision during a dense fog between a train carrying workmen to a mine and a freight train. Of the 40 miners in the passenger train three were killed and ten were injured, and one trainman was killed.

xc, 1st, 2 a.m., St. Louis, Iron Mountain & Southern, Argenta, Ark., collision between passenger train No. 202 and a switching engine; one fireman killed, one engineman fatally injured.

unx, 1st, Illinois Central, Covington, Tenn., a work train was derailed and wrecked; one employee killed, two injured.

3d, 8 p.m., Chicago, Rock Island & Pacific, Ellsworth, Minn., passenger train No. 607 was derailed and two passenger cars were overturned and wrecked. The whole train was badly damaged. Sixteen passengers were injured. The reports indicate that the derailment was due to a loose or spread rail, caused perhaps by the softening of the roadbed by floods.

unx, 4th, New York Central & Hudson River, Rome, N. Y., a freight train was derailed at a frog and ran into a building near the track. The engineman and one brakeman were killed.

5th, 2 a.m., New York, Chicago & St. Louis, Fort Wayne, Ind., collision between passenger train No. 6 and an empty engine, the switching engine being on the main track in a dense fog without right. One employee was killed.

xc, 5th, 11 p.m., St. Louis & San Francisco, Monett, Mo., passenger train No. 12 collided with a switching engine, which was on a side track, but did not quite clear the main line, and the passenger engine was overturned. One engineman was killed.

unx, 5th, Southern Railway, Wolf Creek, N. C., a freight train was derailed and ten cars were wrecked; two trainmen were killed and one trainman and a tramp were injured.

xc, 6th, Detroit & Mackinaw, South Branch, Mich., a train consisting of an engine and a caboose collided with a freight car which had been left standing on the main track unattended; one man killed and another fatally injured.

xc, 6th, Baltimore & Ohio, Salt Springs, Ohio, passenger train No. 7 collided with a wrecking train; one engineman killed, two passengers and four trainmen injured.

rc, 7th, Cincinnati Northern, Rossville, Ohio, a wrecking train running at high speed ran into the rear of a preceding freight which had been stalled on a steep grade. One trainman was killed, four others injured.

xc, 7th, Pennsylvania road, West Morrisville, Pa., collision of freight trains; one engine overturned, engineman killed.

unf, 8th, Little Rock & Monroe, Haile, La., a mixed train was derailed by running over a cow, and the engine was overturned. The engineman and fireman were killed.

bc, 9th, Pennsylvania road, Liberty, Pa., butting collision of freight trains, wrecking the engines and knocking down a bridge on which they were at the moment of the collision. Thirty cars

[1] Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

| | |
|---|---|
| rc | Rear collisions. |
| bc | Butting collisions. |
| xc | Miscellaneous collisions. |
| dr | Derailments; defects of roadway. |
| eq | Derailments; defects of equipment. |
| do | Derailments; negligence in operating. |
| unf | Derailments; unforeseen obstruction. |
| unx | Derailments; unexplained. |
| o | Miscellaneous accidents. |

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

fell, with one span of the bridge, to t tom of the creek below. One engineman was killed and two d trainmen were injured.

dr, 9th, Baltimore & Ohio, Lovela hio, a passenger train was derailed by spreading of rails, and assenger car was over- turned; one brakeman was killed and ssengers were injured, one of them fatally.

unx, 9th, Yazoo & Mississippi Valle Francisville, La., a mixed train was derailed and two freigh s were ditched; two brakemen were killed.

rc, 10th, Atchison, Topeka & Santa ictorville, Cal., rear collision of freight trains; one brakeman

dr, 10th, Illinois Central, Buckley, Ill. assenger train was derailed by a broken rail, and 15 passengers two trainmen were injured.

dn, 10th, Michigan Central, Detroit, M a locomotive, de- serted by the engineman and fireman at th proach of a train which seemed likely to collide with their en ran uncontrolled for some distance to the Third street passe station, where it ran into the building, knocking down a pa the walls. One man was killed and three were injured.

xc, 11th, St. Louis & San Francisco, Fort , Tex., collision between a passenger train and an empty engine fireman killed, four trainmen injured, one of them fatally.

unx, 11th, Missouri Pacific, Eureka, Mo., ger train No. 4, running at high speed, was derailed at a cu nd all of the passenger cars were ditched; 12 passengers were usly injured.

*†bc, 12th, 5 a.m., Baltimore & Ohio, Wood Ind., butting collision between a westbound passenger train n eastbound freight, wrecking both engines and the front portio both trains. The wreck was a very bad one and it took fire at and burned fiercely. Forty-eight passengers were killed and 3 engers and four employees were injured. The bodies of most passengers killed were burned beyond recognition. The fre train had stopped at Babcock to meet passenger train No. t through some mistake not yet fully explained was started ard after the first section of the passenger train passed witho iting for the second, and it was with the second that it collided

*xc, 12th, New York Central & Hudson River, Wa n, N. Y., collision between a freight train and a work train, ng both engines and several cars. The wreck took fire and was burned up. Four employees were injured.

dn, 12th, Southern Railway, Waco, Ga., fast mail No. 97 was derailed at a misplaced switch. Engine and car we ecked.

o, 12th, Southern Pacific, Sargents, Cal., the locon of a passenger train was wrecked by the explosion of its b The first four cars of the train were overturned, and the sta mild- ing, opposite which the explosion occurred, was wrec The engineman and one other employee were killed and the fir was fatally injured.

xc, 13th, 4 a.m., Chattanooga, Tenn., a locomotive of t N. O. & T. P. collided with a locomotive of the Belt Line at a ng of the two roads. One trainman killed and two injured.

unx, 13th, Missouri Pacific, Glencoe, Mo., a passenger tra- ning at full speed was derailed and all of the cars were ditch t the passengers and trainmen all escaped with very slight in

unf, 13th, Pittsburg & Lake Erie, Edensburg, Pa., a pas train was derailed by a wagon load of logs at a crossing of the The engine and first four cars were wrecked. The engineman man and baggageman were injured, the first two fatally.

rc, 14th, Nashville, Chattanooga & St. Louis, Wauhatchie, T rear collision of passenger trains. One car wrecked, several sengers injured.

unx, 14th, West Jersey & Seashore, Grassy Sound, N. J., a p senger train was derailed and the engine and first two cars fell a bridge into a creek. Twelve passengers and two trainmen we injured, two of them fatally.

rc, 15th, 10 p.m., Philadelphia & Reading, Linfield, Pa., a pas senger train ran into the rear of a preceding freight train. One employee killed, three injured. There was a blinding snowstorm at the time and the passenger train had already been once stopped on account of the presence of the freight train on the main line ahead of it.

xc, 15th, 9 p.m., Texas & Pacific, El Paso, Tex., collision of switching trains. One employee killed, two injured.

16th, Southern, Columbia, S. C., collision between a freight train and a work train. One trainman killed, six injured.

†*rc, 17th, Illinois Central, Ripley, Tenn., a train consisting of an engine and a caboose ran into the rear of a preceding local freight train, wrecking the caboose of the freight and several cars. The wreck took fire and was mostly burned up. Two passengers in the freight and a flag man of the same train were killed, and three passengers were injured.

bc, 16th, 5 a.m., Chicago & North-Western, West Chicago, Ill., butting collision of freight trains in the yard, making a bad wreck. One fireman was killed and one engineman fatally injured. Both engines and 15 cars were wrecked. The wreck was due, it is said, to a misplaced switch.

dr, 17th, Atlantic Coast Line, Leland, N. C., a passenger train was derailed by a broken rail and 17 passengers were injured.

rc, 18th, Chicago, Milwaukee & St. Paul, Riverside Park, Ill., rear collision of freight trains. One trainman killed, three injured.

xc, 18th, Delaware, Lackawanna & Western, Lehigh, Pa., a locomotive backed from a side track into a passenger train, badly damaging three engines and two milk cars. One engineman was killed and five freight trainmen were injured, one of them fatally.

dr, 18th, St. Louis & San Francisco, Powers, Ark., three cars of a freight train were derailed at a point where the track had been weakened by heavy rain and one brakeman was killed.

dn, 18th, Colorado & Southern, Buena Vista, Colo., a freight train became uncontrollable on a steep grade and was derailed at a curve. Two trainmen killed and one fatally injured.

dn, 19th, 5 a.m., Baltimore & Ohio, Taylorstown, Pa., a freight train, while switching, ran over a misplaced switch and off the end of the track, the engine falling down a bank; one brakeman was killed.

dn, 19th, Southern Railway, Old Fort, N. C., a freight train descending a steep grade became uncontrollable and after running 10 miles at high speed was derailed at a curve; two trainmen were killed and three injured.

bc, 20th, 10 p.m., Mobile & Ohio, Dwight, Ala., a northbound passenger train standing on a side track was run into by a southbound passenger train, badly damaging both engines. It is said that a brakeman became confused and misplaced a switch immediately in front of the moving train. Twenty-five persons were slightly injured.

bc, 20th, 10 p.m., Richmond, Fredericksburg & Potomac, Cherry Hill, Va., butting collision of freight trains, badly damaging both engines and several cars; one trainman and one trespasser were killed and three trainmen were injured.

dr, 20th, St. Louis & San Francisco, Powers, Ark., a freight train was derailed at a point where the track had been damaged by rain, and one brakeman was killed.

dr, 20th, Great Northern, Grand Harbor, N. Dak., passenger train No. 3 was derailed by spreading of rails and the engine and first four cars were overturned. Two mail clerks and several passengers were injured, the mail clerks severely.

unx, 20th, Louisville & Nashville, Cane Creek, Ala., a freight train was derailed; engineman killed, four trainmen injured.

rc, 21st, Atlantic Coast Line, Waycross, Ga., rear collision of freight trains, six trainmen injured.

unx, 21st, Buffalo, Rochester & Pittsburg, Colden, N. Y., a passenger train was derailed and three cars were ditched; 10 persons injured.

bc, 21st, Atchison, Topeka & Santa Fe, Hilton, Colo., butting collision of passenger trains, wrecking both engines and one mail car. One fireman was killed and five passengers were injured, two probably fatally.

unx, 21st, Chicago & North-Western, Sterling, Ill., a freight train was derailed and four trainmen were injured, one of them probably fatally.

xc, 22d, New York Central & Hudson River, Corning, N. Y., collision between a freight train and an empty engine, wrecking the engines and 10 cars, most of the wreck falling down a bank into Chemung river. One engineman and one brakeman were killed.

dr, 22d, Great Northern, Dohon, N. Dak., a passenger train was derailed by spreading of rails and the engine and first two cars were wrecked; three trainmen were killed, and two mail clerks and three passengers were injured.

unx, 23d, Fort Worth & Denver City, Amarillo, Tex., passenger train No. 1 was derailed and ditched and six passengers were injured. The train was 70 hours late and had been derailed once before on the same trip.

†xc, 26th, Wisconsin Central, Stanley, Wis., a freight train standing on a side track, but not fully clear of the main track, was run into at the rear by a following freight, and of the 12 passengers in the caboose of the standing train two were killed and a third was injured, probably fatally.

xc, 27th, 7 p.m., Southern Railway, Winona, Miss., westbound passenger train No. 35 ran over a misplaced switch and into the rear of a freight train standing on the side track, wrecking both engines. One employee was killed and three trainmen and six passengers were injured.

28th, 5 a.m., Central of Georgia, Bolingbroke, Ga., butting collision of freight trains; six trainmen injured.

29th, 6 a.m., Southern Railway, near Lawyer, Va., southbound passenger train No. 33, which had been stopped by the failure of a signal, was run into at the rear by passenger train No. 37 following, wrecking the rear car of No. 33, which was the private car of President of the road, Mr. Samuel Spencer. Mr. Spencer, three of his guests and three employees were killed, and seven passengers and there employees were injured. This division of the road is worked by the telegraph block system and the collision occurred between Rangoon and Lawyer. Train No. 33 left Rangoon at 6.06 a.m., and was not announced to Lawyer. When train No. 37 ap-

proached Rangoon, the signalman asked Lawyer for a clear block, and Lawyer, not knowing that train No. 33 had been admitted, authorized the admission of train No. 37. The signalman at Rangoon, who is held responsible for sending train No. 33 forward without communicating with Lawyer, is 22 years old, and has been night signalman at that place for nearly two years. He is said to have had a good record. He worked 12 hours a night and received $50 a month. Train No. 33 is said to have been standing about three minutes at the time of the collision. The flagman says that he had gone back 900 ft. At the point of the collision the trains were on a 1 per cent. descending grade and train No. 37 was probably running — miles an hour. If the flagman was back 900 ft. his flag could have been seen about 1,500 ft. from the standing train. The coupler which failed had in it two 1⅛-in. nuts in place of a lock-block, which had been lost. At Lynchburg the coupler had failed, and after spending a half hour or more in trying to find a suitable block with which to repair it, the conductor used the nuts instead.

dr, 29th, Kansas City Southern, Shreveport, La., a freight train was derailed by spreading of rails and the engine and 15 cars were ditched. The engineman and fireman were injured.

rc, 30th, Louisville & Nashville, Castleberry, Ala., rear collision of freight trains; one trainman killed, four injured.

bc, 30th, 6 a.m., Central Vermont, Montville, Conn., a passenger train ran over a misplaced switch and into the head of a freight train standing on the side track; one fireman was killed and three other trainmen were injured.

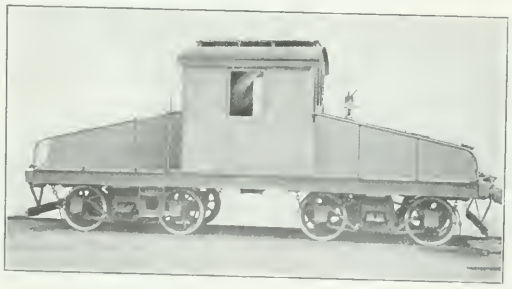
†xc, 30th, Bloomington, Ill., a freight train of the Chicago & Alton backed into a passenger train of the Lake Erie & Western, which was standing at the station, killing one passenger and injuring 14 others, two of them probably fatally.

xc, 30th, Wabash road, Ferguson, Mo., a passenger train ran into a freight train at a side track; one fireman was killed and one other trainman injured.

dr, 30th, Chicago, Rock Island & Pacific, Waukomis, Okla., passenger train No. 12 was derailed by spreading of rails and 10 passengers were injured.

## Electric Locomotive for the General Electric Company.

The American Locomotive Co. has recently completed a 37½-ton electric switching locomotive for the General Electric Co. It is designed to operate on a 250-volt circuit and the maximum tractive effort is 15,000 lbs., though the instantaneous drawbar pull for starting purposes is 18,800 lbs. The machine is carried on two ar[ch] bar trucks similar in general design to those ordinarily used un[der] freight cars with inside hung brakes and cast bolsters. In o[rder] to accommodate the two 175 h.p. motors with which each truc[k is] equipped the brake-beams are dispensed with and the levers [are] attached direct to the brake heads, as shown in the illustrat[ion]. The motors themselves are hung inside with a nose suspensi[on] on the bolster so that their weight is evenly divided between the [axles] and the truck frames.



Elevation; General Electric Locomotive.

General View of Truck.

This locomotive is arranged for a single unit control [and] is fitted with both trolley and third rail shoes. It is also fitt[ed with] the straight air-brake of the General Electric Co. and th[ree each] sander, operated by a single centrifugal pump air compress[or]. The platform and framing is of 10-in. steel channels and [¾-in.] floor plates. The cab is of the steeple type and consists of one [main] cab and two auxiliary cabs.

Some of the principal dimensions of the locomotive [are]:

| | |
|---|---|
| Length over all | 31 ft. 1[0] in. |
| Width | 9 " 6 " |
| Total wheel base | 22 " 6 " |
| Driving wheel base | 6 " " |
| Height over cab | 12 " " |
| Height with trolley down | 13 " [6] " |
| Truck wheels | 36 in. diameter |

## ...gn Railroad Notes.

The Borsig Loc[omotive] Works of Berlin turned out its 6,000th locomotive Nov. 6. 5,000th came out four years before; the 4,000th in 1886.

The productio[n] coal in Germany (the whole empire) has been vastly greate[r] year than ever before, for the nine months ending with Sept[ember] amounting to 185,045,000 short tons, which is 14½ per cent. than last year for the same months. That the increase in [pro]duction has had very much to do with this appears from th[e fact] that the coke shipments increased more than 37 per cent.

The lower [cla]s of the regular employees of the Wurtemberg State Railroads [have] petitioned for certain improvements in their social conditio[ns]. The first point mentioned was that in addressing every employe[e] whatever grade his superior should prefix "Mr." to his name. [The] Minister in charge recommended that this be done in all written [com]munications; for oral directions he wanted more time for cons[ide]ration.

In Holla[nd] an apparatus has been introduced to register the actual speed [of] trains over bridges, past switches, on curves, and on other sec[tion]s of track where the rules limit the speed. It is intended to [mea]sure actual maximum speed at any point on the section, not [the] average speed in passing the section, which may be (and of[ten] is) the average between a dangerous speed and one below that [per]missible.

A rail[road] was opened last October in German Southwest Africa from the [coast] at Lüderitz Bay, about 26½ south latitude, eastward 85 miles [to] Aus, where there is water and vegetation, the country nearer th[e] past being a desert. The road has been generally called the Lüd[eritz] and Kubub Railroad, Kubub being a military station a few m[iles] south of the present eastern terminus. It is intended eventua[lly] to extend this road further east about 170 miles to Keetmanshoo[p] and to connect with the railroads in the British Cape Colony. [The] chief obstacles on the line now built were sand dunes, movin[g] with the winds. At one time it was thought that it might be nec[es]sary to tunnel these.

The Saxon State Railroads have divided their workmen into 23 [clas]ses according to occupation, each of which is to elect a committ[ee] of from 3 to 12 members as its representatives. It will be the duty of the committees to bring before the railroad authorities the wishes or complaints of the workmen, and, on request, to express their opinion on apparatus and rules for preventing accidents, or arrangements for the comfort and convenience of the men; further, to settle differences between the workmen themselves when appealed to by both parties. There has been heretofore an employees committee, but only one for the whole body of workmen.

The demand for cars, which is always in excess of the supply in the autumn months, in the principal European countries is greater than usual this year, and not only in Russia and Italy, where something like a blockade is expected at this season, but also in Germany, where great efforts have been made to anticipate the demand. On the Prussian State Railroads, which have long been very prosperous and can command the means for any additions thought necessary, and which have exceptional facilities for ascertaining the probable demand as anticipated by the shippers themselves, the latter ordered 3,384,186 cars during October last, while the railroads were able to furnish only 3,127,740, or 924 for every 1,000 ordered. The number of cars ordered was 7.4 per cent. more than last year, and the number furnished 8.2 per cent. greater. The growth of traffic has exceeded all calculations.

## Annual Report of Interstate Commerce Commission.

From a synopsis of the twentieth annual report of the Interstate Commerce Commission, issued by the Secretary, we extract the principal paragraphs, as follows:

The most important legislation of the year relating to the work of the Commission was the passage of the amended act to regulate commerce.

The Commission does not present any recommendations for further amendments of the statute in this report, but amendments will be submitted in special communications to Congress during the present session.

The questions arising under the new legislation are numerous, and some of them extremely difficult. It has been necessary for the Commission to devote a considerable part of its time to an administrative construction of this law and the preparation of decisions and rulings as to its meaning and application. The nature and scope of these rulings and decisions are indicated in a summary printed as an appendix to the report. [These have been reported in the *Railroad Gazette* recently.] More than 600 applications for permission to make changes in rates on less than the statutory thirty days' notice have been received since August 28, the date when the new law became effective. The majority of these have been granted, as the reasons set forth seemed to amply justify the Commission in the exercise of this discretionary power. Almost without exception these applications have been to put in reduced rates, the necessity for which could not, owing to various emergencies, be foreseen in time to give the full thirty days' notice. The necessity of examining the tariffs on file in connection with these applications has added very largely to the work of the Commission. Contrary to general expectation, the requirement of thirty days' notice has operated to greatly increase the number of tariffs. Prior to the passage of the amending act, for several years, the average number of tariffs filed daily was about 450, including both freight and passenger tariffs, but from August 1, 1906, up to and including November 30, the average number of tariffs filed daily has been 964, and this number does not include express, pipe-line, or sleeping-car tariffs. On August 27, the day before the amended law became effective, the number of schedules received for filing was 5,587, of which 4,975 were freight and 612 were passenger tariffs.

The great number of tariffs received since and just prior to the taking effect of the amended law, and the limited clerical force available for the work, have rendered impracticable any detailed comparison of the rates shown in these tariffs compared with those previously in effect, but, from such examination as it has been possible to make, it appears that the great majority of the tariff changes have been reductions.

While the majority of tariffs on file are comparatively simple in arrangement and easily read, a great many are not arranged in such manner as to be readily understood by persons of ordinary intelligence, and in some cases they are so complicated that it is difficult for even an expert to determine the rates therefrom. The Commission intends at an early date to prescribe rules governing the construction and arrangement of tariffs.

Numerous hearings have been held in the investigation ordered by the joint resolution of Congress, relating to the relations of common carriers to the production and distribution of coal and oil and the ownership of coal and oil lands by such carriers or their officers and employees. A series of reports on this investigation will be made from time to time, the first of which, so far as coal is concerned, will pertain to what is called the Eastern bituminous situation, and that report will soon be submitted to the Congress. A special report upon that portion of the investigation which pertains to oil will soon be submitted.

A report to the Congress under the La Follette resolution of June 25, relating to the ownership and operation of elevators and practices in the handling of grain, is in course of preparation and will be submitted as soon as practicable.

Other special investigations, instituted by the Commission upon its own motion, relate to the relation between the Union Pacific and Southern Pacific Railway systems growing out of their combined management and control, the relations of the Northern Pacific, Great Northern and Burlington systems, with a view to ascertaining to what extent they are under unified control and the effect of any such control upon their rates and practices. A further inquiry has been instituted with reference to the prevailing car shortage, and is now proceeding in various parts of the country.

The inability of shippers to procure cars for the movement of their traffic is the subject of numerous and grievous complaints which come to the Commission from all parts of the country. The extraordinary prosperity which everywhere abounds, with the high prices obtainable for all classes of commodities, have so stimulated production as to yield a volume of transportation business which far exceeds in the aggregate the carrying capacity of the railroads. In a word, the development of private industry has of late been much more rapid than the increase of railroad equipment.

The conditions now existing in the Northwest, where large quantities of grain require immediate shipment, and in the Southwest and trans-Missouri region, where thousands and tens of thousands of live animals are denied movement to the consuming markets, may justly be regarded as alarming; while throughout the Middle West and Atlantic seaboard the shortage of cars for manufactured articles and miscellaneous merchandise has become a matter of serious concern. In some cases it is simply a lack of cars, in others insufficient tracks and motive power, in still others wholly inadequate freight yards and terminal facilities.

The larger roads are in many cases refusing to furnish cars for loading to points beyond their own rails, because they are not unloaded and returned within a reasonable time.

Subsequent to the last annual report to the Congress and prior to August 28, 1906, the date when the amended law became effective, the Commission rendered decisions in twenty-seven contested cases, which are summarized in the report. The decisions rendered in the United States courts during the year relating to the application of the act to regulate commerce are briefly stated. Twenty-one civil cases are pending in the courts for enforcement of the regulating statute. The fines imposed upon corporations and individuals in proceedings involving criminal violations amount to several hundred thousand dollars, and two persons were sentenced to imprisonment.

Under the twentieth section, as amended, the Commission is granted authority to prescribe a uniform system of accounts for railroads and other transportation agencies under its jurisdiction, and the Commission will take up and consider accounting methods in operating expenses, earnings and income; the proper method of treating terminal companies, arbitraries, absorbed switching charges, and the like; separation of repairs from betterments, so as to learn how far the improvement of property is charged to current earnings; a revision of the balance sheet, and a revision of the classification of construction accounts. Every person interested will have the opportunity of criticism and suggestion before the final form of accounting shall be determined upon. The new law places express companies, sleeping-car companies, pipe lines and electric lines under the jurisdiction of the Commission, and reports will be demanded from them.

[The advance report of the income account statement for operating railroad companies was given in the *Railroad Gazette* Nov. 30, 1906.]

The condition of safety appliances has continued favorable. Many old cars of light capacity have been retired from service and have been replaced by new cars of modern construction. This has had a good effect, as the new cars are all equipped with air brakes and have the latest couplers, which are stronger than those put in service a few years ago. There is also a tendency to limit the couplers used to four or five of the best makes, and this leads to uniformity and removes the necessity of keeping in stock a large number of repair parts.

A difficult problem connected with the coupler question is the matter of improper repair parts, leading to defects that cannot be discovered until an attempt is made to operate the coupler, when it is found inoperative. This leads to danger to employees and places carriers in the attitude of violators of law.

An amendment to the law is needed, placing all appliances included in the master car builders' standards for the protection of trainmen under the regulation of law, such as sill steps, ladders and roof handholds. Penalty defects are well looked after and properly repaired, but appliances not covered by the law are frequently allowed to pass in a defective condition. It is only by placing all these appliances in the same category that their safe and serviceable condition can be insisted upon at all times.

As a result of the Commission's order increasing the minimum percentage of power brakes to be used in trains, there has been a considerable increase in the use of air brakes. The operation of this order has been beneficial, and indications are that freight trains will soon be controlled wholly by means of air brakes.

Generally speaking, the coupler and brake law has been well observed, but there are carriers in all parts of the country that have been somewhat lax, and 225 suits have been filed for violation of the law since it went into effect, 100 of which have been settled, and penalties to the amount of $22,700 have been collected and turned into the treasury. Of the suits settled, 83 were disposed of by the carriers confessing judgment and paying the penalty. Seventeen have gone to trial, in 15 of which verdicts have been rendered in favor of the Government.

The only suits decided against the Government are two recent cases tried in the district court in Colorado. Should this interpretation of the law be sustained by a higher court, the statute will be greatly weakened. Notable decisions upholding the law were recently rendered by Judge McPherson, of the United States district court, at Des Moines, Iowa, and by Judge Whitson, at Spokane, Wash. Congress should provide for a considerable increase in the force of inspectors. The loss of life occasioned by the use of comparatively light postal cars demands attention, and Congress should take some action to the end that this danger may be obviated.

Railroads have now made monthly reports to the Commission

of accidents to passengers and employees for five years. The tremendous increase in the volume of freight traffic has put a severe strain upon employees, and this has often been made the justification of or excuse for working men unduly long hours, and has led to the employment of many young and inexperienced persons. In the matter of long hours the accident reports have shown instances of even worse conditions than existed in former years.

In the item of passengers killed in collisions and derailments, the record for 1906 is not so bad as that of 1905. This is a cause for gratification; but the only real indication of the figures is that the number and severity of great disasters has diminished. The cost of collisions as reported by the companies, excluding damages to property and indemnities paid to or on account of persons killed or injured, is $10,659,189, nearly a million dollars greater than in 1905.

The Accident Bulletins only serve to confirm the serious and pressing character of the threefold problem which has been made the chief feature of this department of the last two or three annual reports: (1) the investigation of accidents; (2) the requirement by law that the block system shall be used on passenger lines, and (3) the regulation by governmental authority of the evil of overwork by trainmen, signalmen and telegraph operators.

Acting under Public Resolution No. 46, the Commission, with the aid of experts, is engaged in an investigation of the use of and necessity for block signal systems and appliances for the automatic control of railroad trains. This information is being put in shape to be reported to Congress and will be shortly transmitted.

## The Pennsylvania Tunnels Under the North River.

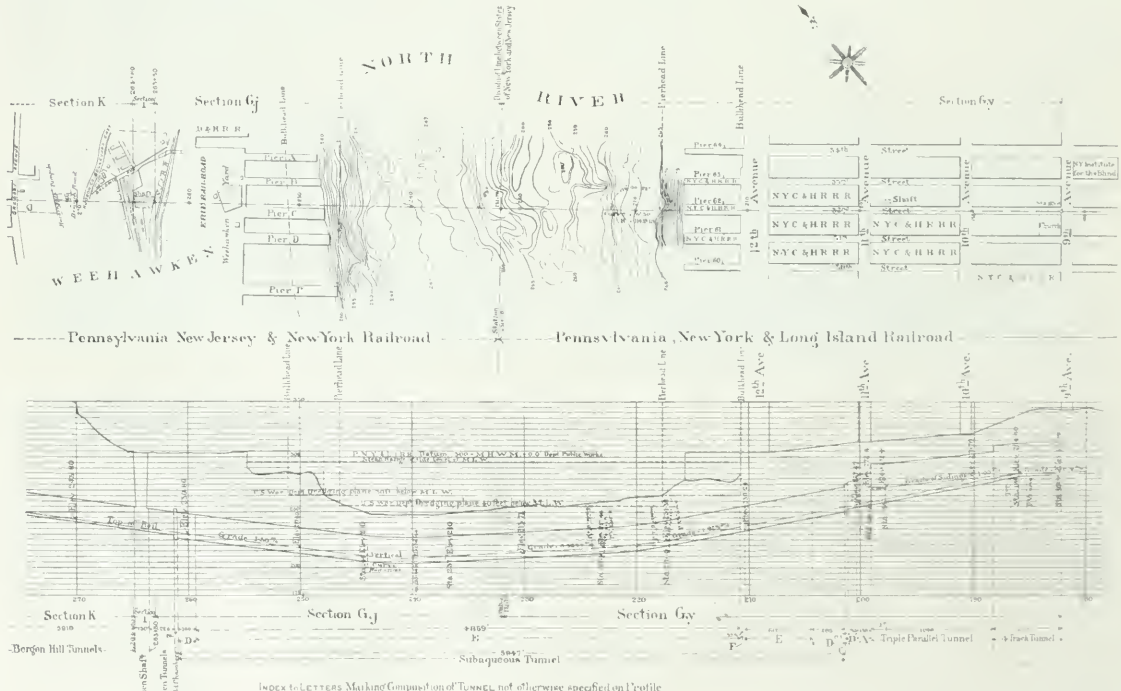
The entrance to the Pennsylvania Terminal Station in New York City from the south and west will be over a two-track detour line across the Hackensack meadows from a point on the main line near Harrison, just east of Newark, through two single-track tunnels in rock under Bergen Hill and Weehawken, and under the North river through two cast-iron lined tube tunnels which join the cut-and-cover excavation for the approach tracks to the station west of Tenth avenue on Manhattan island. The work naturally divides itself into three parts, the Bergen Hill tunnels in rock, the sub-aqueous river tunnels and the station approach from the river shaft to the Ninth avenue side of the station excavation.

The western portal of the Bergen Hill tunnels is about 700 ft. east of the tracks of the New York, Susquehanna & Western and the Northern Railroad of New Jersey (Erie). The approach is a 4 deg. curve on an embankment over the meadows with a plate girder bridge over the tracks of the two railroads which it crosses. One of the illustrations shows the approach looking west from the portal. The tunnels under Bergen Hill are parallel single-track bores 37 ft. center to center, and with a full circular arch of 9 ft. 6 in. radius inside. Between the west portal and the Weehawken shaft, a distance of 5,910 ft., the line is a tangent on a 1.3 per cent. descending grade toward the river. At the deepest point the crown of the tunnels is about 77 ft. below the surface.

The Weehawken shaft, in about 800 ft. from the river pierhead line, is a magnificent piece of concrete masonry. It is rectangular in shape at the bottom, 56 ft. by 116 ft. and 76 ft. deep. The original plans called for a concrete facing but on account of the bad rock encountered in going down the excavation was enlarged to allow for substantial face walls from 3 to 10 ft. thick on the sides stepped into the rock and anchored with bolts. The end walls have nearly a vertical back face and a front face with a batter of 1:3, giving them the proportions and strength of retaining walls. This work was done as a separate contract by the United Engineering & Contracting Co. It was begun in June, 1903, and completed in September, 1904. Half of the shaft is being used by the contractors for the Bergen Hill tunnels and half by the contractors for the river tunnels. The illustration shows the appearance of the completed shaft before the tunnel contractors erected their hoists and other plant.

Work on the Bergen Hill tunnels is being prosecuted from the Hackensack portal, the Weehawken shaft and from a shaft sunk from the top of the hill near Central avenue. The original contractor, The Shields Construction Co., went into bankruptcy about a year ago, after having got the work under way and threw up the contract. William Bradley was given the contract and his forces are at work on both sides of the hill. The two tunnels are in about 1,300 ft. from the Weehawken shaft and about the same distance from the west portal. From the shaft at Central avenue small top headings are being driven in both directions.

For three or four hundred feet in from the Weehawken shaft soft seamy rock was encountered and a tight timber lining was put in. Considerable amounts of surface water come in here, suf


Section K
Section G-J
Section G-Y
NORTH RIVER
WEEHAWKEN
Pennsylvania New Jersey & New York Railroad
Pennsylvania, New York & Long Island Railroad
Bergen Hill Tunnels
Subaqueous Tunnel
INDEX to LETTERS Marking Composition of TUNNEL not otherwise specified on Profile
A 54 Ft. Span Arch
B 20 Ft. Span Twin Tunnels
C Shield Chambers
D Cast Iron lined Tunnel resting on solid ground without pile foundation
E " " " with pile foundation
F " Steel " "

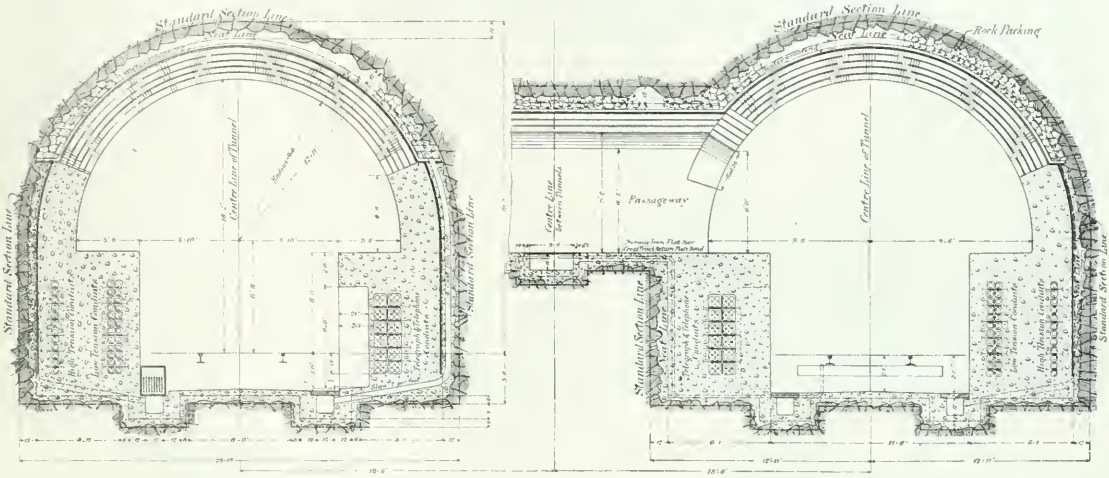
Plan and Profile of North River Tunnels; Pennsylvania, New York & Long Island.

ficient to keep the timbering thoroughly watersoaked, and it will probably be left in when the concrete lining is put in. Beyond the timbering the rock is a fairly soft sandstone which, however, is solid and safe without props. This sandstone extends in about 1,100 ft. from the shaft portal and is followed by a diagonal seam of very hard baked shale from 50 ft. to 100 ft. thick. Beyond the shale is good trap rock which extends most of the way through to the other side. The tunnels from the east end are being driven with a top heading the full width of the section and from the west end with small top headings. A Marion Model 20 shovel run with compressed air is used for mucking in the headings. The rock is loaded on skip cars and hauled to the portal and the shaft with mules. Every 300 ft. the two tunnels are connected by small cross passages in the dividing wall, and advantage is taken of this for ventilating both bores. These cross passages are boarded up except the one nearest the heading in which a portable motor-driven exhaust fan is mounted. Fresh air is drawn in through the south tunnel and sucked through the cross passage by the fan which forces it out through the north tunnel. The exhaust from the drills and the shovels also aids ventilation.

At the Weehawken shaft the skip cars are hoisted to a platform above the ground level and dumped at a tipple over cars standing on a track below. The sandstone and baked shale has been sold to the West Shore Railroad and hauled away for filling in. A crusher plant has been erected close to the shaft and as soon as trap rock is reached it will be taken to the crusher and sold for concrete. It is expected that most of the broken stone for the concrete lining of the tunnels under the hill and the river will be obtained from this source. The contractors have compressor plants at the Weehawken shaft, Central avenue shaft and Hackensack portal for furnishing air for the drills, but some additional air is supplied from the river tunnels plant at the Weehawken shaft.

The record made on the North river tunnels is remarkable for the speed with which the work progressed, the freedom from accidents of all kinds and the accuracy of the engineering surveys. Begun on the New York side early in April, 1904, and on the New Jersey side in September of the same year, communication was established between the two headings in the north tunnel on Sept. 11, 1906, and in the south tunnel on October 9. The boring under compressed air occupied about 15 months. Few lives were lost during the work and the shields in both tubes met with a variation of less than $\frac{1}{16}$ in.

The river tunnels are parallel single-track tubes 23 ft. in diameter outside, of cast-iron, lined with concrete and spaced 37 ft. apart, center to center. They are 6,118 ft. long between shield chambers and have a maximum depth at the invert below mean high water




Section Through Bergen Hill Tunnels in Rock, Showing Cross Passage.

View from Hackensack Portal Showing Embankment Across the Meadows.

of 97 ft. and a minimum depth below the river bottom of 20 ft. The line is a tangent from the Weehawken shaft to a point about 200 ft. west of the Manhattan pierhead line, where a slight change of direction, 53 min. 35 sec. to the south, is made continuing on the adjoining tangent to the terminal station east of Ninth avenue. Starting at the Weehawken shaft the grade is 1.3 per cent. descending for about 2,000 ft., then a rising grade of 0.53 per cent. for 2,000 ft. followed by a rising grade of 1.923 per cent., which continues to a point between Ninth and Tenth avenues.

Weehawken Shaft Before Turning Over to Tunnel Contractors.

The Manhattan shaft, like the Weehawken shaft, was built by the United Engineering & Contracting Co. as a separate contract. It is in solid rock below the filled ground on the surface and is not lined. The dimensions are 32 ft. by 22 ft. by 55 ft. deep. It is located on the north side of Thirty-second street, east of Eleventh avenue, and is connected at the bottom with the tunnels under Thirty-second street by a cross drift. The tunnels were driven in rock from this cross drift to the shield chambers out about 200 ft. Part of this distance is a two-track single arch tunnel running into twin parallel iron lined tunnels just in front of the shield chambers. This work was timbered while the lining was being put in.

The tunnel contractors, the O'Rourke Engineering Construction Co., secured an old foundry building adjoining the shaft to house the required above ground plant, power house, office, engineer's and workmen's quarters. A storage platform with disposal tracks for the muck carts was built over the shaft above ground, and all material, men and supplies were raised and lowered with two steam-driven Lidgerwood hoists.

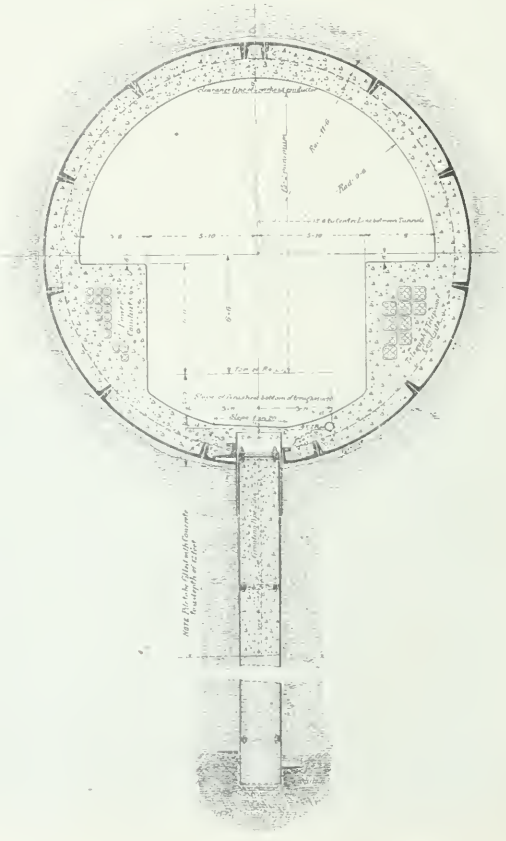
At the Weehawken shaft the contractors built a more elaborate plant, including a new power house, office building, overhead platforms, workmen's quarters and a material dock at the water's edge with a trestle leading in to the shaft. The power house is a temporary building, but the installation of the machinery was as carefully and substantially designed and carried out as for a permanent plant. All of the machinery is placed on concrete foundations and every detail of piping and auxiliary apparatus which would increase the efficiency and reliability of the plant has been provided. The general requirements were here much the same as for the East river tunnels power plant described in the *Railroad Gazette* July 27, 1906, but on a scale of about one-half the capacity since only two tubes were to be driven instead of four. High and low-pressure air, hydraulic pressure and electric current for both tubes are provided.

The low-pressure air compressors, three in number, were furnished by the Ingersoll-Rand Co. They are cross-compounded on the steam end and have duplex air cylinders, the dimensions being: Steam cylinders, 14 in. and 30 in. by 36 in. stroke; air cylinders, 22⅜ in. in diameter. At a delivery-pressure of 50 lbs. and 125 r.p.m. each of these machines has a maximum capacity of 4,000 cu. ft. of free air per minute, or a total capacity of 12,000 cu. ft. This high pressure was never called for during the tunneling operations, the maximum pressure being 30 lbs. and the average about 25 lbs. The valves on the air cylinders, both inlet and exhaust, are opened and closed by air pressure, and on the steam cylinders Corliss valve gear is used.

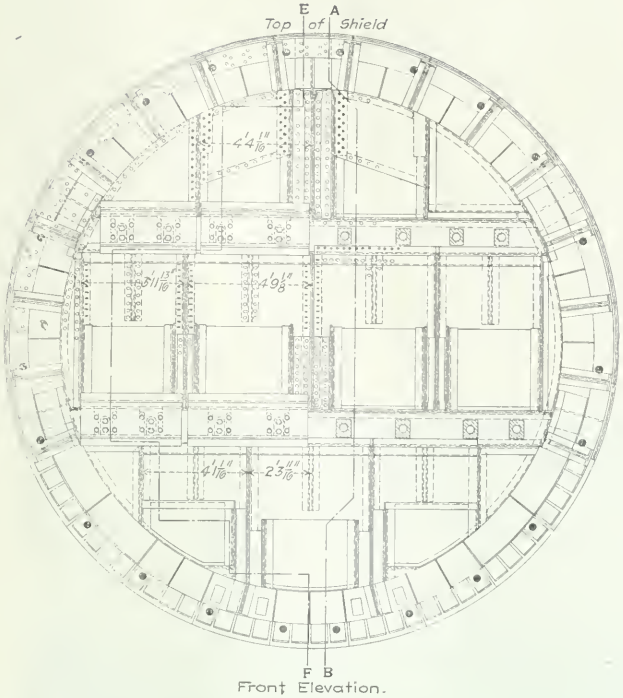
The single high-pressure compressor is a rebuilt machine having old steam cylinders with new air cylinders, and the cylinder proportions are, therefore, not theoretically correct, although the compressor has worked perfectly under trying conditions. The steam cylinders, which are 14 in. and 22 in. x 36 in. stroke, are cross-compounded and have Corliss valve gear, but the duplex air cylinders, 14¼ in. in diameter, are arranged for single stage compression. They have a normal capacity of 1,070 cu. ft. of free air per minute when taking air from the outside, but when run as second stage compressors, taking air at 30 lbs. from the low-pressure compressors, as was usually the case, the capacity was increased to about 3,000 cu. ft. of free air. This machine was designed to deliver air at a pressure of 90 lbs. above the low-pressure, or a maximum of 140 lbs. since the drills, pumps and other machinery exhausted into the low-pressure air. The piping was arranged so that in an emergency the compressor could deliver low-pressure air to supply any deficiency or so that air at high-pressure could be delivered in single stage or so that two-stage compression could be employed as explained above. In the latter case the after-coolers of the low-pressure compressors served as inter-coolers.

In addition to the air compressors the power plant also contains three Blake duplex hydraulic pumps for working the shields, supplying water at a normal pressure of 4,000 lbs. per sq. in., which could be increased to 6,000 lbs. when desired. Two direct-connected, 100-k.w., 250-volt d.c. generators supply light and power for the hoists and hauling drums in the tunnel.

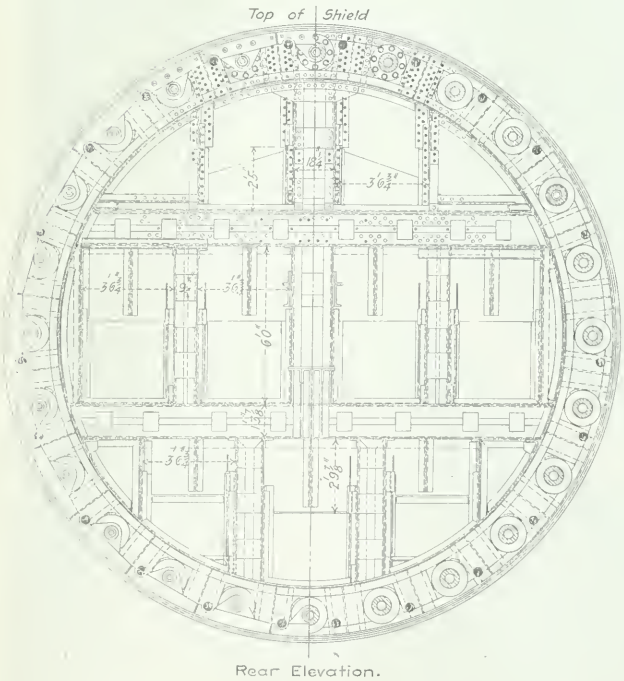
Steam at 150 lbs. pressure is supplied by three 500 h.p. Stirling water tube boilers, one serving as a reserve unit. Coal is supplied by gravity from bins filled from the trestle leading to



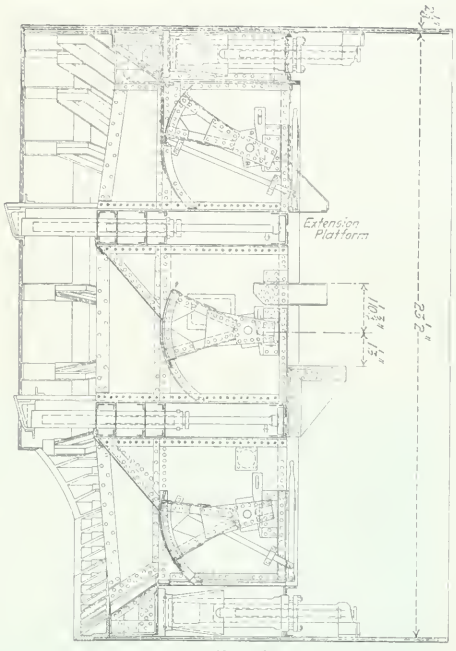
Section of River Tunnels with Screw Pile Support.



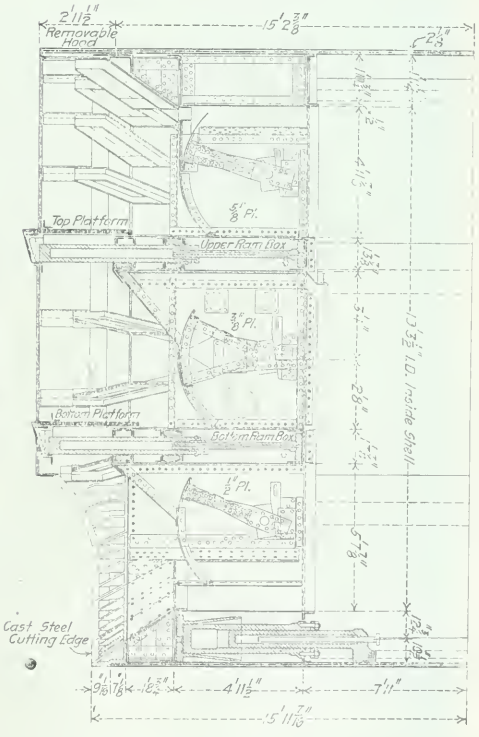

Front Elevation.




Rear Elevation.




Section A-B.




Section E-F.

Shields for North River Tunnels; Pennsylvania, New York & Long Island Railroad.

the material dock already mentioned. The compressor units all exhaust into two Worthington surface condensers which maintain a vacuum of 26 in., and the auxiliaries exhaust into a Cochrane feed water heater. The power plant on the Manhattan side is an exact duplicate of the Weehawken plant except that the building in which it is housed did not permit of so good an arrangement of the machinery. No serious accidents or breakdowns occurred at either plant during the tunneling operations.

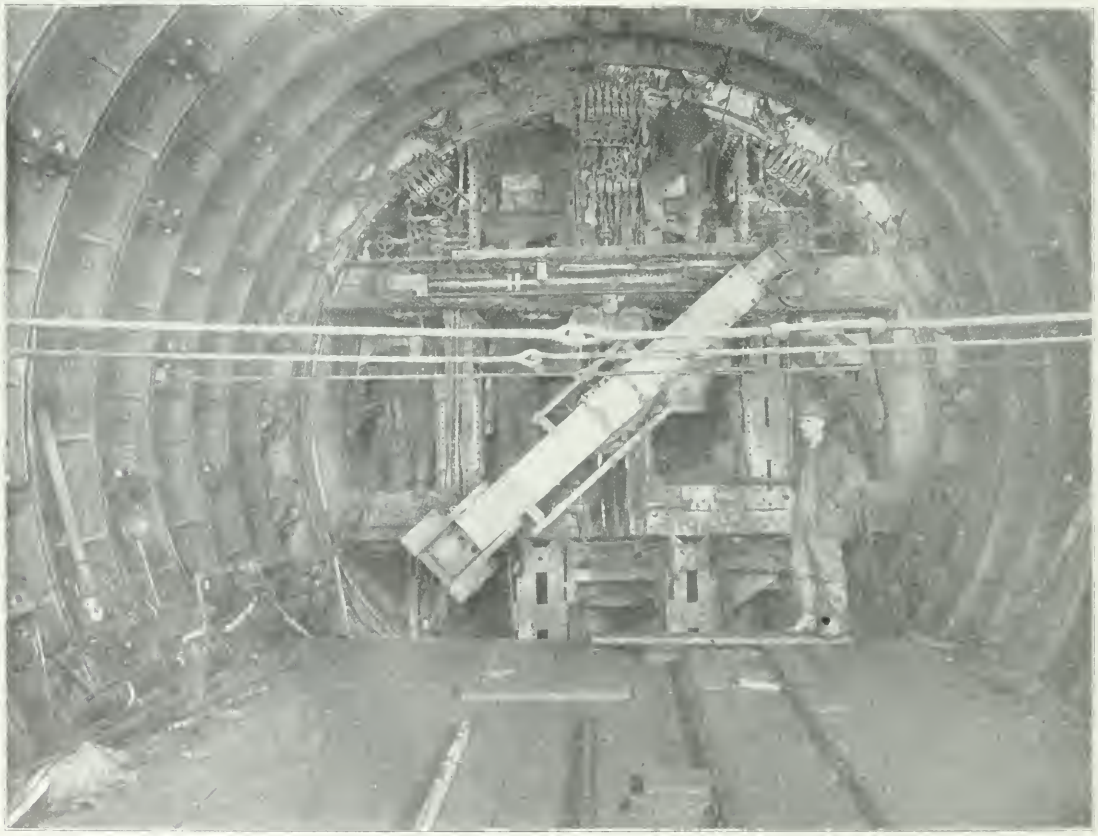
The hospital arrangements and workmen's quarters are complete and commodious. The usual double hospital locks are provided and a doctor is kept constantly on duty. The men's dressing room is large and light and kept always warm and clean. A covered passageway leads to it from the hoisting platform so that the men were not exposed on coming up. The care of the men has been in charge of Dr. W. J. Loomis, of Jersey City, and he has made a personal examination of all applicants for work. To his careful supervision has been due largely the freedom from fatal cases of caisson disease. The air in the tunnels has been kept clean and pure, averaging about 3,000 cu. ft. per man per hour.

The shields used in driving the tunnels were designed by Mr. James Forgie, Chief Assistant Engineer, under the supervision of Mr. Chas. M. Jacobs, Chief Engineer, and were built by the Riter-Conley Mfg. Co., Pittsburg, Pa. They were erected in the shield chambers cut out in the solid rock some distance out from the shafts and started out through the rock, sand and gravel until the silt or river mud was encountered. They were designed to work safely in any material and not particularly in silt, which has many peculiar characteristics with which Mr. Jacobs, Chief Engineer, was quite familiar as a result of his experience in driving the Hudson Company's tunnels under the river at Morton street. As will be seen by comparing the accompanying drawings and illustrations from photographs with the illustrations of the East river shields (*Railroad Gazette*, July 6, 1906) there are scarcely any points of similarity between the two.

The North river shields are 23 ft. 2 in. in diameter inside the tail and 15 ft. 11 15/16 in. long from the back end of the skin to the cast-steel cutting edge. The outer shell or skin is made up of three layers of plate 3/4 in., 5/8 in. and 3/4 in., having no circumferential seams. The single bulkhead has no differential air locks as in the East river shields, nor are material chutes provided. In front of the bulkhead the working face is divided into nine pockets, two on the top level, four on the middle level and three on the bottom level. Each pocket is entered through a door in the bulkhead, and they are separated from each other by vertical partitions and the horizontal platforms. To facilitate work in sand, gravel or rock the shield was provided with a removable hood projecting 2 ft. 1 in. beyond the cast-steel cutting edge at the bottom. This hood was designed to extend down to the level of the bottom platform, as shown on the drawing, but it was built to extend only to the level of the top platform, the cast-steel cutting edge being carried up to that level. The hood was built in segments and bolted to the skin plates, being stiffened by brackets attached to the ring in front of the rams. The working platforms, eight in number are carried on rams and could be forced out about 8 in. in front of the hood. Each platform is supported by two rectangular ram chambers working through brackets attached to the front of the bulkhead. The outer ends of the ram plungers are attached to the cross girders in the rear of the bulkhead under the rear platforms. When working in rock, drilling could thus be carried on on three levels, and in sand or wet ground the platforms were strong enough to support the breast boards in the face.

The doors in the bulkhead are a new departure in shield design. They are pivoted segments mounted on the stanchions in the rear of the bulkhead and rising in a vertical arc to open. The weight of the door assists in closing and no displacement of incoming muck is made when the opening is closed. A simple catch holds the door in any desired position. When working with the hood and mucking back from the forward platforms the doors were normally open, but after getting into the silt the upper doors were kept closed and the muck forced in through the lower doors. With the muck coming in it was necessary to employ jacks to force down the doors after a shove. Another expedient was to bolt 6-in. x 6-in. angles on each side of the door opening and block up the opening with 6-in. x 6-in. timbers. These timbers could be chopped away to let in the muck.

The pushing jacks, 24 in number, are spaced equidistant around the shell in pockets formed by radial diaphragms connecting the inner and outer skin. Each jack rests in a cast-steel socket bearing



Rear View of Shield, Showing Erector and Flooring in the Tunnel.

against the heavy ring which backs up the cutting edge. The jacks are single acting, with a separate internal pull back ram bearing against the lining ring. They were built by the Watson-Stillman Co. The main ram is 8½ in. in diameter, with a stroke of 3 ft. 2 in., while the pull back plunger is 3 in. in diameter. With a maximum hydraulic pressure of 5,000 lbs. per sq. in. each jack can exert a forward pressure of 142 tons, or a total of 3,400 tons for the entire shield. The shoving jacks, platform rams and erector are all controlled from a platform on the rear of the shield above the erector. The valves, piping, etc., are shown in the photograph.

The erector, which is shown in the photograph but not on the drawings, consists of a pivoted hydraulic cylinder which is rotated by chains attached to two fixed horizontal cylinders. The rotating cylinder and piston which carries the erecting head or grip for picking up the lining segments at one end and a counterweight at the other is pivoted on a heavy bracket attached to the lower platform at the exact center of the shield, so that it has a radial thrust in all directions. On the back side of this cylinder and keyed to the pivot is a chain sheave around which the rotating chain passes. Two smaller horizontal cylinders with pistons working in opposite directions are mounted on the upper horizontal diaphragm, these pistons having chain sheaves at their outer ends around which the rotating chain passes. Two small idler sheaves are mounted below these cylinders. By forcing out one piston the rotating arm is revolved in one direction and the other piston is forced in. steam winding engine and cable. The runway in the crown of the tunnel, supported by 6-in. x 6-in. timbers, was primarily built for the use of engineers in charge of alinement whose bench marks and verniers were built in concrete blocks set in the lining at one side near the crown. It also served as a runway to the emergency lock in the bulkhead, to be used in case of flooding. The lighting in the tunnel was provided for by incandescent lights on the sides every 25 ft. and lights under the crown. The 10-in. low-pressure air main shown to the left is a spiral riveted steel pipe with flange joints. The outlet, which was always kept close behind the shield, was provided with a flap valve to prevent air from blowing back in case of a break above ground. The 5-in. blow-out pipe was kept open constantly, and as comparatively little water came in at the heading good ventilation was always secured at the shield.

After the shields got into the silt the progress made was rapid. The best single record was eight complete rings, or 20 ft. erected in an eight-hour shift made in the south tube from the Weehawken end, but six rings was a common performance. With one ring erected and temporarily bolted up the bottom middle door was opened and pressure turned on the shoving jacks. Usually only eight jacks were used, two on each side, one at the top and three at the bottom. The silt with a consistency of thick plastic mud came in through the door in a square stream, preserving its shape like paint squeezed from a tube. This was shoveled into waiting muck cars as quickly as possible and the invert cleared for the bottom segment. Between 20 and 30 per cent. only of the total

Interior of South Tunnel, Looking Towards Outer Bulkhead.

Motion in the opposite direction is obtained by reversing the movement of the horizontal pistons. The arrangement is simple, powerful and easily controlled and has the advantage of giving a direct radial thrust for placing the key segment in the crown.

From the Weehawken shield chambers out, the rock was cleared in about 150 ft., after which 300 ft. of sand and gravel was passed through before reaching the silt. A bad slip occurred over the workings soon after leaving the shield chamber on the north tube and the ground under the railroad yards above subsided several feet. This caused only a short delay, however, and did no serious damage to the tunnels. The first air lock and bulkhead was put in just in front of the shield chamber and the second lock about 1,200 ft. farther out. The bulkhead is of concrete 10 ft. thick and contains three locks, man, material and emergency, in addition to carrying through the various pipes leading to the heading. The man and material locks are on a level with the temporary floor in the tunnel and the emergency lock is above and to one side.

The view of the completed tunnel looking toward the advance bulkhead shows the working floor, tracks, pipes, etc., which were carried up close to the heading as the shield was pushed out. The working floor is built in sections and is about 4 ft. above the invert and is 15 ft. wide. It carries two narrow-gage tracks, over which the muck cars run. An electric haulage system was installed between the first and second bulkheads for bringing out the loaded muck cars and empty material cars. The grade between the bulkheads, a distance of a little over 1,000 ft., is 1.3 per cent. Beyond the first bulkhead the cars were hauled to the shaft hoists by a volume displaced by the advance was taken in through the shield. An advance of 2½ ft., the width of one ring, was roughly equivalent to the displacement of 30 cars of muck, each car holding 1.5 cu. yds. From six to ten cars were taken in during a shove, depending on the movement desired by the shield and the lateral displacement observed in the parallel tube. When the shove was completed and the rams drawn back the erection of the next ring was begun at the bottom. Permanent bolting followed the advance of the shield very closely, this work being done from a movable gantry platform supported on rollers bolted to the lining above the working floor. This platform enabled the men to reach the top segments of a number of rings behind the shield and finish the bolting without interfering with the operations at the shield. From 30 to 40 men constituted a shift in each heading.

The relative positions of the four headings varied from time to time during the work owing to slight delays in one tube or the other and to the desire of the engineers to prevent too great a disturbance in the river mud. The Manhattan shields had a start of nearly three months over the Weehawken workings, and as no delays or accidents of consequence occurred in the north tube it was pushed forward and met the north Weehawken shield 168 ft. west of the state line, which is approximately half way across, on Sept. 11, 1906. The Weehawken south shield was at that time in advance of the north shield. A blowout under the river bulkhead wall which flooded the workings delayed the Manhattan south shield, and as exceptionally rapid progress had been made by the shield working east the two south headings met October 9, 370 ft.

east of the state line. The perfect accuracy of the surveys and operation of the shields is well shown in the photograph of the cutting edges in contact after dismantling had begun. The alinement, elevation and rotation of the shields about the central axis coincided exactly.

When communication was established through it was found that the Weehawken south shield in passing under the docks on the river bank had encountered a number of old piles sunk deep in the mud, and these had been pushed across the river ahead of the shield, but without damage to it. In fact, none of the shields were distorted or damaged in any way except some slight dents in front of the bulkhead due to blasting in rock. They were taken down in the tunnels and all the parts brought to the surface in good condition; if necessary they could be reassembled and used over again.

The unstable nature of the silt through which the tunnels pass caused the chief engineer to make provision for supporting the tubes on screw piles every 15 ft. None of these piles have as yet been driven, but bore segments through which the piles can be sunk were built in the invert every 15 ft., each segment being the width of two rings. These segments will permit a pile 2 ft. 8 in. in diameter with a screw blade 4 ft. 8 in. in diameter to be passed through the lining. Experiments are now being made above ground with electric driving machinery to put down these piles.

The next step in the work will be the putting in of the concrete lining 2 ft. thick. This will not present any special difficulties.

Junction of Shields in North Tunnel, Showing Perfect Contact of Cutting Edges.

Both tunnels will probably be entirely completed long before the contract time and before the adjoining land tunnels or terminal station are ready.

The organization and co-operation of forces has had much to do with the successful and rapid completion of the work. The line from Harrison to the state line under the river is being built under the name of the Pennsylvania, New Jersey & New York, and from the state line east to Long Island under the name of the Pennsylvania, New York & Long Island. The work west of the terminal station beginning at Ninth avenue is known as the North River division, with Mr. Charles M. Jacobs as Chief Engineer in charge. Mr. James Forgie is Chief Assistant Engineer, Messrs. B. H. M. Hewett, Wm. Lowe Brown and H. F. D. Burke are Resident Engineers on the subaqueous work under the North river. Mr. F. Lavis is Resident Engineer of the Bergen Hill tunnels, and Mr. B. F. Cresson, Jr., is Resident Engineer on the portion of the terminal station west of Ninth avenue. An advisory board of engineers is appointed by the two companies, consisting of General Charles W. Raymond, U. S. A., Chairman; Messrs. Charles M. Jacobs, Alfred Noble and George Gibbs. The work is divided into five sections, each in charge of a resident engineer. All of the engineering details were worked out by the railroad company's forces, and every push of the shields was directed by the resident engineer. A large force of inspectors and surveyors was employed constantly in checking elevations and alinement, distortion of the lining, etc., this work being done on a regular daily schedule. The contractors, the O'Rourke Engineering Construction Co., supplied the plant and labor under the direction of the railroad engineers, and worked with them in perfect co-operation. We are indebted to Mr. Jacobs for the information and illustrations from which this article was prepared.

## The Grand Trunk's New Freight Terminal at Toronto.

The new freight terminal which the Grand Trunk has lately finished at Toronto gives facilities for handling business at that important traffic point that are not only ample for present requirements, but will also be enough for considerable future growth. It occupies a new site, near the old terminal, but more accessible. The location is convenient to the important wholesale and manufacturing districts of the city.

The buildings are substantial and handsome. They include an office building fronting on Simcoe street, 44 ft. wide, 180 ft. long and two stories high, an inbound freight house, 50 ft. wide and 955 ft. long, an outbound house, 40 ft. x 910 ft., and a covered transfer platform between, 16 ft. x 910 ft. The office building is a solid brick structure on concrete foundations, with stone trimmings and interior finish of Southern pine. It is steam heated, has its own electric lighting plant, and is fully equipped with vaults and all other necessary facilities.

The two freight houses are of similar construction. The concrete piers, resting on concrete foundations, are spaced 15 ft. on centers and carry Phoenix columns with bottom and top castings which support steel latticed roof trusses. The roof is formed of 2-in. x 8-in. rafters, 2-ft. centers, overlaid with 1-in. hemlock boards covered with four-ply felt and gravel roofing. Nine feet above the floor, between columns, is a 6-in. x 8-in. girder supported at the ends by brackets riveted to the columns, and at the middle by a ¾ in. bolt running up through the beams. This girder supports the door track. Above each door, on both sides of the building, are two sashes, 6 ft. long x 4 ft. high. Above these windows are riveted beams carrying 5 ft. of brick work with a stone coping. The doors are continuous, hung alternately outside and inside, enabling cars and wagons to be unloaded at any point. The floor consists of ⅞-in. maple laid diagonally over 1-in. hemlock resting on 2-in. x 12-in. joists, 2 ft. on centers.

The transfer platform has a row of concrete piers on 15-ft. centers supporting an umbrella roof. The posts are Phoenix columns, and angle bar braces carry the roof, formed of 15-ft. purlins covered with corrugated iron. The platform floor is 2-in. plank nailed to 2-in. x 12-in. joists. There are three tracks in the space for inbound cars and five tracks for outbound cars. The terminal occupies an entire block of 425 ft. in width. The freight houses fill 200 ft. of this, and the remainder is used for team tracks, of which there are five pairs, with the necessary roadways between. The entrance to the terminal is over a single track which crosses Front street diagonally and then joins the converging sidings which run across John street into the terminal.

All tracks are numbered, the house tracks running from 1 to 8, and the team tracks continuing up to 18. The latter are accessible to teams directly from the street. For the guidance of teamsters, the team side of the outbound house has the different doors marked with lettered boards to indicate where goods are received for various "runs," and such goods are accepted only at the proper doors. On the inside of the doors on the track side of the house there are boards to indicate the "runs" and tracks. All doors are numbered. The cars on the house tracks are "spotted" in placing, to give free access to each car and to the transfer platform. The five outbound tracks are divided into sections or train loads to obviate unnecessary switching. The trains to be despatched first are placed at the outer ends of the tracks to facilitate movement and avoid disturbance to the work of loading.

Gang checkers direct the movements of the men. A list is made out each morning showing cars and location, and copies furnished to the checkers. Truckers are given numbers and are directed by a checker, who chalks packages to show what trucker handles them and in which car they are to be put, as well as the number of the track on which the car stands. For example, a package for trucker No. 81, car No. 14, on track No. 3, is chalked "81-14-3." This enables the stower to locate errors in placing. Each stower has two tiers of cars—ten in number—on the outbound tracks and attends to the loading of these cars by the truckers. Carloads of cartage freight are delivered on the team tracks, Nos. 11 to 18, checkers in charge handling the goods direct to teams. Tracks Nos. 9 and 10 are used for outbound carload traffic, which is loaded direct from the teams, the freight being weighed on team track scales. Spare cars for emergencies are worked at present on the head end of tracks 6, 7 and 8, where they can be most easily switched, after loading, to the trains required. The cars on all these "runs" are placed in station order for way freights, so that trains are complete when the cabooses are attached.

Team tracks 17 and 18 are spanned by a 20-ton electric crane, which also serves the adjacent team roadway. It has a steel superstructure resting on concrete piers.

We are indebted to F. H. McGuigan, Fourth Vice-President, for this information.

# GENERAL NEWS SECTION

## NOTES.

The Mobile & Ohio has reduced by three hours the time of its through day train between St. Louis and Mobile.

The honorary degree of Master of Arts was at the recent commencement bestowed by Yale University on Charles S. Mellen, President of the New York, New Haven & Hartford Railroad.

The Pittsburg Chamber of Commerce has established a bureau of statistics of traffic to and from the Pittsburg district, and it has been put in charge of Mr. J. A. Lord, formerly in the service of the Southern Railway.

The Attorney-General of Ohio has ruled that the law of that State forbidding passenger fares above two cents a mile applies on interstate traffic for the portion of the passenger's journey within the State of Ohio.

At Peoria, Ill., a coroner's jury, reporting on the death of a section laborer who was killed in a collision of hand cars, declares that the railroad company is to be censured for employing foreigners unable to understand the orders of their foreman.

At the tenth annual meeting of the Veteran Employees' Association of the Middle division of the Pennsylvania Railroad which was held at Harrisburg June 21, about 500 members were present. The President of the Association is Mr. C. A. Preston, Superintendent of the division. The organization now has 1,200 members.

The Lehigh Valley Railroad has established a freight station at 149th street, New York City, on the east side of the Harlem river. Cars will be taken there on floats. This station is about 12 miles from the terminus of the Lehigh Valley tracks at Jersey City, and is the most northerly freight station within the lighterage limits of the harbor.

The Pennsylvania Railroad, required to produce certain books in court in connection with the Interstate Commerce Commission's coal traffic inquiry, has applied to the judge of the court for an order compelling the Webster Coal & Coke Company and the Pennsylvania Coal & Coke Company to produce certain books to be inspected by the railroad company.

Messrs. Westinghouse, Church, Kerr & Co., who are building for the New York, New Haven & Hartford the new power station at Cos Cob, report that the structures are nearly ready for the first instalment of electric machinery, which is being pushed at the Westinghouse works in East Pittsburg. The first generator is already in the testing department. The initial installation will have a capacity of 13,000 h.p., consisting of Westinghouse-Parsons steam turbines and Westinghouse a. c. single-phase generators. The statement comes to us from the manufacturers: "It is now within the range of possibilities that the first single-phase electric train will run on the New Haven road between New York and Stamford before the summer is over."

A law restricting the issue of free passes, which was passed by the last Legislature of Iowa, went into effect July 4; and the railroads of the state have notified certain persons now holding passes to return them to the company. The passes thus cut off are: City, county, district, state or federal officers, including judges and members of the General Assembly; delegates to any political convention, traveling to or from such convention; members or employees of any political committee; candidates for any city, county, district, state or federal office; jurors in state or federal courts. The statutory prohibition does not apply to notaries public, persons holding an office which pays no fees or salary, officers or members of any state educational institution, officers or directors of the Iowa State Board of Agriculture, members of the Iowa National Guard or of any fire department.

By agreements recently made at Atlanta the railroads of the southeastern states, beginning July 15, will sell interchangeable mileage tickets at $2\frac{1}{2}$ cents a mile. Two forms of book are used, one in each of two districts. The first district includes lines of the Central of Georgia, the Georgia Southern & Florida, the Louisville & Nashville, the Atlantic Coast Line, the Georgia Railroad, Atlanta & West Point, Norfolk & Southern, Atlantic & North Carolina, Virginia & Carolina. Those in the second district are the Southern, the Central of Georgia, the Georgia Southern & Florida, the Alabama Great Southern, the Cincinnati, New Orleans & Texas Pacific, the Blue Ridge, the Augusta Sonthern, the Northern Alabama, the Richmond, Fredericksburg & Potomac, and the Washington Southern. Each book is good over about 15,000 miles of road. The commercial travelers, at whose request these tickets have been issued, are said to be still unsatisfied. They want a reduction in rate as well as an interchangeable ticket.

The Interstate Commerce Commission has won its suit in the United States Circuit Court at East St. Louis in the case of St. Louis Hay & Grain Company against the Southern Railway. The suit was brought to recover $1,572 awarded by the Commission to the Hay Company to be paid by the Southern as reparation for excessive charges on hay in carloads reconsigned from East St. Louis to southern points. The rate in question was 4 cents per 100 lbs. greater than the rate from Ohio River points. At the same time the Southern charged only 2 cents above the Ohio River rate when the hay was not unloaded in East St. Louis, regardless of whether the hay was shipped locally to East St. Louis, or through-billed from the point of origin to the point of destination, or of provisions in the published tariffs concerning through billing. The Commission found that the average expense to the carrier on reconsigned hay which had been unloaded in East St. Louis was only about 1 cent per 100 pounds greater than where the hay was forwarded without unloading, and the reparation awarded was at the rate of 1 cent. The court adopted the findings of the Commission as the special findings of the court, the case having been tried by consent before the court without a jury. The judgment of the court includes interest and is for $1,659, to which are to be added costs and an attorney's fee to be hereafter fixed.

### Disastrous Derailment at Salisbury, England.

By the derailment of an eastbound fast express train at Salisbury, on the London & Southwestern, at 2 o'clock last Sunday morning, 27 persons were killed and six or more were injured. Twenty-three of the killed were Americans, being passengers from the American Line steamship "New York," which had landed at Plymouth a few hours before. The train was a steamer special, taking these passengers to London. At the time of the derailment it was running at very high speed through the moderate curve to the right just beyond the Salisbury station, and the derailed engine and cars ran into a milk train standing on one of the other main tracks. One or more of the wrecked cars stopped on the bridge which spans Fisherton street, just east of the curve, and some of the occupants of the cars fell to the pavement below. The only cause for the derailment thus far suggested is high speed. Neither the officers of the railroad nor the inspectors of the Board of Trade, who examined the track and the wrecked cars and engine, were able to discover any defect or injury in either which seemed likely to have caused the derailment. The press despatches say that all trains are subject to a rule restricting their speed to 30 miles an hour passing Salisbury station. The train consisted of a large engine, four corridor coaches and a combined guard's van and buffet car.

### Bonds for the Panama Canal.

The Secretary of the Treasury offered to the public on July 2 $30,000,000 of the bonds of the Panama Canal loan authorized by the Spooner act June 28, under which the canal construction is being carried on. The bonds will bear 2 per cent. interest, and will be dated August 1, 1906. They will be issued in denominations of $20, $100 and $1,000 of coupon bonds, and of $20, $100 and $1,000 and $10,000 of registered bonds. They will be redeemable at the pleasure of the United States after 10 years from the date of their issue, and will be payable 30 years from that date.

Bids for the bonds must be submitted on or before July 20, 1906. The bonds will be ready for delivery about August 1, 1906.

### Shipbuilding in the United States.

A statement issued on July 2 by the Department of Commerce and Labor shows that during the fiscal year ended June 30, 1906, 1,463 merchant vessels, of 421,744 gross registered tonnage, were built in this country, compared with 1,301 vessels of 326,213 gross tons for 1905. Of the new tonnage, 384 vessels of 73,399 gross tons were unrigged barges and canalboats. The year's increase has been entirely in steel steamers on the Great Lakes, which numbered 52 and measured 237,724 gross tons, compared with 29 vessels of 102,497 gross tons the year before.

### Site for Branch Post Office in New York.

Postmaster General Corteiyou has bought from the Pennsylvania, New York & Long Island Railroad land to be used for a branch post office at the new Pennsylvania terminal in New York. The property extends from 31st to 33d streets, on the west side of Eighth avenue, and is about 460 x 415 ft. A private street will run along

its west side, north and south, and, as in the case of the passenger station, east of Eighth avenue, tracks will run under the building. The price paid is $1,660,085. The Government reserves the right to construct public entrance approaches on the north, east and south sides of the building, to carry mail tubes across the reserved spaces, and to gain proper access to the building should it desire to connect with the city Subway lines.

### Locomotive Exhaust Deflector.

An Atlantic type locomotive of the Great Northern Railway of England has been fitted by Mr. H. A. Ivatt, Mechanical Superintendent, with the smoke deflecting device, patented by Mr. J. F. S. Cridland, drawings of which are shown herewith.

The object of the invention is to prevent smoke, gaseous products of combustion, and steam issuing from the chimney from beating down in front of the cab windows—a very usual occurrence where the modern high boilers and short smokestacks are in use—and thus obstructing the view of the engine driver.

In Mr. Cridland's device a passage for admitting air is formed in the upper part of the front plate of the smoke-box above the door, and this passage or duct has an upwardly inclined inner bottom converging from the shell of the smoke-box round the internally-extended or "trunk" portion of the chimney, which trunk or petticoat pipe is surrounded eccentrically by an oval or other shaped casing so set as to leave the exit of the passage or duct through the mouth of the casing at the back of the chimney; or the casing may be concentric to the chimney extension with the annular space, so formed, closed at the front, leaving the exit at the back of the chimney.

The rush of air through this duct when the locomotive is running thus finds a vertical exit at the back of the chimney and thereby strikes up against the smoke, gas products and steam as they issue from the chimney and forces them upwards, thus preventing their striking against the cab windows and obstructing the view of the engine driver.

In applying the device to engines Mr. Ivatt has fitted a hood, standing out from the smoke-box some three or four inches, just above the opening, for admitting air; this greatly assists in inducing and directing a current of air through the passage or duct.

Locomotive Exhaust Deflector as Applied to Great Northern of England Atlantic Type Locomotive.

### Railroad Elevation in Chicago.

The Pennsylvania-Lake Shore Elevation ordinance and the Chicago & North-Western ordinance have been passed by the City Council. The former provides for the elevation of all tracks from Stony Island avenue to the Indiana state line. Through south Chicago fifteen streets will be opened. This work is to cost $5,200,000 and when completed will give the railroads practically a continuous elevation from their city termini to the Indiana state line.

The North-Western ordinance provides for the elevation of the Evanston branch of the main line from Belmoral avenue to the Evanston line. Permission to extend the elevation through Evanston has been secured. The work will cost between $1,000,000 and $2,000,000.—*Wall Street Journal.*

### Suits for Violation of Safety Appliance Law.

A press despatch from Washington says that the Attorney-General has brought suits against 26 railroads for violation of the Safety Appliance law; that is to say, for using cars not equipped with serviceable automatic couplers or running trains not suitably air-braked. Against one road, the Atlantic Coast Line, 52 violations are charged. The roads against which suits have been brought are the Atchison, the Atlantic Coast Line, the Burlington, the Chicago, Milwaukee & St. Paul, the Rock Island, the Colorado & North Western, the Colorado & Southern, the Denver & Rio Grande, the El Paso & Southwestern, the Missouri Pacific, the Muscatine North & South, the National City & Otay, the Norfolk & Western, the Northern Pacific, the Rio Grande & Pegosta Springs, the St. Johns River Terminal (Florida), the San Pedro, Los Angeles & Salt River, and the Seaboard Air Line.

### Underground Telegraphs in England.

The British Postmaster General, in a recent letter, says that the government underground telegraph line between London and Glasgow has been completed, and that a branch toward Manchester has been finished as far as Leeds. An underground line has been laid from London eastward to Chatham and another westward to Slough. Within the present year it is expected to extend this line to Bristol.

### Railroad Built in Texas in the Half Year.

The engineering department of the Texas State Railroad Commission has compiled the following approximate estimate of railroad mileage (main line) constructed in Texas during the six months ending June 30, 1906:

Beaumont & Great Northern, between Trinity and Onalaska, 15.7 miles; Galveston, Harrisburg & San Antonio, from Stockdale southeast, 38.3; Houston & Texas Central, between Mexia Junction and Jewett, 27; Kansas City, Mexico & Orient, between Sweetwater and Knox City, 21.9; Pecos & Northern Texas, from Canyon City south, 0.8; St. Louis, Brownsville & Mexico, between Refugio and Algoa, 26.6; Trinity & Brazos Valley extension; 89; Wichita Valley, from Seymour to Weinert, 33. Total, 252.3 miles.

Approximate estimate of railroad mileage (main line) constructed in Texas during the year ending June 30, 1906:

Beaumont & Great Northern, from Trinity to Onalaska, 19.7 miles; Galveston, Harrisburg & San Antonio, from Stockdale southeast, 38.3; Houston & Texas Central, from Mexia Junction to Jewett, 28; Kansas City, Mexico & Orient, from Sylvester to Knox City, 55.9; Orange & Northwestern, from Buna to Newton, 31.2; Pecos & Northern Texas, from Canyon City south, 0.8; St. Louis, Brownsville & Mexico, between Refugio and Algoa, 127.6; Trinity & Brazos Valley, extension, 89; Wichita Valley, from Seymour to Weinert, 33. Total, 423.5 miles.

Railroad mileage constructed and in operation in Texas on June 30, 1905, as shown by the 14th annual report of the Railroad Commission of Texas, 11,745 miles; additional mileage constructed but not included in said report, 15. Total mileage constructed and in operation in Texas on June 30, 1906, 12,185.5 miles.

The above does not include some 250 miles of logging railroad and other private railroads, which are not recognized as common carriers by the Commission, nor does it include some electric interurban railroads.

The following is an approximate statement of the railroad mileage now under construction in Texas:

Galveston, Harrisburg & San Antonio, between Stockdale and Cuero, 8.4 miles; Houston & Texas Central, from Jewett to Navasota Junction, 66; Houston Belt & Terminal, in the city of Houston, 6; Kansas City, Mexico & Orient, between Red River and San Angelo, 158; Pecos & Northern Texas, from Canyon City to Plainview, 56; Trinity & Brazos Valley, between Houston and Waxahachie, 138; Texas Central, from Stamford west, 45; Wichita Valley, from Weinert to Abilene, 67. Total, 544.4 miles.

In addition to the above there is something more than 1,000 miles of railroad projected and chartered for immediate construction, some of which is reported having let contracts for construction, and the greater portion of which will probably be completed within the next few years. There is also several hundred miles of

electric interurban lines projected within the state, some of which has been chartered, and all of which may be regarded as being in favorable territory, and whose prospective business will warrant fully the construction of such projects.

### Summary of Prosecutions Under Interstate Commerce Law.

Attorney-General Moody, complying with a resolution of the Senate, reports that under the Elkins law the Department of Justice has secured 36 indictments, resulting in nine convictions, two acquittals and three cases nolle prossed, leaving 22 cases still pending. Eleven of these indictments were for receiving rebates, 19 for granting rebates, five for conspiracy to obtain rebates, and one for conspiring to grant them.

In a report on the prosecutions under the original clauses of the interstate commerce law it is shown that since the passage of the act 84 indictments have been secured, of which 36 had been nolle prossed, 13 had been quashed, six dismissed, 12 were not prosecuted, six resulted in acquittals and 16 in convictions.

Of the $500,000 appropriated for the enforcement of the Sherman anti-trust law, the Attorney-General says that $204,709 has been expended, leaving an available balance of $295,291.

### Australian Railroads—Increased Facilities and Earnings.

The railroads of Australia will during 1905-6 for practically the first time on record earn more than enough to pay full interest on capital expenditure. In 1902-3 there was a net deficit after paying interest of approximately $7,041,825, while in 1903-4 the deficiency was $3,552,545, and last year only $1,951,466. The results in 1904-5 were very satisfactory, for the railroads in Australia are not run for large profits, and in many instances costly lines have been built in advance of, but with the desire to aid, settlement. Any material increase in the population of the country would be immediately reflected in the earnings of the railroads, which promise to become shortly a much more valuable asset than in the past. The Victorian and New South Wales railroad revenue for the first nine months of the present financial year (to March 31) aggregate $29,788,638, an increase of $2,629,944 over the previous year. The New South Wales returns are exclusive of tramways, which also show a good gain. Good progress has also been made in Queensland, south Australia and western Australia.—*Consular Report.*

## TRADE CATALOGUES.

*Electrical and Pneumatic Tools.*—Special circular No. 56 of the Chicago Pneumatic Tool Co., Chicago, is a four-page sheet illustrating special electrical tools and accessories, air-cooled electric drills, standard types of "Little Giant" drills, improved "Little Giant" drills with Corliss valves, and views of the various styles of Boyer and Keller pneumatic hammers.

*Lightning Arresters.*—Circular No. 1,132 of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., describes a number of standard devices for the protection of electrical apparatus against lightning. The devices shown include choke coils, gap units and arresters for a.c. and d.c. circuits both high and low tension.

*Graphite.*—The June number of *Graphite*, published by the Joseph Dixon Crucible Co., Jersey City, reports a new use for graphite. This is the coating of a creaking car with graphite at every point and seam where there could be friction. It is stated that trouble has been entirely stopped by this method.

### Manufacturing and Business.

The Raymond Concrete Pile Co., Chicago, has opened an office at 71 Nassau street, New York, to take care of eastern business.

The Pittsburg Spring & Steel Co., Pittsburg, Pa., has appointed Edw. H. Barnes, Secretary of Railway Supply & Equipment Co., 805-7 Equitable Building, Atlanta, Ga., to represent it in the southern territory.

W. R. Sanborn, late Assistant Engineer of the Chicago, Indiana & Southern, has been elected Treasurer and General Manager of the Lehigh Stone Co., Chicago and Kankakee, Ill. The quarries of the company are at Lehigh, Ill.

### Iron and Steel.

The Great Northern has ordered 15,000 tons of steel rails, the St. Louis & San Francisco 10,000 tons, and the Norfolk & Western 7,000 tons, all for delivery in 1907.

The Dominion Iron & Steel Co. has been given a contract by the Canadian Northern for 50,000 tons of 60-lb. rails. The company is now making 1,000 tons of rails for the Quebec & Lake St. John R. R.

The New York Central lines have closed contracts for 12 steel bridges and will soon ask bids for 15 additional bridges. The company will soon let contracts for about 200,000 tons of rails, and the Harriman lines will soon take 200,000 tons for 1907 delivery.

The Transcontinental Railroad Commission, Ottawa, has awarded the following contracts for supplies for the eastern section of the Grand Trunk Pacific: Steel rails.—Quebec delivery: Dominion Iron & Steel Co., 23,000 tons at $34 per ton. Port Arthur delivery: Algoma Steel Co., 32,000 tons at $34, of which 10,000 tons are to be delivered November, 1906, 22,000 tons June 1, 1907; Dominion Iron & Steel Co., 10,000 tons at $34.50, delivery Aug. 1, 1906. Splice bars.—Quebec delivery: Nova Scotia Steel & Coal Co., 1,317 tons at $47.04. Port Arthur delivery: Hamilton Steel & Iron Co., 2,241 tons at $43.68. Bolts.—Quebec delivery: Montreal Rolling Mills Co., 2,235 tons at $3.57½, August, September and November delivery; Gananoque Bolt Co., 1,072 at $3.41, May, 1907. Port Arthur delivery: Montreal Rolling Mills, 202,800 lbs. at $3.65 per 100 lbs., August, 1906; Toronto Bolt & Forging Co., 202,800 lbs. at $3.60 per 100 lbs., November, 1906; Gananoque Bolt Co., 202,800 lbs. at $3.44 per 100 lbs., June, 1907. Spikes.—Quebec delivery: Peck Rolling Mills, 1,188,200 lbs. at $2.50 per 100 lbs. Port Arthur delivery: Montreal Rolling Mills, 728,900 lbs. at $2.55 per 100 lbs., August, 1906; Toronto Bolt & Forging Co., 728,900 lbs. at $2.50 per 100 lbs., November, 1906; Hamilton Steel & Iron Co., 729,000 lbs. at $2.50, June, 1907.

## MEETINGS AND ANNOUNCEMENTS.

(*For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page* 24.)

### Iron and Steel Institute.

At the joint meeting of members of the American Institute of Mining Engineers and of the Iron and Steel Institute in London July 24, 25 and 26, 1906 (see *Railroad Gazette*, April 26, page 127), the following papers will be presented:

(1) "Machine Moulding," by P. Bonvillain (Paris).
(2) "Tempering and Cutting Tests of High Speed Tool Steels," by Dr. H. C. H. Carpenter (National Physical Laboratory).
(3) "The Nodulizing and Desulphurisation of Fine Iron Ores," by A. Ladd Colby (New York).
(4) "Belgian Practice in Large Gas Engines," by Professor H. Hubert (Liége).
(5) "Electric Steel Smelting," by E. C. Ibbotson (Sheffield).
(6) "Different Methods of Blast Furnace Refrigeration and their Power Requirements," by J. E. Johnson, Jun. (Longdale, Va., U.S.A.).
(7) "The Crystallography of Iron," by F. Osmond (Paris).
(8) "German Practice in Large Gas Engines," by K. Reinhardt (Dortmund).
(9) "The Development of the Roe Puddling Process," by James P. Roe (Pottstown, Pa., U.S.A.).
(10) "The Constitution of Iron Carbon Alloys," by Albert Sauveur (Cambridge, Mass., U.S.A.).
(11) "The Influence of Silicon and Graphite on the Open-Hearth Process," by Alex. S. Thomas (Cardiff).
(12) "British Practice in Large Gas Engines," by Tom Westgarth (Middlesbrough).

At the meeting of the American Institute of Mining Engineers, several important papers dealing with Iron and Steel will be submitted, including the following:

(1) "Comparison of American and European Rail Specifications," by A. Ladd Colby (New York).
(2) "Piping and Segregation in Steel Ingots," by H. M. Howe (New York).
(3) "The Effect of Low Temperature on the Recovery of Steel from Overstrain," by E. J. McCaustland (Ithaca).
(4) "Improvements in Rolling Iron and Steel," by James E. York (New York).
(5) A Simple Distributor for Blast-Furnace Charges," by David Baker, (Philadelphia, Pa.).
(6) "A New Calorimenter for the Determination of Carbon in Steel," by Charles H. White, (Cambridge, Mass.)
(7) "The Gas-Producer as an Auxiliary in Iron Blast-Furnace Practice," by R. H. Lee (Liberty Furnace, Va.).
(8) "Internal Stresses and Strains in Iron and Steel," by Henry D. Hibbard (New York, N. Y.).
(9) "Heat Treatment of Steels containing 0.50 and 0.80 per cent. of Carbon," by C. E. Corson, Latrobe, Pa.
(10) Methods of Mining, Hauling and Screening Coal at the Mines of the Aldrich Mining Co., at Brilliant, Ala.," by T. H. Aldrich, Jr., (Birmingham, Ala.).
(11) Continued Discussion of the Gayley Dry-Air Blast Process.

Bennett H. Brough, Secretary, 28 Victoria street, London, S. W.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Georgia & Florida.*—R. W. Bidgood has been appointed Auditor of the roads which are to compose this system.

*Pacific Coast Co.*—The general offices are being removed from San Francisco to Seattle, Wash.

### Operating Officers.

*Buffalo, Rochester & Pittsburg.*—W. T. Noonan, General Superintendent, has been appointed General Manager.

*Mexican Central.*—R. N. Elliott has been appointed Superintendent of Terminals at Tampico, succeeding A. O. Merrick.

*Roaring Creek.*—R. G. Crossley, Chief Clerk to the Superintendent of the Pennsylvania division of the Delaware & Hudson, has been appointed Superintendent of the Roaring Creek.

*Southern.*—The office of the Superintendent of the Charlotte division will on July 14 be removed from Charlotte, S. C., to Greenville.

### Traffic Officers.

*Atlantic Coast Line.*—T. C. White has been appointed General Passenger Agent, succeeding W. J. Craig, promoted.

*Georgia & Florida.*—A. Pope has been appointed Traffic Manager of the railroads which are ultimately to be operated under this name.

*Illinois Central.*—The traffic department has been rearranged as follows: W. R. Bascom, First Assistant General Freight Agent, to have charge of grain and grain products, live stock and lumber, part of the traffic interchanged with connecting lines north of the Ohio river, traffic between the northwest and the south, southeast and southwest, Pacific coast, New Mexico and Arizona traffic and matters pertaining to classifications.

G. W. Becker, Assistant General Freight Agent, Chicago—Traffic between points in northern territory on and east of the Mississippi river, and the south, southeast and southwest; lumber from Ohio and Mississippi river crossings and points south to points on and east of the Mississippi river.

J. R. Peachy, Assistant General Freight Agent, St. Louis—Traffic originating at and passing through St. Louis and East St. Louis; traffic on the St. Louis division; traffic on the Springfield division, East St. Louis to Litchfield inclusive; traffic interchanged with northern connections at junctions within the above territory, also traffic between the south and stations on the St. Louis division, including interchange with connecting lines within such territory.

V. D. Fort, Assistant General Freight Agent, Chicago—Traffic between stations on northern and western lines of the Illinois Central, except as otherwise assigned; brick, stone, cement, salt and ice traffic; matters pertaining to switching, weighing and inspection.

J. S. Weitzell, Assistant General Freight Agent, Omaha—Traffic interchanged with connecting lines at Omaha, Council Bluffs and Sioux City, also traffic to and from Missouri river points, Kansas City to Sioux City inclusive.

*Las Vegas & Tonopah.*—Harry Green, Chief Clerk in the passenger department of the San Pedro, Los Angeles & Salt Lake, has been appointed General Passenger Agent of the Las Vegas & Tonopah.

### Engineering and Rolling Stock Officers.

*Central of Georgia.*—C. K. Lawrence, Engineer of Construction, has been appointed Chief Engineer, with office at Savannah, Ga., succeeding H. M. Steele, resigned.

*Coahuila & Zacatecas.*—Henry Scholfield, Consulting Engineer, has resigned.

*Southern Pacific.*—J. H. Wallace, Engineer of Maintenance of Way, has been appointed Assistant Chief Engineer, remaining in charge of maintenance of way, on which matters he reports direct to the General Manager.

## LOCOMOTIVE BUILDING.

*The Missouri Pacific* has ordered 30 locomotives from the Baldwin Locomotive Works.

*The Western Maryland* has ordered 15 locomotives from the Baldwin Locomotive Works.

*The St. Louis Southwestern* has ordered 20 locomotives from the Baldwin Locomotive Works.

*The Canadian Pacific*, it is reported, is considering the placing of contracts for a large number of locomotives.

*The Wabash*, it is reported, has placed orders for 60 freight locomotives and 20 switching locomotives, all for 1906 delivery.

*The Texas & Pacific* has ordered 10 locomotives from the American Locomotive Company, to be built at its Rogers works.

*The Pittsburg, Shawmut & Northern* has ordered two consolidation locomotives and one Mallet locomotive from the Baldwin Locomotive Works.

*The Newburg & South Shore*, as reported in our issue of June 29, has ordered one simple mogul freight (2-6-0) locomotive and one simple six-wheel switching (0-6-0) locomotive from the American Locomotive Co. for September delivery. The mogul locomotive will weigh 148,000 lbs., with 120,000 lbs. on the drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 52 in.; wagon top boiler, with a working steam pressure of 200 lbs.; 272 Shelby tubes, 2 in. in diameter and 12 ft. 1¼ in. long; Carnegie firebox, 107 in. x 41¾ in.; tank capacity, 4,500 gallons, and coal capacity, nine tons. The switching locomotive will weigh 133,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 52 in.; straight top boiler, with a working steam pressure of 200 lbs.; 220 Shelby seamless steel tubes, 2 in. in diameter and 11 ft. 7⅛ in. long; Carnegie firebox, 112 in. x 31⅜ in.; tank capacity, 4,500 gallons, and coal capacity, eight tons. The special equipment for both includes: Westinghouse-American air-brakes, Gollmar bell ringer, magnesia sectional boiler lagging and Sterlingworth brake-beams for switching locomotive, Climax couplers, Monitor injector, Jerome and American Locomotive Co. piston and valve rod packings for mogul locomotive, and Leach sanding devices.

## CAR BUILDING.

*The Delaware & Hudson* is in the market for 100 ballast cars.

*The Seaboard Air Line*, as reported in our issue of June 22, has ordered 611 flat cars from the American Car & Foundry Co.

*The New Orleans & Northeastern* has ordered 115 additional flat cars and 60 box cars from the American Car & Foundry Co.

*The Rio Grande, Sierra Madre & Pacific* has ordered 500 flat cars from the Pullman Co. for the Cananea Consolidated Copper Co.'s extension from Temosachic.

*The Isthmian Canal Commission* in addition to the 1,000 flat cars reported ordered in our issue of June 29, has ordered 100 ballast cars and 17 passenger cars from the American Car & Foundry Co.

*The Charleston Consolidated Railway, Gas & Electric Co.* has ordered four semi-convertible cars from the J. G. Brill Co. These cars will have a seating capacity for 32 persons and will measure 20 ft. 8 in. long by 7 ft. 8½ in. wide by 9 ft. 1 in. high, all inside dimensions; the bodies will be of wood and the underframes will be of wood and metal. The special equipment will include Brill 21E trucks fitted with G. E. 67 motors; Brill rattan car seats, open vestibules, and National Wheel Co.'s wheels.

*The Canadian Pacific* is building one sleeping car, one baggage commissariat car, 88 flat cars and 14 stock cars at its Angus shops. The sleeping car will be 72 ft. long by 9 ft. 10½ in. over frame; it will be provided with 12 sections, one smoking room and one state room; the body and underframe will be of wood. The baggage commissariat car will be of the same over all dimensions, and will be fitted with permanent inside fittings for refreshments. The flat cars will be of 60,000 lbs. capacity and will measure 36 ft. 8 in. long by 8 ft. 10 in. wide. The bodies and underframes will be of wood. The stock cars will also be of 60,000 lbs. capacity, and will measure 36 ft. 8 in. long by 9 ft. 5 in. wide by 7 ft. 1¼ in. high. The bodies and underframes will be of wood. The special equipment for all will include Westinghouse air-brakes, Tower couplers, Minor tandem draft rigging, Simplex brake-beams, double bolsters for sleeping and baggage cars, and Simplex bolsters, with Susemihl side bearings for stock and flat cars. Harrison dust guards, McCord journal boxes, all steel diamond pattern trucks with Barber rollers and cast-iron wheels for both stock and flat cars, and Pantasote curtain material, Forsyth roller curtain fixtures, Gold heating system, Standard Steel Co.'s platforms, six-wheel trucks, Pullman vestibules and 36¼ in. diameter steel-tired wheels for both sleeping and baggage cars.

## RAILROAD STRUCTURES.

Buffalo, N. Y.—The Wabash, it is announced, is planning to build a passenger station on the old Hamburg Canal property recently purchased at Buffalo, N. Y.

Carman, Man.—The Midland of Manitoba (Great Northern), it is reported, will build 32 bridges on its line between this place and Neche, N. Dak., just south of the international boundary. E. Brown, Mayor, Portage la Prairie, Manitoba, is President of the company.

Little Rock, Ark.—An ordinance has been passed by the city council granting land to the St. Louis, Iron Mountain & Southern as part of the site on which the union passenger station is to be built. The new station will cover two acres of ground at the corner of Cove and New Markham streets, and will cost $400,000.

MACON, GA.—Ground, it is said, has been bought at this place for putting up a large union passenger station.

MACKEY'S FERRY, N. C.—If the Norfolk & Southern succeeds in securing its permit to build a bridge over Albemarle sound the structure will be over five miles long. The plans call for a structure 27,200 ft. in length. There will be only one track on the bridge. There will be a draw 700 ft. wide of the lift type. Objections to the bridge will be heard at a public hearing at Edenton, N. C., during the week of July 23.

MARYSVILLE, CAL.—The Northern Electric Company, which is building an extension of its Chico-Oroville line from Oroville, Cal., to Marysville via Yuba City, has offered to make its new railroad bridge across the Feather river between Yuba City and Marysville a double deck structure to replace the old wooden county bridge spanning that stream, provided that the two Counties of Sutter and Yuba bear an equitable share of the expense.

MOBILE, ALA.—The Louisville & Nashville, it is said, is planning to enlarge its freight house here.

SAN FRANCISCO, CAL.—The Western Pacific has secured property at the southwest corner of Ninth and Bryant streets in San Francisco, where it is understood the main passenger station is to be built.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

CANADIAN PACIFIC.—An officer writes that the extension of the Kootenay Central from Golden, B. C., southeast to Fort Steel or Jaffray will be about 180 miles long. Only ten miles will be completed this year, from Golden south. This will be done by the British Columbia General Contract Co. The track will be laid by the company's men.

The company will spend $100,000 this summer in improving the Esquimalt & Nanaimo branch. A similar amount will be expended each year until the roadbed is up to the standard.

The Nicola branch in British Columbia was opened July 2.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHATHAM, WALLACEBURG & LAKE ERIE (ELECTRIC).—This company, it is said, proposes to extend its electric line from Chatham to Rondeau Harbor, 20 miles, and is making surveys for a line to Sarnia, 40 miles.

CHICAGO & NORTH-WESTERN.—This company is to spend $3,000,000 for improvements on the Ashland division during the present season. Reducing grades and straightening curves will form the most important part of the work.

Part of the extension from Manitowoc, Wis., northwest 74 miles to Gillette will shortly be placed in operation to Maribelle, 16 miles north of Manitowoc. The distance to Green Bay, through which this line will pass, is about 49 miles, and to Gillette from Green Bay about 25 miles.

The company is also building a line from Kneeland Junction south to Shawano, through Forest, Langlade and Shawano Counties, to open new territory. The plans for operating this line have not yet been definitely outlined. Both these lines will greatly facilitate shipments over the Ashland division, which is being made a low grade line for the speedy transportation of freight. (See Construction Record; also June 22, p. 181.)

A contract has been let by this company to Kilpatrick Bros. & Collins, of Omaha, for building a 26-mile extension from Bonesteel west. The contract calls for the completion of the work by Sept. 15. More than half of the work has been already sublet and grading is to be started at once. (June 22, p. 181.)

CHICAGO, BURLINGTON & QUINCY.—This company, it is reported, will build a line from Gillette, Wyo., east through Spearfish, S. Dak., to a connection with the Great Northern at Ellendale, N. Dak., or Aberdeen or Huron, S. Dak. There is to be a bridge over the Missouri river at Pierre.

CHICAGO, MILWAUKEE & ST. PAUL.—This company, it is reported, has opened a new cut-off between Defiance and Early, Ia., on the main line to Omaha, shortening the distance a mile and reducing the grade from 74 to 34 ft. The company is also laying a second track between Watertown and Portage, Wis., and at points between La Crosse and Minneapolis.

CLINTON, CHEYENNE & CANADIAN.—Incorporated in Oklahoma with $1,000,000 capital to build a line from Clinton in Custer County, Okla., which on the Chicago, Rock Island & Pacific, and the St. Louis & San Francisco, west to Canadian on the Atchison, Topeka & Santa Fe, in Hemphill County, Texas, about 100 miles.

CUBA RAILROADS.—The Cuban Senate has passed the House railroad subsidy bill, appropriating $6,000 per kilometre for the construction of twelve branch railroad lines, which will be feeders for the Van Horne system (the Cuba railroad). The subsidies are to be paid at a rate not exceeding $500,000 annually until all the roads are completed.

President Palma has decided to approve the bill. This measure gives the Van Horne people full control of the transportation situation in central and eastern Cuba. (June 8, p. 167.)

GASSAWAY, ELK RIVER & HUTTONSVILLE.—This company, chartered in West Virginia to build from Gassaway, W. Va., south to Webster Springs, approximately 25 miles, will start work at once, and it is proposed also to build an extension from Webster Springs to Huttonsville. (April 27, p. 129.)

HOUSTON, SABINE & RED RIVER.—A contract has been let to C. Rice and work has been started on this line. The proposed route is from Houston, Tex., north and northeast to Alexandria, La., about 200 miles via Spurger, Jasper and Burkeville, Tex., and Leesville, La. About 22 miles of the grade has been completed. H. W. Cortes is President; Edwin Kennedy, Vice-President, and J. M. Cotton, Secretary, all of Houston. (See Houston, Beaumont & Red River in Construction Record.)

LOUISIANA & PACIFIC.—See Shreveport, Alexandria & Southwestern.

MAINE CENTRAL.—This company has a large force of men at work double-tracking its line from Newport, Me., to Carmel, 12 miles. When this is completed the road will have a double track between Portland and Bangor, except on three sections.

MIDLAND VALLEY.—Plans, it is reported, are being made by this company for extending its line from the southern terminus at Hoye, Tex., south to Texarkana, about 150 miles.

MITCHELL MINING CO.—This company, which is composed of a number of Pittsburg capitalists, at a recent meeting in Washington, D. C., considered the question of issuing $1,000,000 in bonds to build a railroad from the company's copper mining plant at La Dicha, Guerrero, Mex., southwest to a point on the Pacific coast, approximately 183 miles.

NORTHERN PACIFIC.—Announcement is made that this company has started work on a section of the Port Townsend Southern. Surveys are being made from Quilcene, Wash., south to connect with the main line, probably at Olympia. (June 1, p. 161.)

OMAHA & DENVER SHORT LINE.—Incorporated in Colorado and in Nebraska with $12,500,000 capital to build a railroad from Denver, Colo., east through Adams, Washington and Yuma Counties in Colorado, and Cheyenne, Rawlins, Decatur, Norton and Phillips Counties in Kansas. The route through Kansas has not been definitely determined. In Nebraska it will pass through Harlan, Franklin, Kearney, Adams, Clay, Fillmore, York, Seward, Lancaster, Saunders, Sarpy and Douglas Counties to Omaha, 500 miles air line. The offices of the company will be in Denver and in New York. C. M. Allaire, C. S. Devere, D. B. Ellis, C. L. Horton and P. Robinson are directors. Three of the directors, C. M. Allaire, C. L. Horton and C. S. Devere, are eastern capitalists who are said to have been instrumental in financiug the project. Of the incorporators, Samuel F. Rathvon is Secretary and Treasurer of the United Oil Co.; Frederick R. Ross is a well-known real estate man in Denver; Daniel B. Ellis, George A. H. Fraser and Percy Robinson are connected with the law firm of Rogers, Cuthbert & Ellis, attorneys of the Colorado Eastern. This company operates 17 miles of road from Denver east to Scranton, and it is thought that one of the trunk lines not having terminal facilities of its own in Denver contemplates securing those of the Colorado & Eastern.

PACIFIC & EASTERN.—The application for a charter made by Col. Pellatt and other Toronto capitalists, representing this company, which intends building a line from Victoria, B. C., northeast to Fort Churchill, on Hudson's Bay, has passed the Canadian Senate. (May 4, p. 136.)

POLAND, BOARDMAN & CANFIELD.—See Youngstown & Southern.

PORT TOWNSEND SOUTHERN.—See Northern Pacific.

RALEIGH & PAMLICO SOUND.—It is said that the various points to be connected by this line and the distances are as follows: Raleigh east to junction with Seaboard Air Line, 2.23 miles; Pamlico Junction to Knightward, 12.1 miles, thence to Wendell, 4.9 miles; Wendell to Zebulon, 4.73 miles; Zebulon to Wilson, 24.6 miles; Wilson to Stantonsburg, 10 miles; Stantonsburg to Farmville, 13.1 miles; Farmville to Greenville, 12.1 miles; Greenville to Chocowinity, 16.6 miles; Chocowinity, thence south to Newbern, 28.14 miles, and Chocowinity east to Washington, 3.78 miles; a total of 132.28 miles, with a branch from Farmville south to Snow Hill, 11 miles. Connections will be made with the Seaboard Air Line at Pamlico Junction, the Atlantic Coast Line at Wilson and at Greenville, with Norfolk & Southern at Washington. John W. Stewart, of Raleigh, N. C., is Chief Engineer. Construction contracts have been let to J. G. White & Co., of New York, and for rails, spikes,

bolts, nuts and frogs to the Pennsylvania Steel Co., of Steelton, Pa. (See Construction Record.)

St. Joseph & Nodaway Valley.—Incorporated in Missouri with $800,000 capital to build a line from St. Joseph, Mo., north to Graham, in Nodaway County, through Buchanan, Andrew and Nodaway Counties, about 35 miles. W. C. Wilson, T. E. Denny, A. C. Snyder and T. E. Fleming are incorporators.

Shreveport, Alexandria & Southwestern.—Contracts are being let by this company for extending the Louisiana & Pacific from DeRidder, La., south via Bon Ami and Ramsey to Banks, approximately 37 miles. The work includes the reconstruction from narrow to standard gage of 18½ miles of line. Three miles of the balance are already graded and all of the right-of-way secured.

Southern Pacific.—The first division of the Guaymas-Guadalajara extension, being built under the name of the Cananea, Yaqui River & Pacific, is finished. It extends from a point on the Sonora line a short distance above Guaymas, near Batamotal, east to Torin, about 50 miles. The line has been inspected by a Government engineer and will be opened at once. (See Construction Record.) The extension south from Torin will cross the Yaqui river a short distance below that place, on a steel bridge, to be built at a cost of $650,000.

Suffolk Traction.—Incorporated in New York with $1,000,000 capital to build an electric line from Brookhaven, Long Island, west via Bellport, Patchogue, Blue Point, Bayport, Sayville and Islip to Babylon, 28 miles. Associates of the Brooklyn Rapid Transit Company are interested in the company, together with men in business along the route. Herbert Siebert is a director.

Tidewater Development Co. (Electric).—An officer writes that contracts for building this proposed line will be let in November. The route is from Gadsden, Ala., southwest via Ashville, St. Clair Springs, Springville, Huffman, East Lake, Woodlawn, Avondale, Birmingham, Thomas, Pratt City, Ensley, Bessemer, Brookwood and Holt to Tuscaloosa, about 125 miles. From this point the company will operate steamship lines south on the Warrior, Tombigbee, Alabama and Mobile rivers to Mobile. The work will be easy and requires only a few small bridges, with no tunneling. (June 15, p. 175.)

Western Maryland.—A contract, it is said, has been given to Fisher, Gilmore & Reiley of Baltimore for reconstructing and double tracking this road from Owings Mills, Md., north to Emory Grove, 6½ miles.

Youngstown & Southern.—The Poland, Boardman & Canfield Railway Co. has been organized at Sharon, Ohio. The company is affiliated with the Youngstown & Southern, which has built a line from Sharon to Columbiana, and it is proposed to connect with other towns in eastern Ohio.

## RAILROAD CORPORATION NEWS.

Atlanta, Birmingham & Atlantic.—This company has increased its capital from $14,000,000 to $24,000,000, the capital now consisting of $8,000,000 preferred stock and $16,000,000 common.

Birmingham Southern.—See Tennessee Coal, Iron & Railroad.

Black Mountain.—See Virginia & Southwestern.

Boston & Maine.—R. L. Day & Co., Lee, Higginson & Co., Kidder, Peabody & Co., and Estabrook & Co., who recently bought the $10,000,000 4 per cent. 20-year refunding bonds of this road, are offering $8,000,000 of the bonds for sale at 103 and interest. The proceeds will be used to retire $7,724,500 Eastern Railroad Co. 6 per cent. certificates of indebtedness.

Hocking Valley.—This company is to issue $5,400,000 additional common stock, making the total outstanding $16,400,000. The new stock is to be exchanged for Kanawha & Michigan stock.

Indiana, Columbus & Eastern Traction.—The roads to be merged into this company are the following: The Dayton, Springfield & Urbana, the Urbana, Bellefontaine & Northern, the Columbus, London & Springfield, the Columbus, Grove City & Southwestern, the Columbus, Buckeye Lake & Newark, the Columbus, Newark and Zanesville, the Columbus & Lake Michigan, the Dayton & Western, the Dayton & Northern, the Dayton & Muncie and the Zanesville Railway, Light & Power Co. (June 29, p. 190.)

Indianapolis & Cincinnati Traction.—Charles L. Henry, President of this company, now operating 70 miles of interurban electric line out of this city, was appointed receiver for the company on July 3d on application of a stockholder. It is alleged that the company is unable to meet outstanding indebtedness of $500,000, though assets are in excess of liabilities.

Interborough-Metropolitan.—The New York Stock Exchange has listed $67,406,000 collateral trust 4½ per cent. bonds of 1956, $45,284,600 5 per cent. cumulative preferred stock and $92,360,100 common stock. In its application for the listing of these securities, the company made the following statement of the stocks and bonds now owned by it: Three hundred and thirty-seven thousand and thirty-two shares of Interborough Rapid Transit stock; 422,846 shares of Metropolitan Street Railway Company stock; 289,171 shares of the stock of the Metropolitan Securities Company; 17,800 shares Subway Realty Company stock; 32,045 shares New York & Queens County Railway Company stock; 59,870 shares Rapid Transit Subway Construction Company stock; 1,981 shares Pelham Park Railway Company stock; 1,990 shares City Island Railroad Company stock; 938 shares New York & Long Island Railroad Company stock; one-half interest in 5,000 shares preferred stock of New York & Long Island Traction Company; one-half interest in 14,707 shares common stock of New York & Long Island Railroad Company; one-half interest in $1,000,000 4½ per cent. mortgage bonds of New York & Long Island Traction Company; one-half interest in 5,980 shares Long Island Electric Railway Company stock; one-half interest in $600,000 first mortgage 5 per cent. gold bonds of Long Island Electric Railway Company.

International & Great Northern.—See Missouri, Kansas & Texas of Texas.

Kansas City Southern.—This company has accepted the terms of the act of Congress, recently passed, for transfer of the Port Arthur canal to the United States. By the terms of the act Port Arthur becomes a port of entry.

Lehigh Valley.—The Supreme Court of Pennsylvania has decided that this company must pay back dividends, amounting to 100 per cent., on its $106,300 preferred stock. This sustains the decisions of lower courts. (Feb. 2, p. 38.)

Missouri, Kansas & Texas of Texas.—This company is now running its through trains to and from San Antonio, Texas, by way of Austin instead of Smithville. The cut-off leaves the main line at Granger; from there to Austin, 77 miles, the M., K. & T. is used and trackage rights have been obtained over the International & Great Northern for the 30 miles between Austin and San Marcos, where a connection is made with the M., K. & T. main line again. By the new route the time is shortened about an hour.

National of Mexico.—See Rock Island Co.

Pigeon Creek.—See Virginia & Southwestern.

Reading Company.—The gross earnings of the Philadelphia & Reading Railway for the month of May were $3,289,052, a decrease of $261,425; net earnings, $1,086,826, a decrease of $435,572. The P. & R. Coal & Iron Company shows a deficit of $3,024 for May, as compared with net earnings of $325,463 a year ago.

Rock Island Company.—It is reported that interests identified with this company have bought the Texas-Mexican Railroad from the National of Mexico. The T.-M. runs from the Rio Grande river to Corpus Christi, 162 miles.

Tennessee Coal, Iron & Railroad.—This company has bought back from the Southern and the L. & N. the Birmingham Southern, which operates a number of railroads from Birmingham, Ala., to various iron mines, aggregating 26 miles. The T. C. I. & R. R. owned the B. S. until 1900, when it was sold to the two companies mentioned for $1,100,000.

Texas-Mexican.—See Rock Island Co.

Toledo & Western (Electric).—C. F. Franklin has been appointed receiver for this company, which operates 67 miles of road from Toledo to Fayette, Ohio, and a branch to Adrian, Mich. The company also controls the Toledo, Fayette & Western, which has 14 miles of road. The company was unable to meet the July interest on $50,000 of Toledo, Fayette & Western bonds, guaranteed by the Toledo & Western.

Virginia & Southwestern.—It is reported that this company has bought the Black Mountain Railroad, which runs from Darbey, Va., to Intermont, 23 miles, and also the Pigeon Creek Railroad, which runs from Intermont to the Imboden Coal & Coke Co., 2 miles.

Wabash.—The directors have approved the proposition to issue $200,000,000 in bonds, and also the plan for the retirement of the A and B debenture bonds. (June 15, p. 176.)

Lee, Higginson & Co., Boston, and Clark, Dodge & Co., New York, are offering, at a price to yield 5 per cent., $6,180,000 Wabash 4½ per cent. equipment bonds maturing semi-annually from January 1, 1907, to July 1, 1916, inclusive. The bonds are secured on 60 freight locomotives, 20 switching locomotives, 4,000 steel underframe 50-ton capacity coal cars and 2,000 40-ft. box cars of 40 tons capacity.

# GENERAL NEWS SECTION

## NOTES.

The business men of Selma, Ala., have established the Selma Rate Bureau, and it is in charge of J. T. Slatter.

The Northern Express Company has been incorporated as successor to the Northern Pacific Express Company. This is believed to be a step in the merger with the Great Northern Express.

The United States floating drydock "Dewey" which left Chesapeake Bay on Dec. 28, 1905, in tow of two colliers, arrived at destination, Olongapo, P. I., on July 9, after a voyage of 12,000 miles. The trip was made via the Suez Canal.

The Attorney-General of Virginia has begun proceedings to compel the railroads to comply with the Churchman act, which is the law passed at the last Legislature requiring all railroads to sell mileage tickets at 2 cents a mile.

The Canadian Pacific now has two copper telegraph wires between Montreal and Winnipeg and has a number of offices equipped with telegraphone apparatus, by which both telephones and telegraph instruments are used on these wires.

The President of the Pennsylvania Railroad has issued an order directing all officers and employees to divest themselves of any interests, direct or indirect, that they may have in coal companies, or other shippers or interests connected with the business of the road, as recommended in the report of a special committee of the directors, which was given in the *Railroad Gazette* last week.

The Pennsylvania Railroad has issued elaborate and carefully revised rules for the movement of coal cars, both loaded and empty, and the distribution of cars to shippers, with a view to providing a perfect record for reference in case of dispute as to whether or not injustice has been done to any shipper.

The Secretary of Agriculture has notified the railroads that he intends to strictly enforce the live stock transportation law, as amended by Congress at the last session. Animals may now be kept in cars 36 hours on the written request of the owner, or person in custody of the shipment; and the time for confinement of sheep in cars may be extended from 28 hours to 36 rather than unload them in the night time.

At Chicago, July 7, a jury in the Federal court returned a verdict of guilty against J. N. Faithorn and F. A. Wann, former officers of the Chicago & Alton, for granting illegal rebates to the Schwarzschild & Sulzberger Company. Sentence was suspended until July 11, at the request of the counsel for the railroad, for the purpose of securing new evidence, but none was produced, and fines were assessed aggregating $50,000; on the railroad $20,000 each on two counts, and on Messrs. Faithorn and Wann $5,000 each on two counts.

The Atlantic City Railroad (Reading System) now runs a train from Camden to Atlantic City once each hour throughout the day, beginning at 5 a.m. and ending at 9 p.m. From Atlantic City to Camden there is a train every hour from 7 a.m. until 10 p.m. Besides these, there are four other fast trains to the seashore in the afternoon and three from the shore in the morning.

Judge Holt, in the United States Circuit Court at New York City, has sustained the demurrer of Messrs. Guilford and Pomeroy, of the New York Central, and Messrs. Edgar and Earle, shippers, to the indictment returned some time ago charging them with conspiracy to violate the laws of the United States. The men named were indicted for making secret and illegal rates on sugar from New York to Detroit, and suit was brought under Section 5,440, which prescribes either fine or imprisonment or both. Judge Holt holds that Congress, in passing the Elkins law of 1903, expressed the intention that violations of the freight rate law should be punished by fines only; the act expressly declared that imprisonment was abolished. The amendment passed this year, restoring the imprisonment penalty, is not retroactive.

### Ties from Japan.

It is reported from San Francisco that the Harriman interests have made contracts in Japan for 1,500,000 ties, to be delivered at Guaymas, on the Pacific coast of Mexico, for 56 cents gold, each. One cargo of 83,000 ties has already been delivered. They are to be used on the 700 miles of new lines which are being built in the states of Sonora and Sinaloa in the interest of the Southern Pacific Company.

### Increase in Gross Earnings.

Reports from 56 railroads show for the eleven months ended May 31 an increase in gross earnings of 12.3 per cent., compared with the same period of last year, and 15.4 per cent. increase in net earnings. Applying these percentages to the Interstate Commerce Commission's figures for 1905, the following results are obtained as an estimate of the earnings for all the roads of the country for the full year:

| | |
|---|---|
| Total gross, 1905 | $2,073,177,000 |
| Increase, 1906 | 255,000,000 |
| Gross, 1906 | $2,328,177,000 |
| Total net, 1905 | 689,593,000 |
| Increase, 1906 | 106,197,000 |
| Net, 1906 | $795,790,000 |

The following is a list of the estimated gross earnings for the year of the larger roads whose increase is over 10 per cent.:

| Road. | Gross, 1906. | Increase. | Per cent. |
|---|---|---|---|
| Pennsylvania | $134,000,000 | $18,000,000 | 15 |
| Canadian Pacific | 61,600,000 | 11,100,000 | 22 |
| Northern Pacific | 62,000,000 | 10,400,000 | 20 |
| Atchison | 78,800,000 | 10,000,000 | 14 |
| Baltimore & Ohio | 77,219,000 | 9,600,000 | 14 |
| Great Northern | 52,000,000 | 8,500,000 | 19 |
| Union Pacific | 66,900,000 | 8,200,000 | 15 |
| New York Central | 89,400,000 | 7,100,000 | 10 |
| Chicago & North-Western | 62,700,000 | 7,000,000 | 13 |
| Rock Island | 51,000,000 | 7,000,000 | 16 |
| Erie | 49,600,000 | 6,300,000 | 14 |
| St. Paul | 55,000,000 | 5,000,000 | 10 |
| Lake Shore | 41,000,000 | 4,900,000 | 13 |
| Louisville & Nashville | 42,500,000 | 4,000,000 | 10 |
| Norfolk & Western | 28,200,000 | 4,200,000 | 17 |

—*Wall Street Journal.*

### Report from Lodge No. 683.

MINOT, N. DAK., June 1.—On the evening of April 18th Grand Master John J. Hannahan and bride arrived on No. 5 from St. Paul on their wedding tour to the coast in J. J. Hill's private car. As we did not hear of this news until two hours before train time we were unable to give the Grand Master and bride the ovation that we should have liked to. On his arrival in the city he extended a cordial invitation to all brothers to meet with him in his private car, which was appreciated and enjoyed by all. By special invitation Master C. D. Riffey and wife and Secretary C. Amsbaugh and wife accompanied the bridal party as far as Williston. The Brotherhood appreciates very much the courtesies so generously extended to our Grand Master by General Superintendent Slade. Such acts as these tend to bind more firmly together the two great classes, Capital and Labor, and will aid in the solution of many of the industrial problems which are bound to arise.—*Locomotive Firemen's Magazine.*

### A Juggernaut in Pennsylvania.

According to a press despatch from Altoona, Pa., of July 4, 11 men were killed near that city on the night of the 3d by a runaway freight car. It appears that on the Martinsburg branch of the Pennsylvania Railroad, a line on which trains are not run at night, a car was started from Portage by some unknown person and ran uncontrolled at high speed about three miles down the steep grade to Puritan, and in its course ran over and killed 11 men. Not more than two of the bodies were found in any one spot. On the following day it was reported that the victims of the runaway car were non-union miners and that the car had probably been maliciously started by enemies of these men, who were known to use the track as a footpath at night.

### Government Purchase of Italian Railroads.

The Italian parliament has approved the purchase by the government of the railroads in southern Italy. Payment is to be made at the rate of $6,000,000 annually for 60 years. The government already owns most of the important railroads of Italy.

### New York Telephones.

A bulletin has just been issued by the New York Telephone Company and the New York & New Jersey Telephone Company showing the increase in telephones in New York City during the month of June just past. The total net gain in telephones for the month is given as 3,591. This is against a gain of 2,217 telephones during June, 1905, an increase for June, 1906, over the same month of last year of 62 per cent.

### The Glory of St. Paul.

One of the most striking illustrations of the rapid development of the railroads of the Northwest is that to be seen any night by a visit to the Union Depot, at St. Paul, Minn., where, standing side by side, may be found four of the finest trains in the world, each run by a separate railroad, each bound for the same destination and

all scheduled to be started at nearly the same time. At no other place in the United States [or the world] can such a sight be seen, and to the railroad man it is really inspiring. The cars of these trains are all of the latest design and embody all the best features; and they are hauled by the fastest and most powerful passenger locomotives.

St. Paul is a night's ride, 410 miles, northwest of Chicago, and the traffic between the two cities is now heavy. The competition, however, is still heavier, for no less than six roads run through trains between the two points. Compared to the east, taking Pittsburg and New York, or Buffalo and New York, for example, the superiority of the western service is clearly apparent. Buffalo and New York are connected by the New York Central, the Lehigh Valley, the Lackawanna and the Erie, but the competition is not keen owing to the varied distances traversed by the several roads. Pittsburg traffic to and from New York is practically monopolized by the Pennsylvania. In the west conditions are different, and even with the high class service there is never any mention of extra fare. Competition forbids the thought of it. A glance at the folders published by the various companies shows the following St. Paul-Chicago mileage: Burlington, 431; Chicago Great Western, 420; Chicago, Milwaukee & St. Paul, 410; Chicago & North-Western, 410; Chicago, Rock Island & Pacific, 465; Wisconsin Central, 514. The last two named, owing to their greater length, do not strenuously compete but nevertheless run several good trains. The first four, however, are after the traffic all the time. The Burlington's famous No. 48, advertised as the finest train in the world; the Great Western Limited; the Pioneer Limited (St. Paul), and the new Northwestern Limited are the trains that attract the public, and they present a brilliant spectacle as they stand side by side with their innumerable sparkling electric lights glittering from one end to the other.

The Great Western Limited is the first to leave, at 8.30 p.m. It is closely followed (8.35) by the Pioneer Limited and the Northwestern's flyer goes at the same time. Five minutes after that the Burlington starts and the last of the quartette is off on its all night run to Chicago. The first and third reach the western metropolis at 8.55 a.m., while the Pioneer and Burlington are scheduled to reach the same depot at 9 a.m. The stops are such that all these trains have to maintain fast time, but the last named is compelled to make the fastest owing to the additional 21 miles in its route. The number of cars hauled varies according to the time of year but usually they range between seven and 12. All the cars are mounted on six-wheel trucks. The North-Western uses the Pacific type locomotive with piston valves; the Great Western the Prairie, while the Burlington and the St. Paul have the Atlantic type.

C. F. T.

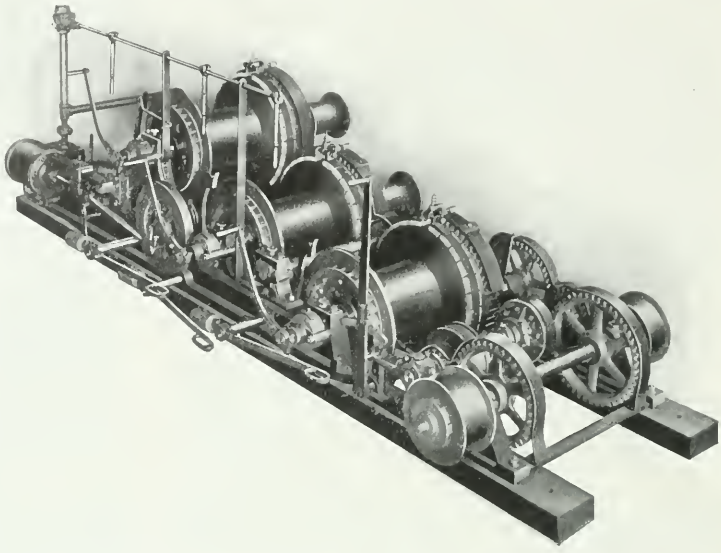
### Prize Story of the Season.

Running at the rate of 60 miles an hour just south of Reading, a train of the Philadelphia & Reading Railway, filled with passengers, came to a sudden stop last night, halted by the red light of a block signal. After waiting the minute in which a train is supposed to clear the short blocks, the engineer proceeded with caution, expecting a wreck, or at least a broken rail. . . . An inspector was sent out at once, and found the red still showing. A thorough examination overhead and above ground showed no defect. The inspector finally removed the top of the underground case, which contains the electric connections with the rails. A garter snake, 22 in. long, lay comfortably coiled, its head cushioned on the delicate spring, depressing it so that it made the contact necessary to set the signal at danger. The reptile had reached the height of its fame and met death in so doing.—*Allentown Leader.*

Contrary to our expectations, we find no foot note explaining that this is the *Leader's* prize story, the result of an exciting competition between all the romance writers of Pennsylvania, New Jersey and Delaware. It deserves the prize, however; at least for this season. The Massachusetts sparrow that lit on the counterweight of an enclosed disk signal will now take a back seat—or, rather, roost in the rear row.

### Three Drum Tandem Lidgerwood Derrick Engine.

The double cylinder, three drum tandem Lidgerwood hoisting engine shown in the accompanying illustration is designed for use where it is desired to operate three hoisting lines or ropes. It needs one man to run it. Its construction is much the same as the standard two-drum hoisting engine built by the Lidgerwood Manufacturing Co., New York, with the addition of the third drum. An equipment of the Buckeye Dredging Company, of Columbus, Ohio, for elevating gravel from barges is fixed on a steel tower 10 ft. square at the base, 5 ft. square at the top and 22 ft. high. The 10 x 12 double-cylinder, three-drum hoisting engine is on the same platform, steam being taken from the main boilers which operate the other machinery. The boom is 80 ft. long, of steel construction lattice-work pattern, and the derrick is rigged to handle a 1⅝-yard clam-shell bucket. The weight of the bucket loaded is 6,000 pounds.



Three Drum Tandem Lidgerwood Derrick Engine with No. 4 Swinging Gear.

The two rear drums of the engine are used to operate the bucket ropes, which are ⅞ in., and lead from sheaves at the foot of the hoist direct to the drums. The forward drum is used to operate the boom topping lift, which is of ¾-in. rope and passes over rooster at top of mast direct to the engine. A No. 4 swinging gear is employed to operate the 16-ft. bull wheel for swinging the boom. The drums are so arranged that they may be operated independently of one another, or they may all be operated at the same time for hoisting, lowering or swinging. Each is equipped with a cone friction of wood, a steel band brake with segmental wood lining and a ratchet and pawl. The cone friction is employed for hoisting the load and the band brake for lowering. When it is desired to hold the load suspended at any particular point a pawl is used, and holds the ratchet which is cast on one flange of each drum.

### Manufacturing and Business.

The Sprague Electric Company now has a permanent office in the Atlas Building on Mission street, San Francisco, Cal.

C. L. Bundy, general foreman of the D., L. & W. shops at Scranton, Pa., has been appointed manager of the car department of the Hicks Locomotive & Car Works, Chicago.

The Boston offices of the Niles-Bement-Pond Company and the Pratt & Whitney Company have been removed from Pearl street to the Oliver building, corner of Milk and Oliver streets.

Among recent orders taken by the Scherzer Rolling Lift Bridge Co., Chicago, Ill., are the following: Two double-track rolling lift bridges for the Norfolk & Western, having movable spans of 145 ft. and 160 ft. respectively and designed for the heaviest engine loadings; a double-track single-leaf bridge of 160 ft. span for the Egyptian Government to be erected at Khartoum; a long span bridge ordered by the Burma Railways to be erected over the Ngawun river in India; and an order from Sir Benjamin Baker for the new Buccleugh bridge, Barrow-in-Furness, England. The Scherzer bridge over the Suir river, Ireland, for the Fishguard & Rosslare Railway is nearing completion and substantial progress is being made in the construction of the Walney Island bridge, England, and the Ekaterinhofka bridge, Russia. The Buenos Aires Great Southern Railway is building two double-track Scherzer lift bridges at Buenos Aires, Argentina. The Dutch Railroad is also building one of the bridges across the Spaarne river, Holland, on its main line. For all of these bridges the Scherzer Rolling Lift Bridge Company, Monadnock Block, Chicago, furnishes the designs, plans and specifications and consulting engineering services, co-operating with the engineers of the various railroad companies and governments.

### Iron and Steel.

The Vanderbilt roads will soon let contracts for rails for 1907 delivery for between 110,000 and 150,000 tons.

The Illinois Central has ordered 3,000 tons of bridge material and the Western Pacific is receiving bids on 6,000 tons.

The Minneapolis, St. Paul & Sault Ste. Marie has bought 12,500 tons of rails, and another contract has been let for 5,000 tons in Chicago.

The Great Northern has bought 30,000 tons of rails. the Erie 10,000 tons and the Lehigh Valley 10,000 tons, all for delivery next year.

The American Bridge Co. did a much larger business in the month of June than anticipated. New bookings aggregated 60,000 tons, about the same amount as in May. The company has just closed a contract for the erection of the open hearth furnaces for the steel plant at Gary, Ind., and has sold to the Southern Railway about 15,000 tons of steel.

The New York, New Haven & Hartford, it is reported, is to buy two Scherzer draw-bridges, involving an aggregate of 1,000 tons of structural steel, and will also let additional contracts for considerable more bridge work shortly. The New York Central is calling for several new bridges; the Chicago Great Western will soon contract for 1,500 tons, while numerous other roads are to buy fully 150,000 tons for 1907.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Traveling Engineers' Association.

The fourteenth annual convention of this association will be held at the Auditorium Hotel, Chicago, Ill., August 28th, and will probably be in session four days. Rooms can be had at the following rates (European plan): Single room, one person, without bath, $2 a day; double room, without bath, $3; single room, with bath, $3.50; double room, with bath, $5. The Pullman Company, as heretofore, has arranged for reduced rate privileges to members and their families going to and returning from the convention. Members desiring to avail themselves of the one-half rates will make application to the Secretary, stating the members of the family who intend to accompany them and specify the road over which they intend to travel and one-half rate orders will be furnished to and from the convention. The committees will present valuable papers.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Dublin & Southwestern.*—D. R. Thomas has been appointed Secretary and Auditor, and Otis Ellison, Treasurer; both with office at Tennille, Ga.

*Interstate Commerce Commission.*—The nomination, by the President, of F. K. Lane, of California, to succeed J. W. Fifer has been confirmed by the Senate. The President has nominated E. E. Clark, of Iowa, as one of the two new Commissioners which the Hepburn bill provides for. Mr. Clark is Grand Chief of the Order of Railway Conductors, and was on the Anthracite Coal Strike Commission in 1902.

*Norfolk & Southern.*—G. G. Boardman has been appointed Treasurer and Assistant Secretary, with office at New York, succeeding C. W. Van Voorhis, resigned.

### Operating Officers.

*Atlantic Coast Line.*—L. E. Spencer has been appointed Superintendent of Terminals at Jacksonville, Fla., succeeding R. A. McCranie, transferred.

*Dublin & Southwestern.*—T. T. Hollomon has been appointed Superintendent, with office at Tennille, Ga.

*Colorado & Wyoming.*—J. B. McKennan has been appointed General Superintendent of the Middle division. The authority of George Van Brimer, Superintendent of the Middle division, has been extended over the Northern division.

*Gainesville & Gulf.*—C. N. Adkinson has been appointed General Manager.

*Gulf, Colorado & Santa Fe.*—F. G. Pettibone, General Superintendent, has been elected Second Vice-President and General Manager, succeeding W. C. Nixon. See St. Louis & San Francisco.

*Louisiana & Arkansas.*—F. W. Green, Superintendent of the Missouri Pacific at Wynne, Ark., has been appointed General Superintendent of the L. & A., with office at Stamps, Ark.—See St. Louis & San Francisco.

*Missouri Pacific.*—See Louisiana & Arkansas.

*St. Louis & San Francisco.*—W. C. Nixon, Second Vice-President and General Manager of the Gulf, Colorado & Santa Fe, has been elected Vice-President and General Manager of the St. L. & S. F., succeeding, as General Manager, C. R. Gray, who remains Vice-President in charge of operation. W. T. Tyler, General Manager of the Louisiana & Arkansas, has been appointed General Superintndent of the second district of the S. L. & S. F., with office at Springfield, Mo., succeeding S. L. Rainey, assigned to other work on account of ill health.

### Traffic Officers.

*Atlantic Coast Line.*—W. F. Kirkland, Commercial Agent at Montgomery, Ala., has been appointed to the new office of Assistant General Freight Agent at Jacksonville, Fla.

*Dublin & Southwestern.*—M. V. Mahoney has been appointed General Freight and Passenger Agent, with office at Dublin, Ga.

### Engineering and Rolling Stock Officers.

*Chicago, Burlington & Quincy.*—G. M. Reynolds has been appointed Master Mechanic at Alliance, Neb., succeeding E. W. Fitt, transferred.

*Chicago, Rock Island & Pacific.*—E. D. Andrews, Master Mechanic at Dalhart, Tex., has been appointed to the new office of Master Mechanic of the Arkansas division, extending from Booneville to Memphis, and of the Louisiana division, consisting of the new lines being built under the name of the Rock Island, Arkansas & Louisiana in that state; office at Little Rock, Ark.

*International & Great Northern.*—F. Hufsmith, Superintendent of Motive Power and Rolling Stock, has resigned and the office has been abolished. George S. Hunter, General Foreman, has been appointed General Master Mechanic, succeeding to Mr. Hufsmith's duties.

*Missouri Pacific.*—F. J. Kraemer has been appointed Master Mechanic at Baring Cross, Ark., succeeding C. A. Braun.

## LOCOMOTIVE BUILDING.

*The Central of Brazil* has ordered six locomotives from the Baldwin Works.

*The Colorado & Southern*, it is reported, is in the market for locomotives.

*The Mexican Central*, it is reported, is in the market for upwards of 35 locomotives.

*The Pittsburg, Binghamton & Eastern* has ordered three locomotives from the American Locomotive Works.

*J. G. White & Company* has ordered four locomotives from the Baldwin Works for use in the Philippine Islands.

*The New York, New Haven & Hartford*, it is reported, has ordered 42 locomotives from the American Locomotive Co.

*The Atlantic & Birmingham Construction Co.*, it is reported, has placed an order with the Baldwin Locomotive Works for four locomotives.

*The Brookville & Mahoning*, it is reported, will shortly order a number of locomotives for next year's delivery. Address C. E. Barrett, 277 Broadway, New York.

*The Baldwin Locomotive Works*, it is reported, during the first six months of this year built upwards of 1,311 locomotives, 62 more than ever before recorded for the same period. The total number of men employed at the works is 21,245.

*The Quebec Central*, as reported in a previous issue, has ordered two simple mogul locomotives from the Canadian Locomotive Co. for December, 1906, delivery. These engines will weigh 144,000 lbs., with 122,000 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 50 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; total heating surface, 1,921 sq. ft.; 280 steel tubes, 2 in. in diameter by 12 ft. long; firebox, 100 in. long by 40 in. wide; grate area, 26¾ sq. ft.; tank capacity, 4,000 gallons, and coal capacity, 10 tons. The special equipment includes Westinghouse air-brakes, asbestos boiler lagging, Sterlingworth brake-beams, Tower couplers, Hancock injectors, U. S. metallic piston and valve rod packing, World safety valves, Witson's sanding devices, Nathan sight feed lubricators, French springs, and Consolidated steam heat equipment.

*The Boston & Maine* has ordered 12 simple mogul (2-6-0) locomotives and 10 simple consolidation (2-8-0) locomotives from the American Locomotive Co., for November delivery. The mogul locomotives will weigh 140,000 lbs., with 121,000 lbs. on the drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 63 in.; radial stay extended wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 1,893.2 sq. ft.; 286 American Locomotive Co.'s charcoal iron tubes, 2 in. in diameter and 11 ft. 8 in. long; Worth Bros. steel firebox, 108 1/16 in. x 40⅜ in.; grate area, 30.2 sq. ft.; tank capacity, 5,000 gallons, and coal capacity, 10 tons. The con-

solidation locomotives will weigh 170,000 lbs., with 148,000 lbs. on the drivers; cylinders, 20 in. x 30 in.; diameter of drivers, 61 in.; radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 2,859.87 sq. ft.; 326 American Locomotive Co.'s charcoal iron tubes, 2 in. in diameter and 16 ft. long; Worth Bros. steel firebox, 102⅝ in. x 65¼ in.; grate area, 46.5 sq. ft.; tank capacity, 5,000 gallons, and coal capacity, 10 tons. The special equipment for both includes: Westinghouse-American air-brakes, Carnegie axles, Franklin boiler lagging, Sterlingworth brake-beams, American Brake Shoe & Foundry Co.'s brake-shoes, Tower couplers, F. O. Dewey's headlights, Hancock Inspirator Co.'s injector for mogul locomotives, and Wm. Sellers & Co.'s injector for consolidation locomotives, Downing piston and valve rod packings, Ashton safety valve, Hanlon sanding devices, Detroit sight-feed lubricators, Pittsburg Spring & Steel Co.'s springs, American steam gages and Midvale driving wheel tires. The Walschaert valve gear will be used on the consolidation locomotives.

## CAR BUILDING.

*The Mobile & Ohio* is in the market for 200 gondola cars.

*The Chesapeake & Ohio* has ordered one dining car from the Pullman Co.

*The Norfolk & Western* is in the market for additional passenger equipment.

*The Florida East Coast* has ordered 200 flat cars from the Pressed Steel Car Co.

*The Illinois Central*, it is reported, will shortly place orders for upwards of 20 passenger coaches.

*The St. Louis, Brownsville & Mexico* has ordered 20 tank cars from the American Car & Foundry Co.

*The Mineral Range* has ordered 60 hopper bottom cars of 80,000 lbs. capacity from the American Car & Foundry Co.

*The Erie*, it is reported, has ordered 500 gondola cars of 100,000 lbs. capacity and 500 flat cars of 80,000 lbs. capacity from the Standard Steel Car Co., and 500 produce cars of 80,000 lbs. capacity from the American Car & Foundry Company.

*The Canadian Pacific* has placed an order for one air-brake construction car at its Angus shops and is building 30 vans at its Farnham shops. The vans will be 29 ft. 9 in. long over frame. The special equipment includes: Christie brake-shoes, Westinghouse air-brakes, Tower couplers, Miner tandem draft rigging and "Goff" type trucks.

*The Canadian Northern* has ordered 550 new box cars to be delivered in time for moving this season's western wheat crop. The order was placed as follows: Rhodes, Curry & Co., 250 cars; Canada Car Co., 200 cars, and the Crossin Car Mfg. Co., 100 cars. This order is in addition to the 1,600 cars ordered earlier in the season.

*The Chihuahua & Pacific* has ordered two cabooses from the Mt. Vernon Car Manufacturing Co., for August delivery. These cabooses will be 30 ft. 6 in. long and 8 ft. 6 in. wide, over all; and 10 ft. 11 in. high, over cupola. The special equipment includes: Sterlingworth brake-beams, Christie brake-shoes, Westinghouse brakes, Standard Coupler Co.'s couplers, Canda draft rigging, McCord journal boxes and Railway Steel Spring Co.'s springs.

## RAILROAD STRUCTURES.

Birmingham, Ala.—Work is expected to start soon on the $100,000 office building and freight house to be built by the Southern Railway at South 20th street.

Flomaton, Ala.—The Louisville & Nashville will build a passenger station here to cost $28,000.

Muskogee, I. T.—Alex H. Tombly, of New York City, estimates the cost of a steel bridge over the Arkansas river preparatory to building an electric line into Fort Gibson to be $100,000.

New Orleans, La.—Work will soon be started on a large new elevator, which will form part of the terminals in St. Bernard of the New Orleans Terminal Company. The contract for the elevator was let recently, and the subcontract for the steel material has also been let. The elevator will have a capacity of 1,500,000 bushels and will be built of steel, with the latest appliances. The Terminal Company is also to make important improvements at Port Chalmette. The wharves there will be repaired and enlarged at an expense of $50,000.

Roanoke.—The Tidewater has bought land at a cost of about $100,000 for a new yard. The yard will be about 1½ miles long. The company will probably build repair shops here, and make Roanoke division headquarters.

Schenectady, N. Y.—Announcement has been made that the contract for building the New York Central passenger station has been let to Guy B. Dickinson of Syracuse. The main room in the center, the upper part of which will be in the form of a rotunda, will be 100 by 200 feet. In Schenectady the railroads are elevated, so that from the waiting room the passengers will pass out under the tracks through avenues which will lead to the different platforms for different trains.

Sidney, Ohio.—Bids are wanted by J. C. Rosser, Auditor of Shelby County, July 30, for the construction of a two-span high-truss bridge to carry single-track, each span 125 ft. long, with an 18-ft. roadway over the Great Miami river; also for the construction of the substructure, consisting of one abutment and superstructure for a one-span, high-truss, single-track bridge 80 ft. long, 16-ft. roadway over the Miami and Erie Canal.

Woodbury, N. Y.—Contract is reported let by the Erie to Weakland Brothers, of Philadelphia, for building a steel viaduct over the valley of Moodna Creek near this place. Work has already been started by the company's men on the concrete piers and the anchorages. The viaduct is to be 4,000 ft. long, 190 ft. above the bed of the stream and 90 ft. above the Greycourt branch.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Bessemer & Lake Erie.—This company, which started work in April last year on the Western Allegheny branch from Queen Junction, on the main line, has all the track laid west to a point about five miles east of New Castle. At a point just east of Rose Point the line crosses a large viaduct about 560 ft. long which has recently been completed. Grading is now under way from this point west to a connection with the Allegheny & Western, which is part of the Buffalo, Rochester & Pittsburg. This short connecting link is to be used jointly by the Bessemer & Lake Erie and the Buffalo, Rochester & Pittsburg. (See Construction Record.)

Buffalo, Rochester & Pittsburg.—This company is reported making surveys to build an extension of its road from Iselin, Pa., southwest to Pittsburg. The proposed line will cross the Bessemer & Lake Erie near New Texas. The company at present has a trackage agreement with the B. & O. from Butler to Pittsburg.

Cairo & Thebes.—The route of this proposed road, to connect Cairo and Thebes, has been surveyed for nine miles from Cairo, Ill., toward Thebes, and plans are ready for immediate building of the line. The road will run between the Mississippi river and the tracks of the Mobile & Ohio for the entire distance. President Smith is authority for the statement that the Iron Mountain, St. Louis Southwestern, Rock Island, Burlington and Chicago & Eastern Illinois from the north and the Louisville & Nashville and the Cumberland Gap from the south will use the new line. (May 4, p. 136.)

Canadian Pacific.—Sir Thomas G. Shaughnessy, President of this road, says that the company has now 900 miles of new road under construction. By the time the western crops are ready to be moved there will be 150 miles of double track between Winnipeg and Fort William.

Canadian Eastern.—Incorporation granted by the Quebec Legislature to this company with $25,000,000 capital to build a line from Montreal northeast to the Atlantic coast or to the Gulf of St. Lawrence, with branch lines. The Directors are: E. B. Garneau, of Quebec; L. Moore, V. Cussow, D. W. Campbell and A. Geoffrion, of Montreal The principal office will be at Montreal.

Colorado & Southern.—The company has not yet selected the route for the proposed northern extension to the Yellowstone river in Montana. Connections will probably be made at Buffalo and Sheridan, Wyo., but the road's engineers are still surveying the most available routes through Montana. It is expected that they will submit their reports in August.

Dakota Midland.—Incorporated in South Dakota with $500,000 capital to build a line crossing the state from north to south along the Missouri river. L. R. Giddings and L. E. Giddings, of New York, are the promoters. Others interested in the project are: Charles O. Elwood, of Minneapolis, Minn.; Phil. Lawrence and M. E. Priter, of Huron, S. Dak. The office of the company is to be at Huron, S. Dak. The proposed route is from a point on the Sioux river in Union County, opposite Sioux City, northwest through the state to a point on the north line in Campbell County, passing through the Counties of Union, Clay, Yankton, Turner, Hutchison, Douglas, Davison, Aurora, Brule, Jerauld, Buffalo, Hand, Hyde, Hughes, Sully, Potter, Faulk, Walworth, Edmunds, Campbell and McPherson.

Delaware & Hudson.—Construction work is well under way on the line from Rouse's Point, N. Y., to Napierville, Que. Five miles are graded and track-laying will commence this week. The Pacific Construction Co., of Ottawa, will do the track-laying and ballasting. The work on the new line from Napierville to St. Constance is also well advanced. The D. & H. will build to St. Lambert and there-

make connection with its recently acquired South Shore system. (June 15, 1906.)

DENVER & RIO GRANDE.—A line 14½ miles long is being built from the Rio Grande Western to the mines of the Utah Copper Co., near Bingham, Utah. The new line will be used by both the Utah Copper Co. and the Boston Consolidated Mining Co. The contract for grading, which will be mostly through rock, has been let to the Utah Construction Co., of Ogden. The maximum gradient is 2½ per cent., maximum curvature 16 deg. There will be two small tunnels, aggregating less than 600 ft. in length, and a number of wooden trestles. Work will soon be under way. No track yet laid. (June 22, p. 181.)

ELDORADO, MARION & SOUTHWESTERN.—This company has been incorporated in Illinois to build a line from Eldorado through Saline, Williamson, Jackson, Union and Alexander Counties to the Mississippi river. The incorporators and first board of directors are: S. T. Brush, Carbondale; John Colp, Carterville; Charles Agent, Marion; S. H. Rundy and Charles E. Owen, Carterville.

ELMIRA & SENECA LAKE TRACTION.—This company, recently incorporated in New York with $200,000 capital, has bought the property and franchise of the Elmira & Seneca Lake Railway Company, operating a line 17 miles long from Seneca Lake, N. Y. The principal office is in Watkins, N. Y. Among the directors are: William H. Wadhams, Murray W. Dodge, A. S. Cook, I. B. Grant, all of New York City.

ERIE, LONDON & TILSONBURG (ELECTRIC).—Incorporated, with office at Tilsonburg, Ont., and $1,000,000 capital, to build a line from Port Burwell, Ont., on Lake Erie northwest via Aylmer to London, approximately 40 miles, with a branch from a point on the main line east to Tilsonburg, an additional 15 miles. E. C. Jackson and E. V. Tillson, of Tilsonburg; J. H. Teall, Vienna; W. Warnock, Aylmer, and W. Thompson, London, are incorporators. (March 30, p. 98.)

ESSEX TERMINAL.—This company, incorporated in 1902 to build a line from Walkerville, on the Grand Trunk, Pere Marquette & Wabash, in the southwest corner of Ontario, south to Amherstburg, about 20 miles, and which has its charter amended in 1904, has applied to the Railway Commission for the approval of its location plans. F. A. Hough and J. A. Auld, of Amherstburg; S. A. King, Windsor, and G. F. Porter and W. Pope, of Walkerville, are said to be provisional directors.

FLORIDA EAST COAST.—According to local reports this company is considering the question of building an extension from a point on its main line west to Tampa, Fla.

FOX RIVER VALLEY (ELECTRIC).—This company, organized in Wisconsin last year, has increased its capital stock from $25,000 to $200,000, and decided to build from Manitowoc, Wis., south about 30 miles to Sheboygan at once. A part of the line is to be completed this summer and the road extended next year from Manitowoc northeast to Kaukauna, 40 miles.

HALIFAX & SOUTHWESTERN.—Ballasting is under way on this Mackenzie-Mann line between Liverpool and Shelburne, N. S., and the permanent bridge at Liverpool is nearly completed. The line through to Yarmouth is expected to be opened for traffic this year. The ballasting of the Middleton and Victoria Beach section has been completed and it is expected to soon have the line opened for traffic. (See Construction Record.)

INTERIOR & WEST VIRGINIA.—Incorporated in West Virginia to build a line from a point in Monroe County, West Virginia, on the boundary of Giles County, Va., northeast to a point in Monroe County near Potts Creek, in Craig County, Va. The incorporators are L. E. Johnson, of the Norfolk & Western, and J. I. Doran, T. W. Reath, D. C. Callahan and W. C. MacDowell, of Philadelphia. This is reported to be a project of the Norfolk & Western.

INTEROCEANIC.—Preliminary work, it is announced, will shortly be started on the improvement of this line from Mexico City east to the port of Vera Cruz. The road, which at present is narrow gage, is to be made standard. The work has been under consideration for over a year, but the final surveys have only recently been completed. The line is to be shortened, all the heavy grades reduced, and sharp curvs made easier. Orders are soon to be given for 75-lb. rails for the new work. The greater part of the line, which is about 350 miles long, has been ballasted, and it is expected to have the work completed at an expenditure of about $6,000,000 (Mexican), during the next 18 months.

INTERSTATE RAILWAY (MISSOURI) (ELECTRIC).—Incorporated in Missouri to build an electric line from Kansas City north to St. Joseph, 47 miles. Application will be made for authority to cross highways in Buchanan County. The line is to be double-tracked and may use electricity or steam as a motive power. George R. Collins, of Kansas City, is the chief promoter.

IOWA CITY, MONTEZUMA & WESTERN (ELECTRIC).—Incorporated in Iowa to build an electric line from Iowa City, Iowa, west to Montezuma, approximately 60 miles. E. B. Macey and L. H. Bufkin, of Lynnville; J. W. Carr, of Montezuma; F. O. Hardington, of York; P. S. Carson, of Iowa City; M. C. Rohret, of Union, and others, are interested.

JAMES BAY.—An officer writes that the contract has been let to Angus Sinclair, of Parry Sound, Ont., for building a branch from the Toronto-Sudbury line in Ontario to Key Inlet, about 10 miles. Work is to be started at once. (June 22, p. 182.)

KANSAS CITY, MEXICO & ORIENT.—Vice-President E. Dickinson is quoted as saying that the 619 miles of road now in operation will be increased to 1,100 miles soon after Jan. 1. In Mexico half of the territory is now covered with a completed line, 325 miles of the 635 now being finished. (See Construction Record.)

LAS VEGAS & TONOPAH.—An officer writes that a contract has been let to Deal Bros. & Mendenhall, of Springville, Utah, for building this road from Las Vegas, Nev., on the San Pedro, Los Angeles & Salt Lake, northwest via Indian Creek to the Bullfrog mining district, 123 miles; and a length of 96 miles has been completed. The company will build from Bullfrog northwest to Goldfield, an additional 75 miles. The work will be easy, being mostly over a level country. (June 15, p. 175.)

LORAIN & ASHLAND.—See Lorain, Ashland & Southern.

LORAIN, ASHLAND & SOUTHERN.—Announcement is made by Joseph Ramsey, Jr., of the consolidation of the Industrial and the Lorain & Ashland Railroads and the decision to at once begin the construction of an extension south to the Ohio river at a cost of $5,000,000. The consolidated railroad will be known as the Lorain, Ashland & Southern. Preliminary surveys have been made.

LOUISVILLE & NASHVILLE.—The route of the proposed line for which the contract has been let to the Walton, Wilson & Rodes Company, of Knoxville, Tenn. (the Madisonville, Hartford & Eastern), is from Madisonville, Ky., east, crossing Pond river, Green river, and the O. & N. division of the Louisville & Nashville, 10 miles north of Central City; thence through Centertown, Hartford, Sunnydale and Dundee to Mitchell on the Louisville, Henderson & St. Louis. George W. Feagin, of Hartford, Ky., is Chief Engineer. (June 22, p. 182.)

Surveys, it is reported, are being made by this company for a line from Fourmile in Bell County, Ky., west to Williamsburg in Whitley County, approximately 30 miles, to connect two of the company's existing lines. Contracts are also reported let to improve the line from Barboursville, Knox County, south to Flat Lick, nine miles.

MADISONVILLE, HARTFORD & EASTERN.—See Louisville & Nashville.

MAYFIELD & COLUMBUS.—Contracts are reported let by this company to build its proposed line from Mayfield, Ky., to Columbus, approximately 30 miles. Surveys have been completed and right of way secured. W. B. Stanfield is Chief Engineer, Mayfield, Ky.

MONONGAHELA.—An inspection was recently made of this road by the Pennsylvania and Baltimore & Ohio officials with a view of extending the line along the east bank of the Monongahela river to Fairmont and there make connection with the projected West Virginia line. In this an attempt will be made to get the better of other interests who are trying to get into the West Virginia coal district. The Monongahela operates about 58 miles of line in the lower Connellsville and Klondike coke regions, and is owned jointly by the Pennsylvania and the Pittsburg & Lake Erie. On this line a large amount of coal and coke tonnage originates, and this is delivered almost entirely to the Pennsylvania and Pittsburg & Lake Erie. Small shipments are also made to the Baltimore & Ohio.

NAPIERVILLE JUNCTION RAILWAY.—See Delaware & Hudson.

NEW YORK CITY SUBWAYS.—The Rapid Transit Commission of New York City is planning to ask for bids for building subways in Lexington, Third, Seventh and Eighth avenues, Manhattan, and in Fourth avenue, Brooklyn, on or before January 1 next. The various commissions appointed by the court have reported favorably on nine of the 11 routes thus far considered. The Appellate Division, it is expected, will shortly give its assent to the plans. As soon as that approval is given, Chief Engineer Rice will have plans made for the principal routes. The surveys have already been made. Chief Engineer Rice says it will take about three months to prepare the plans for the main tunnels, and these should be complete by November 1. The advertising for bids will take about 60 days, so that the awarding of the first large contracts may take place early in 1907. The limitation on the city's authority to incur debt will probably prevent the construction of more than one important subway within the next few years.

NORFOLK & WESTERN.—See Interior & West Virginia.

NORTHEASTERN.—Incorporated by J. C. Heintz, P. Harnischfyer, New York; J. T. Marchand, J. B. Lapointe, Montreal, and R. Chevrier, Ottawa, with $1,000,000 capital and office in Montreal, at the last session of the Quebec Legislature to build the following lines:

From a point near Ville Marie, on Lake Temiskaming, east, passing the southern bays of Lakes des Quinze, Victoria and Kakebonga, to Quebec; from Lake Temiskaming to the National Transcontinental near Lake Abitibi; from near Lake Kakebonga to Manwaki, and from near the Gatineau river to Nominingue.

Pennsylvania.—This company expects about August 1 to open for operation its low-grade freight line between Columbia and Atglen. The work that still remains to be done is a cut of 1,000 ft. near Quarryville. Atglen, the eastern terminus of the low-grade line, is 47 miles west of Philadelphia. Between that point and Glen Loch, where the Trenton cut-off begins, a distance of 22 miles, two freight tracks have already been built for the greater part of the way and are now in use. From Glen Loch to 56th street, Philadelphia, about 20 miles, the company intends to build a separate freight line south of the present main line, and has already secured most of the right of way.

Pinar Del Rio Northern.—Incorporated in Maine with $3,000,000 capital to build railroads in the island of Cuba. F. H. Morrill, of Portland, Maine, is President, and F. R. Barrett, of the same place, is Treasurer.

Rio Grande Western.—See Denver & Rio Grande.

St. Louis & North Arkansas.—At a recent meeting of the bondholders of this company, plans were made for extending the line from its northern terminus at Seligman, Mo., northwest to Neosho, where connection is to be made with the Kansas City Southern; also for extending from the southern terminus at Leslie southeast to the eastern boundary of Arkansas at Helena or Memphis, about 150 miles; and for a branch south to Little Rock, 90 miles. When the reorganization of the company is arranged John Scullin will probably be Chairman of the Board and D. R. Francis, President.

Southern.—A contract is about to be let to W. J. Oliver, of Knoxville, Tenn., at about $1,000,000, for extending the tracks from the Lookout Mountain tunnel to the Belt Railway, and for four-tracking the Belt Railway from this point to where it crosses the Central of Georgia tracks in South Chattanooga; from this point the Central of Georgia tracks will be used in reaching the new terminal station. (May 11, p. 144.)

Stewartstown.—This company, operating seven miles of road from New Freedom, Pa., on the Northern Central, in York County, east to Stewartstown, has begun running regular trains east to Fawn Grove, 10 miles over the new extension.

Temiskaming & Northern Ontario.—The Ontario government has authorized this company to build three short branches to the Cobalt mining area and the agricultural region to the north. One of these is from Haileybury to the Dominion government wharf on Lake Temiskaming; another from Englehart to Charlton, serving a district around Long Lake; and a third from a point near Cobalt to Kerr Lake, six miles distant, giving shipment facilities to many working mines.

Union Pacific.—It is reported that this company is making surveys for a line from Kansas City to a connection with the Illinois Central at Memphis, Tenn., about 370 miles, air line. Such a line would, in connection with the Illinois Central, give the U. P. a route to the gulf.

Versailles & Sedalia.—This line, which extends from Versailles, Mo., to the property of the Missouri Canal Coal Co., about six miles, is to be extended to Sedalia, Mo., about 24 miles. James Applewhite, of Memphis, Tenn., is President, and G. D. Albe, of Versailles, Mo., Vice-President and General Manager.

Wabash.—According to reports this company contemplates making important improvements at Decatur, Ill., the most important of which will be a reinforced concrete bridge over the Sangamon river. A contract for double-tracking the road from Decatur east to Bement, 20 miles, to remove a 1 per cent. grade and to change the alinement so as to eliminate the 4 deg. curves in the present line has been let. This work necessitates about 600,000 yards of grading. When this work is finished the Wabash will have completed the double-tracking from Decatur, where the line diverges toward St. Louis and Kansas City to Bement, where the line from Chicago joins that from the east.

## RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Part of the proceeds of the sale of the $27,500,000 new capital stock recently issued were used to pay off the $9,000,000 three months' loan made to the company by the National City Bank of New York last April.

Canadian Pacific.—The land sales during June amounted to 75,408 acres, an increase of 10,435 acres over June, 1905. The sales realized $588,013, an increase of $247,254.

Chicago, Peoria & St. Louis.—The semi-annual interest on the $2,000,000 consolidated mortgage 5 per cent. bonds, which fell due on July 1, has not been paid. The president has addressed a circular to the bondholders explaining that the payment of the interest has been postponed because in the last year the deficit after charges has been largely increased over the $97,103 reported in July, 1905.

Chicago Railways Co.—Marshall G. Sampsell has been named as the seventh director of the Chicago Railways Co., which will take over the Chicago Union Traction. (June 15, p. 176.)

Chicago Union Traction.—See Chicago Railways Co.

Cincinnati, Hamilton & Dayton.—The receiver has asked permission to issue $511,000 receiver's certificates, maturing July 1, 1906, and bearing not more than 6 per cent. interest. The issue is for the purpose of paying interest due on mortgage bonds.

Erie.—This company has bought about four acres of land on the Harlem river, near 149th street, New York City, to be used for a freight yard instead of that used at present near the East river. The new property is now occupied by a lumber company under a lease which will not expire for 18 months.

Lehigh Coal & Navigation.—Of the $17,378,500 outstanding stock of this company, $13,327,250 was, in October, 1905, put into the hands of a voting trust with power to sell at not less than $135 per share. The holders of about $5,000,000 of the stock have asked the trustees to raise this minimum selling price to $200 per share.

Michigan Central.—Minority stockholders of this company have recently made efforts to get larger dividends on the stock, which at present is paying 4 per cent. annually. It is contended that surplus earnings have been used for improvements which ought to have been charged to capital account.

New York Central Lines.—The gross earnings of this system in June are shown in the following table:

| | 1906. | Increase. |
|---|---|---|
| New York Central & Hudson River | $7,649,645 | $595,184 |
| Lake Shore & Michigan Southern | 3,557,298 | 406,451 |
| Lake Erie & Western | 402,461 | 3,901 |
| Chicago, Indiana & Southern | 169,409 | 13,871 |
| New York, Chicago & St. Louis | 791,631 | 79,935 |
| Michigan Central | 2,173,444 | 273,021 |
| Cleveland, Cincinnati, Chicago & St. Louis | 2,039,791 | 111,214 |
| Peoria & Eastern | 257,607 | 40,809 |
| Cincinnati Northern | 94,258 | 18,630 |
| Pittsburg & Lake Erie | 1,359,776 | 276,310 |
| Rutland | 257,801 | 30,783 |
| Total | $18,753,121 | $1,850,709 |

North American Company.—This company, which controls all the street railways in and near St. Louis, excepting the St. Louis & Suburban, and nearly all the light and power plants in that city, is completing negotiations for the purchase of the St. Louis & Suburban, which has outstanding $3,924,000 capital stock and $4,500,000 bonds, and operates 120 miles of road. The stock will be exchanged for an equal amount of preferred stock of the United Railways of St. Louis, a subdivision of the North American Co. The transfer is to be made on August 1.

Norfolk & Western.—The company has sold to Brown Brothers & Co., New York, $4,000,000 equipment trust notes, bearing 4 per cent. interest, maturing semi-annually for ten years from 1907. This is in addition to the $3,000,000 issued and sold this spring. The company has sold to the same firm $2,000,000 divisional first lien and general mortgage 4 per cent. bonds of 1944, making $13,000,000 outstanding of the $35,000,000 authorized.

North Shore.—An assessment of $10 per share, payable immediately, has been levied on the holders of the $6,000,000 capital stock.

Pere Marquette.—The receiver has been authorized to issue $419,180 receiver's certificates to run for not more than one year from July 1, 1906, and bearing not more than 6 per cent. interest. The proceeds are to be used for the payment of the July interest on certain bonds.

St. Louis & Suburban (Electric).—See North American Company.

Toledo & Western (Electric).—A call has been made for a meeting of the bondholders on July 16 at Toledo, Ohio, for the purpose of selecting a committee of two to act with the Ohio Savings Bank & Trust Co. in protecting the interests of the bondholders during the receivership. The notice is signed by J. K. Secor, J. G. Mitchell and H. C. Rorick. (July 6, p. 6.)

Toledo, St. Louis & Western.—This company has sold to Brown Brothers & Co., New York, $1,000,000 4½ per cent. equipment notes maturing in semi-annual installments for 10 years beginning March 1, 1907. They are secured on 750 box cars and 500 coal cars. The Pennsylvania Company for Insurance on Lives and Granting Annuities is the trustee.

United Railways of St. Louis.—See North American Company.

# GENERAL NEWS SECTION

## NOTES.

The United States Court in Utah has issued a permanent injunction forbidding the ticket brokers of Salt Lake and Ogden to deal in tickets of the Southern Pacific or the Denver & Rio Grande.

Ten young officers from the Japanese army are to take positions in offices of the Southern Pacific Railroad at San Francisco, Portland, Salt Lake, Los Angeles, New Orleans and Omaha, to study American railroad methods.

At Las Vegas, N. Mex., the Atchison, Topeka & Santa Fe Railway and the Colorado Fuel & Iron Company have been fined in the Federal court $15,000 each for violation of the Interstate Commerce law in making secret freight rates.

In a fire at St. Louis on July 12 the records in the general offices of the Missouri Pacific Railway were half destroyed by fire and water and by being pitched out into the street. The building, which is fireproof, was not seriously damaged.

It is reported in the newspapers, apparently on the authority of an officer of the road, that the Canada division of the Michigan Central, formerly the Canada Southern, has never killed a passenger during the 31 years that the line has been in operation.

Mr. W. A. Moyer, Industrial Agent of the Delaware & Hudson Railroad, has made arrangements with 10 farmers along the line of the railroad to experiment with crops which they have not heretofore raised, and he has already had planted a lot of alfalfa.

The yacht "Dixie," owned by a man in Galveston, Tex., has recently made a voyage from Bayonne, N. J., where it was built, through to Galveston, by way of the Hudson river, the Erie canal, the Great Lakes, the Chicago drainage canal, the Mississippi river, and the Gulf of Mexico.

In the case of a street car motorman in New York city arrested recently for causing the death of a pedestrian, Coroner Harburger required $5,000 bail; and he informed the New York City Railway Company that hereafter, in cases where a person is run over and killed by a street car, the motorman will be held without bail.

The Missouri, Kansas & Texas, the St. Louis Southwestern, and, it is said, several other roads, have filed or will file suits in the Federal Courts at Austin, Tex., to stop the enforcement of the reduced freight rates in that state recently ordered by the Railroad Commission. The railroads declare that the present rates are so low as to be confiscatory.

At Martinsville, N. Y., on the night of July 11 a train of two electric cars of the International Railway Company ran over a misplaced switch and collided with a standing train consisting of a motor and seven freight cars; and five passengers were killed outright. About 20 were injured, some of them fatally. The foremost passenger car was completely wrecked.

The "St. Louis Limited" express of the Pennsylvania Railroad, according to an advertisement in the daily newspapers, has arrived at St. Louis on time 344 times out of 365. This train leaves Jersey City at 2.14 p.m., eastern time, and is due at St. Louis the next day at 4.30 p.m., central time. The distance, as given in the *Official Guide*, is 1,064 miles, making the average rate of speed, through, 39 miles an hour.

One of the grain elevators of the Pennsylvania Railroad (Philadelphia, Baltimore & Washington) at Baltimore, has been equipped with a Hess pneumatic grain drier with a capacity from 18,000 to 25,000 bushels a day, and grain containing an excess of moisture can here be put in suitable condition for export. Corn which was graded as "steamer No. 1" has been run through the drier and so improved that its grade was raised so as to increase its value, with a loss of only 5 to 7 per cent. in quantity.

A press despatch from Pittsburg quoting statistics of the Pittsburg Car Service Association says that the freight movement in that territory during the month of June was 9 per cent. greater than in the same month of 1905, the number of cars moved being this year 317,715 and last year 291,895. These figures do not include 150,000 cars a month which are engaged in coal and coke traffic, not dealt with by the car service association. The Pittsburg association's territory takes in Wheeling, New Castle and Youngstown. Mr. Prall, Manager of the car service association, estimates that the tonnage of freight moved in the nine months ending with last December was about as large as that for the 12 months last preceding that period. The railroads in the Pittsburg district are now giving prompt freight service.

### Eight Automobile Passengers Killed.

A press despatch from London, July 12, reports the wreck of a motor omnibus at Crawley, on the road to Brighton, in which eight passengers were killed and 20 badly injured, the omnibus being overturned. In consequence of the failure of the brakes the vehicle dashed at high speed down a hill and ran against a tree. The 34 passengers, mostly merchants of Orpington, were pitched out in all directions.

### Mail Carrying on Chicago Underground Tunnels.

The Chicago Subway began this week carrying mail between the La Salle street station and the Federal building. Service between the post office and the Union Station will be opened shortly. It is expected that service to the North-Western and Illinois Central stations will be in operation within a month, and to the Dearborn street station by September 1st.

### The Salisbury Disaster.

Press despatches of July 16 report that the inquest on the deaths of the 27 persons killed in the derailment at Salisbury, England, on the London & South Western, July 1, resulted in a verdict by the jury that the derailment was caused by excessive speed. At the hearing on the 16th the railroad company announced that it accepted full responsibility for all the legal consequences of the accident. The chief guard of the train testified that the train was running at high speed, probably 50 miles an hour, as it entered Salisbury station, and that he applied the brakes to warn the engineman. From Wilton to Salisbury, most of the way down grade, the speed was about 70 miles an hour. By an order issued in April, 1904, the speed of express trains through Sallsbury was limited to 30 miles an hour, on account of the curve. It was testified that in February last an order was issued reducing this limit to 26 miles an hour, but later was withdrawn, from which it would seem that the 30-mile rule was re-established. Superintendent Holmes, of the railroad, expressed the opinion that this derailment was due to excessive speed. An officer of the road testified that the engineman was a teetotaller and perfectly competent to run an express train. The roadway and rolling stock were examined after the accident and no defect was found which would have caused the derailment.

### Investigation of Railroads and Elevators.

Chairman Knapp, of the Interstate Commerce Commission, has sent to the principal railroads a request for information on which to base a report on the connection between railroads and grain elevators as called for by Senator La Follette's resolution, which was passed June 25. The information, under nine heads, is required by August 15. The different branches of the subject are, briefly—

(1) Name and location of every elevator and its capacity; and whether public or private.

(2) Name and address of party operating each elevator, and whether he is the owner.

(3) Whether or not elevators stand on the company's land; and, if so, whether this privilege is open to all.

(4) What interest has the road in any elevator or in its operation; what allowances are made to elevators for elevating or transferring grain?

(5) Names of ten largest grain shippers since June 30, 1905; and whether these shippers have an interest in elevators on the company's lines.

(6) Extent to which the road has bought or sold grain (by ownership in grain companies).

(7) Extent, so far as known, or readily ascertainable, to which any officer, director or employee is interested in elevators or the grain business; also the same information, so far as known, concerning stockholders.

(8) What allowances to shippers have been made during the last three years because of stress of competition; why did you grant these allowances? Did they depend upon the amount of grain shipped?

(9) Methods of distributing grain cars.

### A Decision on Overhaul.

Ex-Judge Alton B. Parker sitting as referee rendered a judgment on July 17 against the Delaware & Hudson for $951,000 and costs in favor of the contracting firm of Sundstrom & Stratton, of

New York. The claim arose in the settlement of a contract for the reconstruction of the Chateaugay Railroad which the plaintiffs completed in 1904. The principal contest in the case was over the item of "overhauled material." There was a provision in the contract by which Sundstrom & Stratton were to receive a cent a yard extra for every yard of earth hauled for each 100 ft. over 3,000, no distinction being made between material hauled in standard gage cars or narrow gage cars. During the progress of the work the contractors hauled the material with standard gage cars. The Delaware & Hudson asserted that the contractors were not entitled to recover for the material hauled in the standard gage cars.

### The Earthquake as a Road-Builder.

The Ocean Shore road, being built between San Francisco and Santa Cruz, is to run close to the ocean the entire distance. J. B. Rogers, the Chief Engineer, says that roadbed of the line, while damaged to some extent, was actually benefited in one place by the earthquake to the extent of about $15,000. Along Mussel Rock bluffs, the company was progressing nicely with the work of grading its roadbed, when the earthquake came along and accomplished in a few seconds what the company would have taken weeks and the expenditure of many thousands of dollars to accomplish. The bluffs in question were very precipitous, and in order to secure a roadbed for the electric line half-way up the bluffs it became necessary to remove thousands of yards of overhanging rock and earth; but the earthquake shook down an immense amount of material, and where a precipitous bluff stood before the earthquake is now a sloping hill that can be graded at comparatively little expense. This offsets probably half the damage which the road sustained in other places.—*Engineering and Mining Journal*

### A Prize Package for Every Passenger.

By printing a puff of the prunes purveyed to his patrons Mr. Daniels once increased the patronage of the New York Central dining cars 98 per cent. (or some other percentage), and now Mr. Eustis is trying to do the same trick with a potato. His advertisement says:

> It is no ordinary, every-day potato that the patron of the Burlington dining car gets. No, it's a potato of distinction—a potato with a pedigree and a special mission to perform. It was grown especially for the Burlington away out in the Big Horn Basin of Wyoming. A special leaflet has been printed. Inquiries may be addressed to—

And so on for two or three stickfuls. The peanuts of Virginia and the hash from the hotels of Hohokus have yet to make their mark as dining-car luxuries.

### Freight Car Frauds.

Mr. J. W. Midgley, of Chicago, quotes from a letter from a railroad officer the following example of how foreign freight cars are misused:

"1. A detoured train of sixty-odd penalty cars delivered a few minutes before midnight and afterward returned by reason of an alleged engine failure.

"2. A paper delivery arranged, covering between 200 and 300 cars. This deal fell through, however, because a third party intervened.

"3. We have cars returning bearing cards: 'Load this car off the line'—the identity of the road placing the cards not being shown.

"4. Instructions are in the hands of many terminal agents to use penalty cars for transfer of merchandise and other switch business that will remove them temporarily from accounts.

"5. Instructions to load penalty cars to any road, in any direction, are in the hands of certain agents.

"6. By some roads it is considered legitimate to load penalty cars out of route, so long as the loading takes them in the general direction of the owning line."

Another officer raises these questions:

"While a large amount of diversion can undoubtedly be prevented by careful, conscientious work on the part of those in charge of the handling of foreign cars, a certain amount of diversions cannot be avoided without a large increase in expenses not commensurate with the object attained—and, what is worse, a detention in the movement which could not be tolerated or defended. For instance, at transfer stations cars arrive and depart on certain schedules of time. It is necessary to meet those schedules or block the transfer. Foreign cars will arrive loaded for miscellaneous points and the heaviest lading in the car will possibly take it out of route; yet if the transfer people should attempt to sort the lading to fit the car ownerships, it would require considerably more labor and more time, and cars would not make schedules, and in a short time the transfer would become blocked.

"Again, cars floated to piers must necessarily bring back lading from the piers, and if the destination of the return lading does not fit the car ownership, the cars will be diverted. The expense of avoiding such a contingency by transferring or providing proper foreign cars or system cars at the piers and returning empty such foreign cars as cannot be used at piers, with consequent delay to freight, would be considerably in excess of the object attained."

### Railroads in the Southern States.

The most prosperous year in the history of railroads in the south and throughout the country closed with the fiscal year 1905-1906, on June 30. All previous records were broken, every railroad in the south having done a larger business during that period than any previous similar period. During 10 of the 12 months every car and locomotive on the railroads of the south were constantly in use with a demand far greater than the supply. During the first two months, July and August, 1905, business was very large but not taxing the capacity of the roads. Beginning with September and continuing up to the present, few of the railroads could have moved a greater volume of business than was offered them. Six months of the time the roads were unequal to the task, and the unsatisfied demand for cars was general. One result of such prosperity is that there is hardly a company but is arranging to build new lines and extensions.

The Illinois Central proposes building a line from Nashville to Jackson, Miss., connecting with the main line to New Orleans. The 'Frisco System proposes building from Baton Rouge, La., to Jackson, Birmingham and Nashville. The Mobile, Jackson & Kansas City will extend its line to Jackson, Tenn. The Atlanta, Birmingham & Atlantic is now building two lines into Atlanta and one to Birmingham. This company also proposes building over the right-of-way of the Nashville & Huntsville to Nashville. The Southern is building from Stevenson, Ala., to Chattanooga, 40 miles, and is building another important line from Walland, Tenn., to Anderson, S. C., forming a more direct line to Charleston and Savannah for its lines in Tennessee and Kentucky. Besides these the Southern will build a score of small branch lines. Other southern roads are practically certain to build short lines aggregating 400 miles of new track. In the past few months a number of new companies have been organized to build roads in the south. Several of these projects will probably be carried out.

Another encouraging feature is the building of second track by a number of the most important trunk lines. The Illinois Central is pushing its double-track work to New Orleans. The Louisville & Nashville is preparing to build the second track from Gallatin, Tenn., just north of Nashville, to Birmingham. The Southern has begun laying second track from Chattanooga through Knoxville to Morristown, Tenn. On a number of other divisions some double-track work will also be done. In Texas and Louisiana railroads are building in almost every direction. The Colorado Southern, New Orleans & Pacific, controlled by the 'Frisco, is being rapidly constructed from Baton Rouge to De Quincy, where it connects with the Kansas City Southern to Beaumont. The St. Louis, Brownsville & Mexico is nearing completion from Brownsville to Houston, where the Baton Rouge line will connect with it over the Beaumont, Sour Lake & Western. Mr. Yoakum is also building toward Dallas and Fort Worth to connect his southwestern lines with the Rock Island and the 'Frisco proper. The St. Louis Southwestern is building from near Shreveport to Beaumont, Houston and Galveston. The Santa Fe is building from near Beaumont through Louisiana to New Orleans. Not less than 20 other lines are building through Texas, and as many are projected in the three states of Louisiana, Arkansas and Oklahoma.—*The Tradesman.*

## TRADE CATALOGUES.

*Scales.*—The Buda Foundry & Manufacturing Co., Chicago, describes its U. S. standard scales in its latest publication. These include railroad track scales, coal hopper scales, depot scales, stock scales, wagon scales and portable scales. Each of these is suitably described and illustrated and prices given for the various styles and capacities. Sheets and lists of repair parts of the track scales and of the wagon stock and depot scales are also given. The book is attractively gotten up, being printed in two colors and illustrated with excellent half-tones.

*"A Colorado Summer."*—This is the title of a folder recently issued by the Atchison, Topeka & Santa Fe. Its beautifully illustrated and interesting description of the state is a strong argument in favor of the passenger department's advice to "go to Colorado" if in doubt as to where to spend a vacation.

*Blue Print Machine.*—The Revolute Machine Co., New York, sends a folder describing the Everett-McAdam continuous electric blue-print machine. Mercury vapor lamps are used and the paper is fed from rolls to the inside of the cylinder in which the printing is done.

*Forging.*—The Solid Steel Tool & Forge Co., Brackenridge, Pa., is distributing an "Index" or complete list of the kinds of forgings and tools the company makes.

### Manufacturing and Business.

The Union Switch & Signal Co. has received orders for signal apparatus from the Nippon and the Kobe Railroads of Japan.

The Chicago Car Heating Co. on July 1st opened an eastern office at 170 Broadway, New York, with F. F. Coggin and B. A. Keeler in charge.

David O. Holbrook, who until recently was Vice-President of the Pennsylvania Malleable Co. and the Central Car Wheel Co., has been elected Vice-President of the Dayton Pneumatic Tool Co., Pittsburg, Pa.

The Dayton Pneumatic Tool Co., Dayton, Ohio, which suffered a small loss from fire on July 2 and closed down the plant temporarily until the power plant could be repaired, resumed full operations on the 6th. The only loss from the fire was in belting, line shafting and some miscellaneous office supplies which were stored in the portion of the building where the fire occurred.

The American Car & Equipment Co., 936 Monadnock Building, Chicago, has been incorporated to buy, sell, repair, rebuild and construct cars and locomotives and handle a general line of railroad supplies. The officers are: I. J. Kusel, President; C. R. Powell, Vice-President and Secretary; H. C. Smyth, Treasurer. Mr. Kusel was for a number of years connected with the electrical trade and was President of the Enreka Electric Co. Mr. Powell was for many years with the Illinois Central R. R., holding various positions in the mechanical department. Mr. Smyth will give attention to the financial interests of the company.

In an article on the "Abuse of Valves," published in *The Valve World*, R. T. Crane, President of the Crane Co., Chicago, says that in 95 cases out of 100 leaky valves are due to abuse and carelessness on the part of the men who install them, rather than to defects in the valves themselves. If the few simple directions given by Mr. Crane for the installation and care of valves were generally followed much of the annoyance and expense due to leaky valves would be avoided. The article has been reprinted in the form of a poster suitable for hanging on the walls of engine rooms and shops, and all users of valves may obtain one or more copies free by writing the Crane Co. The posters are legibly printed in two colors on heavy calendered bristol-board.

### Iron and Steel.

The Lehigh Valley has ordered 12,000 tons of rails and the Chicago, Burlington & Quincy 10,000 tons.

The Baltimore & Ohio has given a contract to the American Bridge Co. for an additional 1,100 tons of bridge material, and the Northern Pacific to the same company for 1,000 tons; the Pennsylvania, 1,500 tons; the Chicago, Milwaukee & St. Paul, 400 tons, and the Lake Shore & Michigan Southern, 350 tons. The Southern Pacific Company has ordered 50,000 tons of rails from Spain for the Cananea, Yaqui River & Pacific. These rails are to be shipped from Bilbao via Cape Horn to Guaymas, in the state of Sonora, Mexico.

## OBITUARY NOTICES.

Robert B. Burns, Chief Engineer of the Atchison, Topeka & Santa Fe Coast Lines, died recently at Los Angeles, Cal. Mr. Burns was born in 1852 and graduated from the University of Maine in 1877. He began railroad work as a draftsman on the Northern Pacific in 1879. From 1881 to 1884 he was in the engineering department of the Mexican Central. He then, for two years, was engaged in private practice as a consulting engineer, after which he went to the Colorado Midland as Bridge Engineer on construction. In 1889 he was appointed Engineer of Maintenance of Way of the Atlantic & Pacific, now part of the Atchison, Topeka & Santa Fe Coast Lines. In 1892 he was appointed Resident Engineer in charge of Maintenance, and in 1896 Chief Engineer in charge of Maintenance. The next year he was appointed Chief Engineer of the Santa Fe Pacific, the name of the new operating company of the Atlantic & Pacific, and, in 1900, he was appointed also Chief Engineer of the other two roads comprising the A., T. & S. F. Coast Lines.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### International Railroad Master Blacksmiths' Association.

The fourteenth annual convention of this association will meet at the Sherman House, Chicago, Ill., August 21-23. The subjects to be discussed at this meeting, with names of chairmen, are: Frogs and Crossings, S. Uren; Flue Welding, G. H. Judy; Classification of Work in Shop, W. J. Mayer; Tools and Formers for Bulldozers, Steam Hammers and Forging Machines, Thos. F. Keane; Discipline in a Blacksmith Shop, A. W. McCaslin; Case Hardening Methods, G. F. Hinkins; Annealing and Tempering High-Speed Steel, Geo. Lindsay; Best Coal and Best Kind of Fires, John Buckley; Subjects for 1907 Meeting, G. H. Judy; Piece Work vs. Day Work, R. A. Mould; Locomotive Frames—From Scrap to Finish, Also Repairing, Jas. Fenwick; Thermit Welding and Cast, Geo. Kelly.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Butte, Anaconda & Pacific.*—J. D. Ryan has been elected President, with office at Butte, Mont.

*Coahuila & Zacatecas.*—E. C. Farrel has been appointed Auditor, with office at Saltillo, Mex., succeeding H. F. Horton, resigned.

*Illinois Terminal.*—G. M. Levis, Vice-President, has been elected President, succeeding W. E. Smith. H. S. Baker, General Counsel, has been elected also Secretary, succeeding Charles Levis, and L. A. Schaffy has been elected Treasurer, succeeding R. H. Levis. L. T. Castle has been appointed Auditor, succeeding F. L. Taylor.

*Kentucky Valley.*—The officers of this company are: I. H. Wheatcroft, President and General Manager, with office at Providence, Ky.; B. J. Arnold, Vice-President, with office at Chicago, Ill., and E. C. Ruff, Secretary and Auditor, with office at Providence.

*New Orleans Terminal.*—J. S. Powell has been appointed Acting Assistant Auditor, with office at New Orleans, La., succeeding C. A. Carroll.

### Operating Officers.

*Atchison, Topeka & Santa Fe (Coast Lines).*—R. H. Tuttle, trainmaster at Needles, Cal., has been appointed Acting Superintendent at that place, during the three months' leave of absence of John Denair.

*Atlantic Coast Line.*—W. R. Beauprie, Superintendent at Montgomery, Ala., has resigned. S. B. Bennett, Superintendent at Waycross, Ga., succeeds Mr. Beauprie. R. A. McCranie, Superintendent at Jacksonville, Fla., succeeds Mr. Bennett.

*Chicago, Lake Shore & Eastern.*—A. N. McClary has been appointed Car Accountant, with office at Joliet, Ill., succeeding O. F. Clark.

*Chicago, Rock Island & Gulf.*—J. R. Blakeney has been appointed Car Accountant, with office at Forth Worth, Tex., succeeding J. W. Thompson, resigned.

*Corvallis & Eastern.*—G. W. Talbot has been appointed General Manager. J. T. Walsh has been appointed Acting Superintendent, succeeding C. Sullivan.

*Illinois Terminal.*—H. H. Ferguson, General Manager, has been elected also Vice-President.

*International & Great Northern.*—H. S. Corrington has been appointed Assistant Superintendent at Taylor, Tex.

*Interoceanic of Mexico.*—See National R. R. of Mexico.

*Kansas City Southern.*—E. E. Gibson has been appointed Superintendent of Terminals at Port Arthur, Tex.

*National R. R. of Mexico.*—The authority of H. H. Allison, Superintendent of Terminals at Mexico City, has been extended over the terminals at that place of the Interoceanic of Mexico.

*Southern.*—The lines east and south of Harriman Junction, Chattanooga, Nashville and Memphis, are now operated in four districts instead of two. E. H. Coapman has been appointed Assistant General Superintendent in charge of the Northern district, consisting of the Washington, Danville and Norfolk divisions, with office at Danville, Va. J. N. Seale has been appointed Assistant General Superintendent in charge of the Eastern district, consisting of the Charlotte, Columbia, Charleston and Jacksonville divisions, with office at Charlotte, N. C.; W. N. Foreacre has been appointed Assistant General Superintendent in charge of the Western district, consisting of the Birmingham, Memphis and Mobile Divisions, with office at Birmingham, Ala.; G. R. Loyall has been appointed Assistant General Superintendent in charge of the Middle district, consisting of the Asheville, Knoxville, Nashville and Atlanta divisions, with office at Knoxville, Tenn.; G. W. Taylor has been appointed Superintendent of Transportation, with office at Washington, succeeding J. N. Seale, promoted. E. E. Norris has been appointed Assistant Superintendent of the coal lines, Knoxville division, with office at Knoxville, Tenn.

*Tonopah & Goldfield.*—J. F. Hedden has been appointed General Superintendent and General Freight and Passenger Agent, with office at Tonopah, Nev., succeeding Alonzo Tripp, resigned.

*Vandalia.*—The office of F. H. Worthington, Superintendent of the

Peoria division, has been removed from Terre Haute, Ind., to Decatur, Ill.

### Traffic Officers.

*Alabama & Vicksburg.*—See New Orleans & Northeastern.

*Central of Georgia.*—J. L. Graham, Assistant General Freight Agent, has resigned to go into other business.

*Chicago & Eastern Illinois.*—S. J. Cooke, General Freight Agent, has resigned, effective August 1.

*Chicago, St. Paul, Minneapolis & Omaha.*—E. A. Gray has been appointed Assistant General Freight Agent at St. Paul, Minn. F. C. Gifford has been appointed Assistant General Freight Agent at Minneapolis, Minn.

*Great Northern.*—A. L. Craig, who was recently appointed Passenger Traffic Manager, was born at St. Paul, Minn., in 1861. He began railroad service in 1880 as a roadman on construction work on the Northern Pacific. For the next seven years he was in the office of the Auditor of that road and was then appointed chief rate clerk in the office of the General Passenger and Ticket Agent. He was made Assistant General Ticket Agent in 1891 and, in 1900, was appointed Assistant General Passenger and Ticket Agent. The next year he went to the Oregon R. R. & Navigation as General Passenger Agent; and now comes from that road to the Great Northern.

A. L. Craig.

S. G. Yerkes, Assistant General Passenger Agent, has been appointed General Passenger Agent, with office at St. Paul, Minn., succeeding C. E. Stone, resigned.

*New Orleans & Northeastern.*—W. H. Quigg, Second Assistant General Freight Agent of this road and of the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific, has been appointed First Assistant General Freight Agent of the three companies, succeeding J. D. Grant, resigned to go into other business.

*Vicksburg, Shreveport & Pacific.*—See New Orleans & Northeastern.

### Engineering and Rolling Stock Officers.

*Chicago & North-Western.*—W. J. Towne, Engineer of Permanent Improvements, has been appointed Engineer of Maintenance of the lines east of the Missouri river. A. A. Schenck, Division Engineer at Omaha, Neb., has been appointed Engineer of Maintenance of the lines west of the Missouri river. Hereafter, division engineers will report to the engineers of maintenance on all matters heretofore referred to the Chief Engineer. The Engineers of Maintenance will report to the General Manager on Maintenance of tracks, buildings, water stations and other operating facilities, and to the Chief Engineer on matters relating to bridges and drainage.

E. B. Thompson, Master Mechanic at Winona, Minn., has been appointed to the new office of Second Assistant Superintendent of Motive Power and Machinery, with office at Chicago, Ill.

*Chicago, Rock Island & Gulf.*—J. H. Farmer has been appointed Master Mechanic of the Mexican division, with office at Delhart, Tex., succeeding E. D. Andrews, resigned.

*Chicago, Rock Island & Pacific.*—E. F. Tegtmeyer, Foreman of the Fort Wayne, Ind., erecting shops of the Pennsylvania Lines West, has been appointed Assistant Superintendent of the C., R. I. & P. shops at East Moline, Ill.

*Coahuila & Zacatecas.*—W. F. Hannes has been appointed Consulting Engineer, succeeding H. Scholfield, resigned.

*Coal & Coke.*—D. C. Courtney has been appointed Superintendent of Motive Power, succeeding C. E. Turner, resigned.

*National R. R. of Mexico.*—James Farrel, Acting Superintendent of Motive Power and Machinery, has been appointed Superintendent of Motive Power and Machinery, with office at Laredo, Tex.

*Parral & Durango.*—G. S. Davis, Engineer, has been appointed Chief Engineer, with office at Mesa de Sandia, Mex.

*Pennsylvania Lines West.*—H. E. Newcomet, Engineer of Maintenance of Way at New Castle, Pa., has been appointed Acting Engineer of Maintenance of Way at Cleveland, Ohio, during the absence of H. E. Culbertson, who has been given a leave of absence for several months on account of ill health.

*Philadelphia & Reading.*—J. B. Young has been appointed Chemist, succeeding Robert Job, resigned. Mr. Young will report to the Superintendent of Motive Power and Rolling Equipment.

*Southern.*—The office of Thomas Bernard, Engineer of Maintenance of Way, has been removed from Greensboro, N. C., to Danville, Va.

### Purchasing Agents.

*Chicago Great Western.*—V. T. DeVinny has been appointed Acting Purchasing Agent, succeeding A. D. Ward, resigned to go into other business.

*Norfolk & Southern.*—W. R. Burrows has been appointed Purchasing Agent, with office at Norfolk, Va., succeeding, as Purchasing Agent, M. K. King, who remains Vice-President and General Manager.

### Special Officers.

*Temiskaming & Northern Ontario.*—A. A. Cole has been appointed Mining Engineer, with supervision over the cobalt and silver mines under the control of the T. & N. Railway Commission.

## LOCOMOTIVE BUILDING.

*The Buffalo, Attica & Arcade* has ordered two locomotives from the Baldwin Works.

*The Missouri River & Northwestern*, it is reported, is in the market for locomotives.

*The Louisville & Nashville*, it is reported, is in the market for material for locomotive tender tanks.

*The Canadian Northern* has ordered 15 ten-wheel locomotives from the Canadian Locomotive Co., for 1907 delivery.

*The Lima Locomotive & Machine Company* report the following orders during the past week for Shay locomotives: Sibley Quarry Co., Sibley, Mich., one 18-ton locomotive; C. R. Johnson, Norfolk, Va., one 24-ton locomotive; Victoria Lumber & Mfg. Co., Victoria, B. C., two 45-ton locomotives; England Walton Co., Ltd., Philadelphia, Pa., one 18-ton and one 24-ton locomotive; Superviele & Co., Las Predras, Uruguay, S. A., one 10-ton locomotive; Gibson, Battle & Co., Sydney, Australia, one 65-ton locomotive, and T. M. O'Connell, Rainer, Ore., one 37-ton locomotive.

## CAR BUILDING.

*The Kiushu of Japan* has just ordered five Pullman cars from the Pullman Co.

*The Southern*, it is reported, is considering the building of several hospital cars.

*The Baltimore & Ohio*, it is reported, is converting a number of its old box cars into flat cars.

*The Lehigh Valley*, it is reported, has ordered 1,000 steel hopper cars from the Standard Steel Car Co. and 500 gondola cars from the Cambria Steel Co.

*The Marcellus & Otisco Lake* is in the market for one passenger coach equipped with Baker heater. Address R. L. Scott, Superintendent, Marcellus, N. Y.

*The Norfolk & Western* has ordered nine postal cars from the Pullman Co., for October delivery. The specifications for these cars were published in our issue of May 25.

*The New Jersey & Hudson River Railway & Ferry Co.* has ordered eight closed cars with bodies 42 ft. long and a seating capacity of 44 persons, from the John Stephenson Co. These cars will be equipped with G. E. motors and M. C. B. trucks.

*The Los Angeles Railway Co.* has ordered 100 standard combination cars from the St. Louis Car Co. The cars will weigh 23,000 lbs. and measure 39 ft. $6\frac{1}{2}$ in. long, 8 ft. $5\frac{1}{2}$ in. wide and 9 ft. 1 in. high, over all. The special equipment includes Sherwin-Williams Co.'s paint.

*The Mineral Range*, as reported in our issue of July 13, has

ordered 60 hopper bottom gondola cars of 80,000 lbs. capacity from the American Car & Foundry Co. These cars will weigh 32,000 lbs. and will measure 30 ft. long, 8 ft. 10 in. wide and 8 ft. 4 in. high, all outside measurements. The special equipment will include Common Sense bolsters, Monarch brake-beams, Congdon brake-shoes, Westinghouse brakes, National Fulton brasses, Trojan couplers, Gould draft rigging, Symington journal boxes, Railway Steel Spring Co.'s springs, Diamond trucks and American Car & Fdy. Co.'s wheels.

*The Erie*, as reported in our issue of July 13, has ordered 500 flat cars of 100,000 lbs. capacity for December, 1906, delivery, and 500 flat bottom drop end gondola cars of 100,000 lbs. capacity for January, 1907, delivery, from the Standard Steel Car Co., and 500 steel underframe produce cars of 80,000 lbs. capacity for November and December delivery from the American Car & Fdy. Co. The flat cars will weigh 33,000 lbs. and will measure 40 ft. 9 in. long by 9 ft. 6 in. wide. The bodies and underframes will be of metal. The gondola cars will weigh 42,600 lbs. and will measure 45 ft. long by 9 ft. 6 in. wide. The sides and ends will be of wood and the underframes will be of steel. The produce cars will measure 37 ft. 11 in. long by 9 ft. 2 in. wide. The bodies will be of wood and the underframes will be of steel. The special equipment will include steel axles, built up bolsters, Simplex brake-beams for produce and flat cars and Damascus brake-beams for gondola cars, Congdon brake-shoes, Climax brasses, Gould couplers for flat cars, R. E. Janney couplers for gondola cars and Major couplers for produce cars, Minor tandem draft rigging, Wood dust guards, Erie malleable iron journal boxes, archbar Barber roller trucks, and M. C. B. standard wheels for gondola and flat cars, and American Car & Fdy. Co.'s wheels for produce cars.

## RAILROAD STRUCTURES.

ALBANY, N. Y.—The State Canal Board has made an agreement with the New York Central to pay that company $72,954 compensation for crossing the railroad company's line on the Niagara Falls branch near Rochester. The railroad agrees to build and maintain a steel bridge at the crossing.

BEAVER CITY, NEB.—Bids are wanted August 6 by the board of county commissioners of Furnas county for the construction of new steel bridges as follows: One 300-ft. bridge at Oxford, one 32-ft. steel span, 3 miles northwest of Cambridge, and one 34-ft. span, 8 miles southwest of Beaver City. A. R. Perry, County Clerk.

BIRMINGHAM, ALA.—A building permit has been issued by this city for the new union passenger station.

DAYTON, OHIO.—The commissioners have granted permission to the Cincinnati Northern Traction Co. to build two canal bridges, one at Alexandersville and the other at West Carrollton.

CHATTANOOGA, TENN.—According to local reports, the Chattanooga Electric Railway will put up car repair shops, to cost $125,000.

ELYRIA, OHIO.—The Lorain & West Virginia Railroad will build a bridge in Amherst Township and will also build a large number of overhead structures for highways in this county.

FORT WORTH, TEX.—The Fort Worth & Denver City Terminal Co. will soon start work on a new brick passenger station on East Ninth street.

GREENSBURG, PA.—Bids are wanted July 19 by John D. Hitchman, Controller, for putting up a three-span steel bridge over the Youghiogheny river in Westmoreland County.

HOUSTON, TEX.—The St. Louis, Brownsville & Mexico, it is said, has completed arrangements to build about six steel bridges along the line of its road.

MACON, GA.—Definite announcement has been made that the Central of Georgia will build shops on the land recently bought from this city.

MINNEAPOLIS, MINN.—The Northern Pacific and the M., St. P. & S. S. M., according to local reports, are making large purchases of land for new yards and terminal facilities. The Northern Pacific has bought 180 acres in southeast Minneapolis. The Great Northern has filled in a large tract of marshy land in the Cedar Lake suburban district of Minneapolis as a site for grain elevators, shops and roundhouses.

MONTGOMERY, ALA.—The Western of Alabama is to make improvements to include a new shop building 75 ft. by 500 ft., to cost about $80,000.

NEW ALBANY, IND.—The Chicago, Indianapolis & Louisville, it is said, has decided to put up a new brick, 16-stall roundhouse to cost $25,000.

RICHMOND, VA.—The Chesapeake & Ohio has bought land along Seventeenth street as a site for a large freight station.

RED DEER, ALB.—Contract has been given to Thorald & Pardis, of Calgary, for putting up a six-stall roundhouse for the Canadian Pacific.

SAN FRANCISCO, CAL.—The Southern Pacific, which recently leased the James Flood building for its general offices, employing about 1,500 persons, has given a contract, at about $80,000, for remodeling the interior of the building, the work to be completed during the present year. The ticket offices of the Southern Pacific and a number of the trans-continental lines which formerly had offices in the Palace and Grand Hotels, will be on the ground floor of the Floid building.

SCRANTON, PA.—The Delaware, Lackawanna & Western, it is said, is having plans made for building a viaduct at Clark's Summit.

SOURIS, MAN.—Contracts have been let to J. McDiarmid Bros., of Winnipeg, for putting up a six-stall roundhouse and engine room at this place for the Canadian Pacific; also for putting up a roundhouse at Lethbridge for the same company.

TORONTO, ONT.—Mayor J. Coatsworth states that bids for building the combined railroad and highway bridge at Yonge street will be called for as soon a the legal arrangements can be completed.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ALTON, CALHOUN & QUINCY.—Incorporated in Illinois with $5,000 capital, with C. L. Wood, M. C. Johnson, J. J. Kinder, B. T. Douglas, G. W. Douglas, J. R. Vaughn and John Early as directors. The company proposes to build a line from Alton west to Grafton and Brussels, thence north via Batchtown, Hamburg and Pleasant Hill to Quincy, Ill., approximately 100 miles.

ANDERSON TRACTION COMPANY.—This company is building the first section of an electric line from Anderson, S. C., to Belton, 10 miles, and proposes eventually to extend the line to Greenville, S. C., 35 miles. The capital stock of the company is $280,000. J. A. Brock, of Anderson, is President.

ATCHISON, TOPEKA & SANTA FE.—The Denver, Enid & Gulf, controlled by this company, has been incorporated in Kansas, with $3,000,000 capital, to build from the northern terminus of the present road of that name at Kiowa, northwest to a connection with the Englewood branch of the A., T. & S. F. The principal office will be at Topeka. Joseph Young, of Enid, is President, and J. E. Hurley, General Manager of the Santa Fe, is Vice-President. A contract is reported let to Barney Barkley for track laying on this extension from Kiowa, Kan., north as far as Medicine Lodge, about 20 miles, the work to be completed by September 1st.

ATLANTA & NEW ORLEANS.—This company, which has planned to build a line from Atlanta to New Orleans and Baton Rouge, La., has applied for a charter in Georgia. The proposed capital is $100,000, and the principal office at Atlanta. Ronald Ranson, H. S. Collinsworth, F. M. Merkell, W. N. Hawkes, F. M. Butt, J. S. Middletown and others are interested.

ATLANTIC & WESTERN.—See Atlantic Coast Line.

ATLANTIC COAST LINE.—This company having recently bought the Macon, Dublin & Savannah, which runs from Macon, Ga., to Vidalia, 92 miles, is planning to build a connecting link which will give it a through line from Macon to Savannah. This is to be done under the charter of a new company, the Atlantic & Western, which it to run from Vidalia, Toombs County, to a connection with the Atlantic Coast Line in Liberty County.

BIG HORN.—See Chicago, Burlington & Quincy.

CALIENTE & PIOCHE.—Incorporated in Utah with $300,000 capital to build a line from the Nevada-Utah Mines & Smelters Company at Pioche, Nev., south to the San Pedro, Los Angeles & Salt Lake at Caliente. The road will be 30 miles long and cost about $300,000. The officers and directors are: J. Ross Clark, President; W. H. Bancroft, Vice-President; E. Backingham, C. O. Wittemore, Pennel Cherington and F. H. Knickerbocker.

CANADIAN NORTHERN.—A contract is reported let to J. Y. Schell, M. P. for Glengarry, for building the proposed new line along the Ottawa river from Hawksbury, Ont., west through Ottawa, approximately 55 miles. (May 11, p. 142.)

The Prince Albert division of this road has been opened for business from Melfort, Sask., west to Prince Albert, 62.4 miles.

CANADIAN PACIFIC.—This company, it is said, will build a cut-

off at the Terrebonne Loop, on its Montreal and Quebec line, reducing the distance between these two points to 160 miles.

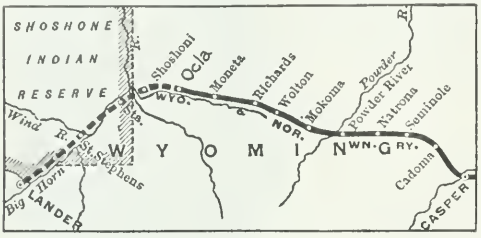
A contract, it is said, has been given to A. Cazier, of Cardstown, Alb., at about $200,000, for improving the roadbed near Maple Creek, Alb.

Central of Georgia.—This company has incorporated the Georgia Central & Gulf to build a line from Albany, Ga., via Quincy, Fla., to Apalachicola, approximately 160 miles. Such a line will give the Central a line from Atlanta via Macon and Albany to the Gulf of Mexico. Construction work is to be started shortly. J. T. Hanson, A. R. Lawton, W. A. Winburn and T. M. Cunningham, all of the Central of Georgia, are interested in the new company.

Chesapeake & Ohio.—The Piney Creek branch of the Hinton division has been extended from Surveyor, W. Va., to Lester, 3.2 miles.

The new Laurel Creek branch has been opened for business from Quinnimont, W. Va., to Hemlock Hollow, 5.5 miles.

Chicago & North-Western.—The Wyoming & North-Western has been extended from Wolton, Wyo., as far west as Ocla, 30.3 miles




Chicago & North-Western Extension in Wyoming.

from Wolton. Work on the remaining 60 miles to Lander is being pushed to completion. (June 29, p. 188.)

Chicago, Burlington & Quincy.—A contract has been given to the Walsh & Johnson Construction Co., of Davenport, Iowa, by this company, and work is already under way for reconstructing part of the line from Lynn, Ill., north about four miles to Orion; also from Rio north to Alpha, an additional five miles. The work includes grade reduction and change of line.

This company has opened the new Big Horn line from Frannie, Wyo., southeast to Worland, 82 miles. (June 29, p. 189.)

Consolidated Railway (N. Y., N. H. & H.).—President Mellen, of the New York, New Haven & Hartford, which controls the Consolidated electric lines, in a communication to the Massachusetts State Legislature says that the Consolidated Railway is to furnish the capital for building the Bennington & North Adams Street Railway. The Berkshire Street Railway has agreed to build an extension from Great Barrington to the Connecticut state line at or near Canaan either via South Egremont or direct from Great Barrington to Sheffield. The Consolidated is surveying for a line from the Massachusetts state line from near Canaan through Hartsville to Monterey, connecting with the Berkshire Street Railway; also for a connection between the Western Massachusetts at Huntington and the Berkshire Street Railway at Lee, Mass. Surveys are also to be made from Lee through the valley of the Farmington river to the Connecticut line near New Hartford, Conn. The company is also building an extension of the Springfield & Eastern from Monson to Fiskdale, about 12 miles, to connect the Springfield and the Worcester systems; and an extension is to be built to South Monson about one-half mile.

Cross Creek.—See Wabash.

Cuba Roads.—The President of the Republic has directed that bids be asked for building the 12 branch lines, for which the Cuban Parliament recently passed a bill granting subsidies of $6,000 a kilometer. This action would seem to defeat the plan to give the whole benefit of the subsidies to the Van Horne railroad system.

DeKalb, Sycamore & Interurban Traction.—Incorporated in Illinois with $100,000 capital to build an electric line from Belvidere south via DeKalb to Yorkville; also from Sycamore east to Elgin, with branches into the counties of Boon, McHenry, Kane, Ogle, Lee, Kendall, La Salle and Du Page. The names of the incorporators are not given.

Denver & Omaha Short Line.—Russell Harding, former Vice-President of the Cincinnati, Hamilton & Dayton, and of the Missouri Pacific, has taken active charge of the plans for the construction of a new line between Omaha and Denver. Mr. Harding is associated with H. B. Hollins & Co., who have undertaken to arrange the financing of the new line. (See Omaha & Denver Short Line, July 6, p. 5.)

Denver, Enid & Gulf.—See Atchison, Topeka & Santa Fe.

Eldorado, Marion & Southwestern.—Incorporated in Illinois to build a line from Eldorado southwest through Saline, Williamson, Johnson, Union and Alexander Counties to the Mississippi river, about 80 miles. The directors and incorporators are: John Collp and Chas. E. Owen, of Carterville; C. Agent, of Marion, and S. T. Brush, of Warbondale.

Fort Dodge, Des Moines & Southern.—With the proceeds of bonds sold to the Old Colony Trust Co., of Boston, the proposed electric line from Fort Dodge, Iowa, southeast via Ames to Des Moines, about 75 miles, is to be built at once. The right of way has been secured. The F. D., D. M. & S. is to take over the Fort Dodge and Ames electric lines.

Georgia & Florida.—This company has been granted a charter in Georgia, with $1,000,000 capital and with principal office at Augusta. The company proposes to build a line from Augusta, Ga., which, with several existing roads, will make a continuous line to the Gulf of Mexico, approximately 350 miles. Mindendorf-Williams & Co., of Baltimore, are said to be financing the project. (June 1, p. 161.)

Georgia Central & Gulf.—See Central of Georgia.

Georgia, Florida & Alabama.—Application has been made by this company for authority to amend its charter so as to build two branch lines, one from Cuthbert, Ga., to the Chattahooche river, and the other from the main line at Colquitt, Ga., to Eufala, Ala.

Granite City & East St. Louis Terminal.—Incorporated in Illinois, with $100,000 capital, with office in Chicago, to build a line from Granite City to East St. Louis. The incorporators and directors are: Charles G. Lucas, P. A. Nueffer, H. H. Phillips, H. B. Herd and R. M. Cole.

Gray's Harbor & Columbia River.—Incorporated in Washington with $1,000,000 capital and office at Tacoma. This company proposes to build a line from Kalama in Cowlitz County, Wash., on the Northern Pacific northwest through Wahkiakum and Pacific Counties to a point on the Pacific coast, about 80 miles, with a connecting line north to Gray's Harbor, an additional 40 miles. The company is also to operate steamers on the Pacific ocean and on the Columbia river. A. F. Albertson and C. Thorn, of Tacoma, and F. A. Rice, H. H. Scales and others, are interested.

Hamilton, Waterloo & Guelph (Electric).—Bids are wanted July 27 for building an electric line for this company from Hamilton, Ont., west to Galt; also from Hamilton northwest to Guelph, approximately 60 miles. Plans at the office of Thomas E. Hillman, C.E., Hamilton Provident Loan Building, Hamilton, Canada, to whom all bids should be addressed. (April 13, p. 115.)

Hancock & East Branch.—Incorporated in New York with $200,000 capital by F. V. Wishart, F. J. Mann and E. J. Welch, of New York City, to build a line from the Delaware & Eastern road near East Branch, N. Y., to Hancock, on the Erie and the New York, Ontario & Western, approximately 20 miles.

Hillsboro, Kimmswick & Northern.—Incorporated in Missouri with $300,000 capital and office in St. Louis. The company is to build a line from Hillsboro, in Jefferson County, northeast to the southern limits of St. Louis, about 23 miles. The stockholders are: H. W. Gulke, A. F. Furrer, Lee A. Hall, Charles A. Gulke and James J. Ring, all of St. Louis.

Houston & Texas Central.—This company announces that the Mexia-Nelleva cut-off was opened for traffic between Mexia and Jewett on July 15, and will be operated as a part of the first division. The new line extends from Mexia, Texas, southeast via Mexia Junction, Varela, Personville and Farrar to Jewett, on the International & Great Northern, 27.96 miles.

Indiana Union Traction.—In consideration of privileges granted by the city of Anderson, Ind., this company agrees to build by July, 1907, shops at that place to cost $125,000; and to extend its lines from that city southeast via Middletown to New Castle, about 20 miles; also from Anderson northwest to Elwood, an additional 15 miles, all by 1909.

Kansas City Terminal Co.—This company has been incorporated in Missouri with a capital of $20,000,000. The directors are as follows: B. L. Winchell, Rock Island; J. W. Kendrick, A., T. & S. F.; A. J. Earling, C., M. & St. Paul; S. M. Felton, Chicago & Alton; W. B. Scott, Union Pacific; F. A. Delano, Wabash; C. S. Clarke, Missouri Pacific; A. J. Davidson, St. L. & S. F.; A. A. Allen, M., K. & T.; D. Willard, C., B. & Q.; John M. Egan, Kansas City. The corporation is to build the new Union Passenger Station at Kansas City and construct and operate all the lines connected with

it. The present union station is operated by the Union Depot Co., of Kansas City.

LA GLORIA TRANSPORTATION COMPANY.—Incorporated in New Jersey, with $25,000 capital, to build railroads and operate steamers from Nuevitas, Cuba, northwest about 35 miles to La Gloria in the Province of Camaguey. The principal office of the company is at 167 Main avenue, Passaic, N. J., where Richard Atwater is in charge. The incorporators are: Louis T. Wilson, of Elizabeth; F. H. Ridgway and F. W. Frost, of New York.

MACON, DUBLIN & SAVANNAH.—See Atlantic Coast Line.

MARLBORO & DEEPWATER.—Incorporated in South Carolina with $25,000 capital to build 12 miles of railroad in that state. J. J. Matheson is President; G. D. Matheson, Vice-President, and C. R. May, Secretary and Treasurer.

MEXICAN ROADS.—A company, it is said, is being organized by A. W. Geist, who is a large mine operator, to build a line from Laspenas, on the Pacific coast of Mexico, at present without railroad connection, to a connection with the extension of the Sonora Railway, southeast of Guaymas.

An English syndicate, it is reported, is planning to build a line from San Jose del Sitio, Chihuahua, south to Parral and north to a point on the line of the Kansas City, Mexico & Orient.

MISSISSIPPI CENTRAL.—This company has extended its road from Silver Creek, Miss., west to Brookhaven, 29 miles.

MISSOURI, KANSAS & TEXAS.—A contract is reported let by this company for reducing the grades on the main line, on the section from Atoka, Ind. Ter., to the Red river.

NEVADA NORTHERN.—The line being built by this company from Cobre, Nev., south to the Ely mining region is nearing completion. According to the General Manager the road has been completed already into Cherry Creek, which is about 50 miles from Ely. (See Construction Record.)

NEW YORK & QUEENS COUNTY (ELECTRIC).—This company, which operates 40 miles of electric line in and near Long Island City, N. Y., is planning to build extensions to reach Bayside and Whitestone and eventually to Douglaston and Little Neck.

NORTHERN PACIFIC.—On the Pacific division of this road the Grays Harbor branch has been extended from Hoquiam, Wash., west to Moclips on the Pacific coast, 28 miles.

PALMA, SUANA & WESTERN.—This company has been organized at Portland, Me., for the purpose of operating railroads. Capital stock, $300,000. President, H. L. Cram; Treasurer, C. E. McGlauflin, both of Portland.

PAN-AMERICAN.—The road of this company beginning at San Geronimo, on the Tehuantepec National, is in operation southeast to Pipiñapam, 172 miles, with a branch from the main line at Tonala to Arista, 12 miles; and it is expected that the road as far as the border of Guatemala will be completed by the close of this year. Reports from Salvador indicate that a concession will soon be granted to the company, and that a subsidy will be allowed for the extension of the line through that country as soon as the present disturbance in Guatemala is settled. (See Construction Record.)

PEARL RIVER.—The charter of this company has been filed in Mississippi. The company has completed organization and will have a capital stock of $1,000,000. The following officers have been elected: President, Fred Herrick; Vice-President, C. F. Lattimer; Secretary, Arthur L. Hogue; Treasurer, Roy L. Hogue. (See Construction Record.)

PHILADELPHIA & READING.—The double track from Harrisburg to Shippensburg on the Philadelphia, Harrisburg & Pittsburg branch will be finished next month.

PORTO RICO ROADS.—Petitions have been made for a franchise by parties interested in the Porto Rico American Tobacco Co. to build a line from San Juan to Caguas.

PUTNAM & WESTCHESTER TRACTION.—Incorporated in New York, with $75,000 capital, to build an electric line from Peekskill, Westchester County, to Oregon, Putnam County. J. S. Ladd and A. L. Erhardt, of Peekskill, and Walter Perry, of Putnam Valley, are directors.

SEABOARD AIR LINE.—According to Birmingham reports, this company has completed arrangements to enter the city of Anniston and the Anniston mineral district by building a branch from its main line at Jacksonville, Ala., about half way between Birmingham and Atlanta, south to Anniston, about 25 miles. The surveys have been completed but work has not been started pending the securing of certain franchises from the Anniston City Council which have just been granted. It is said to be the intention of the company to build south from Anniston to Talladega and eventually to Montgomery, the western terminus of its line from Savannah. It also contemplates the construction of a branch line north from its main line to the Gadsden mineral district.

SOUTHERN.—An officer sends us the following statement showing the number of miles of new track laid since January 1 on branches and extensions:

| | Miles. | Miles. | Miles. |
|---|---|---|---|
| Double Tracking | | | |
| From Danville to Pelham, N. C., main line | 9.60 | ... | .... |
| Completed in March. | | | |
| From Pomona to High Point, N. C., main line | 12.80 | ... | .... |
| Northbound track laid to June 30 | 7.05 | ... | .... |
| Southbound track laid to June 30 | 8.22 | ... | .... |
| Knoxville to Mascot, Tenn.: | | | |
| Main line, estimated distance | 11.90 | ... | .... |
| Eastbound track laid to June 30 | 3.73 | ... | .... |
| Westbound track laid to June 30 | 1.40 | ... | .... |
| Jefferson City to new line, Tennessee: | | | |
| Main line, estimated distance | 10.30 | ... | .... |
| Eastbound track laid to June 30 | 5.16 | ... | .... |
| Mobile Junction cut-off between Mobile Junction and North Bessemer, Ala.: | | | |
| Length of main line | 3.40 | ... | .... |
| Completed in March. | | | |
| Spur track for Pratt Consolidated Coal Co, near Davis mines, Alabama: | | | |
| Length of main line | .70 | ... | .... |
| Length of sidings | .73 | ... | .... |
| Completed in May. | | | |
| Spur track for the Ware Shoals Mfg. Co., near Barmore, S. C. | 1.70 | ... | .... |
| Length of siding | .17 | ... | .... |
| Two-thirds completed to June 30. | | | |
| Spur track for Atlas Coal Co., near Okman, Ala.: | | | |
| Length of main line | 2.39 | ... | .... |
| Length of sidings | .47 | ... | .... |
| Completed in January. | | | |
| Extension to the South Knoxville, Tenn., spur, for J. M. Ross Marble Company: | | | |
| Length of main line spurs and sidings, estimated distance | 3.14 | ... | .... |
| Track laid to June 30 | 3.00 | ... | .... |
| Extension of Littleton branch, near Flat Top, Ala.: | | | |
| Length of main line, estimated distance | 5.00 | ... | .... |
| Track laid to June 30 | 1.00 | ... | .... |
| Extension of line from Vardaman, Miss., to Derma, Miss.: | | | |
| Length of main line, estimated distance | 8.90 | ... | .... |
| Track all laid, but not ballasted. | | | |
| Spur track for Obey River Coal Company, near Obey City, Tenn.: | | | |
| Length of main line | .75 | ... | .... |
| Length of sidings | .40 | ... | .... |
| Total | | ... | 101.91+ |
| Completed in May. | | | |
| DELTA SOUTHERN. | | | |
| Elizabeth Branch: | | | |
| Length of main line | 15.70 | ... | .... |
| Completed in May. | | | |
| Percy Branch: | | | |
| Length of main line, estimated distance | 10.50 | ... | .... |
| Length of sidings | 1.00 | ... | .... |
| Track laid to June 30 | 10.30 | ... | .... |
| Itta Bena Branch: | | | |
| Length of main line, estimated distance | 19.10 | ... | .... |
| Length of sidings, estimated distance | 2.00 | ... | .... |
| Track laid to June 30 | 5.00 | ... | .... |
| Spur track for S. J. Hughes on Elizabeth Branch: | | | |
| Length | .50 | ... | .... |
| Completed in April. | | | |
| Total | | ... | 64.10 |
| CUMBERLAND. | | | |
| *In Tennessee.* | | | |
| Campbell County, ft. ... | 18,094 | 3.05 | ... .... |
| Claiborne County | | | |
| Main track, ft. ... | 32,070 | 6.07 | ... .... |
| Baffle siding, ft. ... 971 | .... | .... | ... .... |
| Clarfield sidlng, ft. ... 860 | .... | .35 | ... .... |
| | 1,831 | | 9 47 .... |
| *In Kentucky.* | | | |
| Bell County— | | | |
| Main track, ft. ... | 9,099 | 1.72 | ... .... |
| Pruden Station siding, ft. ... 2,103 | .... | .... | ... .... |
| Sowder Creek spur "Y," ft. ... 3,506 | .... | 1.06 | ... .... |
| | 5,609 | 2.78 | |
| Total ... | .... | ... | 12.25 |
| ENSLEY SOUTHERN. | | | |
| Spur track for Tutwiler Coal & Coke Company, near Short Creek, Ala.— | | | |
| Length of main line: | .80 | ... | .... |
| Length of sidings | .88 | ... | .... |
| Completed in May, 1906. | | | |
| Total | | ... | 1.68 |
| Total of all lines | | | 179.94 |

The company has also a number of other lines under construction, on some of which a small amount of track has been laid, but not ballasted, and it will be some time before they are ready for operation. These are not included in the above table.

SHARON & SOUTH SHARON (ELECTRIC).—This company has secured a charter in Pennsylvania to extend its line to Wheatland. The incorporators are: C. Beckman, of Sharon; W. T. Burns, New Castle; R. Montgomery, Youngstown, Ohio, and others.

SOUTHERN PACIFIC.—It is said that this company is planning to build a line from Durango, Colo., and Silverton to Denver. Southern Pacific interests have already bought 1,000 acres of coal lands in and around Durango, on the border line between Colorado and New Mexico. Articles of incorporation have been filed in Colorado showing the route of the railroad. It lies through a rich coal territory.

TEXAS & PACIFIC.—The Avoyelles division of this road has been extended from Simmesport, La., south to Melville, 22.4 miles.

Thomasville, Sparks & Northeastern.—Incorporated in Georgia to build a line from Thomasville to the Gulf of Mexico.

Thornton & Alexandria.—This company has extended its road from Calhoun, Ark., south to Hampton, 3 miles.

Topeka & Northwestern.—See Union Pacific.

Tuscarora Traction Company.—Incorporated in New York, with $500,000 capital, to build an electric line from Addison, in Steuben County, N. Y., west to Jasper, about 15 miles. Thomas E. Hardin, of Addison; George R. Brown and John M. Connelly, are directors.

Union Pacific.—A contract has been given to Kilpatrick Bros., of Beatrice, Neb., for extending the Topeka & Northwestern from Onaga, Kan., northwest to a connection with the U. P. at Marysville, about 35 miles. This connecting line has already been built from Topeka on the Kansas City main line northwest to Onaga, 40 miles, where connection is made with the Leavenworth, Kansas & Western. (See Construction Record.)

Valdosta, Moultrie & Northwestern.—Incorporated in Georgia with $200,000 capital to build a line from Valdosta, Ga., on the Atlantic Coast Line, Georgia Southern & Florida and Valdosta Southern, northwest to Moultrie, on the Atlanta, Birmingham & Atlantic and the Georgia Northern, about 38 miles. E. P. Rose, C. R. Ashley, H. C. Briggs, J. A. Dasher, R. F. Ousley, J. Y. Blitch and D. C. Ashley, all of Valdosta, are interested.

Wabash.—This company has begun to operate the Cross Creek Railroad, a 6-mile coal line built by the Washington County Coal Co., from Avella, Pa., on the Wabash-Pittsburg Terminal.

Wheeling & Lake Erie.—This company, it is said, is planning to extend its Chagrin Falls branch north about 30 miles to Fairport, on Lake Erie. Surveys are now being made. It is thought the proposed extension will follow the original survey of the Clinton Air Line to within 10 miles of Painesville and then branch off to Fairport. The Clinton Air Line was surveyed and two miles of grading completed about 30 years ago.

Wyoming & North-Western.—See Chicago & North-Western.

Yazoo & Mississippi Valley.—A new line of this company, to be called the Silver Creek district, on the Vicksburg division, has been opened for business from Silver City, Miss., south to Holly Bluff, 24.7 miles.

Youngstown & Ohio River (Electric).—This company, which proposes to build a line from Salem, Ohio, east via Washingtonville, thence southeast via Leetonia, Lisbon and West Point, to East Liverpool, 34 miles, is asking bids for building the section from Washingtonville southeast to West Point, approximately, 15 miles. (June 8, page 168.)

## RAILROAD CORPORATION NEWS.

Atlantic Coast Line.—This company has bought the Macon, Dublin & Savannah, which runs from Macon, Ga., to Vidalia, 92 miles. The A. C. L., when a connection is built with this smaller line, will have a shorter route from Macon to Savannah than the existing line of the Central of Georgia.

Baltimore & Ohio.—The gross earnings of this company for the year ending June 30, 1906, were $77,392,056, an increase of $9,702,059. The net earnings were $27,876,835, an increase of $4,897,442. The company has for some time been carrying an unusually large amount of coal and it has also participated in the heavy traffic which all the trunk lines have been taking.

Illinois Central.—A regular semi-annual dividend of 3½ per cent. has been declared on the $95,040,000 common stock. The semi-annual rate has been, heretofore, 3 per cent. and ½ of 1 per cent. extra.

Forest City Railway, Cleveland.—This company, which is building 13½ miles of double-track road in and near Cleveland and has $2,000,000 authorized capital stock is offering $400,000 common stock at 90. When the road is completed it will be operated under lease by the Municipal Traction Co.

Hartford & Springfield Street Railway.—The shareholders have authorized an increase of 850 shares of 6 per cent. preferred stock, making the total amount $285,000.

Kansas City, Mexico & Orient.—There are now 1,619 miles of this road in operation and the Vice-President is quoted as saying that 1,100 miles will be completed soon after Jan. 1, 1907. About 325 miles of the 635 to be built in Mexico are already completed.

Kansas City Terminal.—Under this name a company has been incorporated with $30,000,000 capital stock to build and operate new terminal facilities to take the place of the present Union Depot Co. A union passenger station will be erected at a cost of $3,500,000. Of the bonds to be authorized, $13,000,000 will be used to pay for land and terminal facilities, and $4,000,000 to buy the Kansas City Belt and to retire the outstanding bonds of the last named company. The incorporators are officers of the 10 railroads entering the city.

Lehigh Valley.—This company has opened a new freight terminal on the east side of the Harlem river, New York City, at the foot of East 149th street.

Macon, Dublin & Georgia.—See Atlantic Coast Line.

Media, Middleton, Aston & Chester (Electric).—See Philadelphia Rapid Transit.

Mohawk Valley (N. Y. C. & H. R. Electric Lines).—This company has filed a certificate of an increase in capital stock from $10,000,000 to $20,000,000. Half of the total amount has been issued and the certificate filed shows that the New York Central & Hudson River holds $6,000,000 of this amount and that Horace E. Andrews holds the remaining $4,000,000.

National of Mexico.—A dividend of 1 per cent. on the $32,000,000 4 per cent. first preferred stock of this company has been declared. This is the first dividend on this stock and, while it is not announced that the payment will be continued, it is believed that the earnings of the company will continue to warrant it. During the last few months the earnings have increased at a rate greater than 10 per cent.

New York, New Haven & Hartford.—This company, through the New England Navigation Company, has taken over the property of the Block Island & Providence Co., which operates a steamship line between Rhode Island and Block Island.

New York, Westchester & Boston (Electric).—This company, which has begun to build its road from New York City eastward to the Connecticut state line, has been refused a franchise in the town of New Rochelle, N. Y. It is reported that it will be two years before a decision can be obtained from the Court of Appeals on this matter.

Norfolk & Western.—Brown Brothers & Co., New York, are offering at a price to yield about 4¾ per cent. the unsold balance of an issue of $4,000,000 4 per cent. equipment trust notes. They are secured on 86 freight locomotives, 1,885 gondolas, and 1,000 box cars. (July 13, p. 12.)

Pennsylvania.—It is announced that the French syndicate has sold, at 99, the entire amount of the 250,000,000 francs Pennsylvania Company 15 year, 3½ per cent. bonds. (June 22, p. 182.)

Philadelphia, Morton & Swarthmore (Electric).—See Philadelphia Rapid Transit.

Philadelphia Rapid Transit.—This company has leased the Philadelphia, Morton & Swarthmore and the Media, Middletown, Aston & Chester. The P., M. & S. runs from Swarthmore to Philadelphia, 15 miles, and the M., M., A. & C. runs from Chester to Media, five miles. The outstanding capital stock of the P., M. & S. is $250,000 and funded debt $500,000. The M., M., A. & C. has $205,300 outstanding capital stock and $210,000 bonds.

Pittsburg.—It is reported that E. H. Gay & Co., of Boston, and Fisk & Robinson, New York, have completed the floating of a bond issue of $55,000,000 for the purpose of building a new union terminal at Pittsburg for the Erie, the Buffalo, Rochester & Pittsburg, the Pittsburg, Shawmut & Northern, the Buffalo & Susquehanna and the Pittsburg, Binghamton & Eastern.

San Francisco, Oakland & San Jose (Electric).—This company has 14 miles of road in Oakland, Cal., and also operates a ferry line across the bay to San Francisco. It proposes to build a pier at Oakland diagonally from the water front to the broad gage pier of the Southern Pacific, so as to enclose a triangular space which will be filled in and used as a freight yard. The slips will be built for the accommodation of ocean steamships and the company will transfer freight from these boats to other railroads.

Southern.—See Transylvania.

Transylvania.—This company made a mortgage to the Standard Trust Company, New York, trustee, securing $500,000 first mortgage 5 per cent. bonds of 1956. The company's property is leased to the Southern and is operated as a part of the last named road's Carolina division. Of the authorized amount of bonds, $434,000 has been issued to retire underlying bonds and to discharge floating obligations. The remainder is reserved for betterments and additions.

Velasco, Brazos & Northern.—This road was sold under foreclosure on July 3 to H. C. Alexander, Dallas, Tex., for a price said to be $260,000.

Wabash.—It is reported that the French firm of Dupont & Furland are offering in France $6,250,000 4½ per cent. equipment bonds. The Wabash sold $6,900,000 of these bonds, in June, to Lee, Higginson & Co., of Boston, who offered for sale, in this country, $6,180,000 of them.

# GENERAL NEWS SECTION

## NOTES.

The Maine Central has lately finished oiling the roadbed on a considerable part of its main line.

The Pennsylvania Lines in Ohio are now selling round trip local tickets on Sundays at 3 cents a mile, or 1½ cents a mile each way.

Chicago newsgatherers now quote the railroad officers of that city as substantially unanimous in their reports of remarkable and healthy activity in all branches of freight traffic.

The narrow gage line of the Denver & Rio Grande from Grand Junction, Colo., to Montrose, 72 miles, and the North Fork branch from Delta, Colo., to Somerset, 43 miles, have been changed to standard gage, beginning July 20.

Fifteen locomotive runners have recently been arrested at Long Island City, N. Y., for violating the board of health rules against the emission of smoke from locomotives. Two men in charge of the big power house at Long Island City have also been arrested.

On July 15 there were in the railroad yards at Jacksonville, Fla., 978 cars of yellow pine lumber awaiting transfer to vessels. The total amount of lumber in the yards was estimated at 35,000,000 ft., the most serious freight congestion ever experienced at that city.

Judge Holt, of the Virginia Corporation Court, has dismissed the suit of the state, which was brought to compel the railroads to comply with the Churchman law, passed at the last session of the legislature, requiring all railroads to sell mileage tickets at 2 cents a mile.

Seventy-five freight agents of the Norfolk & Western met in annual meeting at Norfolk, July 11. The meeting was presided over by General Freight Agent J. R. Ruffin. The men appear to have been mostly the traveling and district solicitors, whose offices are not on the line of the road.

By a vote of 152 to 4, the lower house of the Georgia Legislature has passed a bill to have the State Railroad Commission hereafter elected by vote of the people instead of being appointed. If the bill is passed by the Senate and becomes a law, commissioners will hereafter take office about 12 months after they are elected.

At Louisville, Ky., July 21, J. M. Scott, Chief Train Despatcher of the Louisville & Nashville, was arrested, at the instance of the President of the Order of Railroad Telegraphers, on the charge of discriminating against the members of that order. The charge appears to have been based on the dismissal of certain operators two years ago.

A press despatch from San Francisco says that the freight blockade there is so great that the Southern Pacific has given orders to send no more freight until what is there is unloaded. Seven thousand cars, 20 per cent. of the available equipment of the company, are tied up on sidings near that city. The company has levied storage charges of $7 to $10 a car a day, but without result.

Most or all of the large express companies have applied to the Interstate Commerce Commission for relief from the requirement of the new Federal law that all tariffs of charges shall be filed by August 27. The general manager of the United States Express Company says that, after engaging all available competent men to prepare the tariffs, he thinks that the work cannot be done in less than six months.

The Oregon Railroad & Navigation Company has announced a reduction of 30 cents a ton on wheat and flour sent to Portland for export. This reduction has been made necessary by an advance in the rates by vessel from the Columbia river to foreign ports, and there has also been a reduction, by order of the state railroad commission, on wheat to Puget Sound from points in the state of Washington, which competes with Oregon wheat.

The Baltimore & Ohio, throughout its lines east of the Ohio river, has moved the mail cranes, 1,200 cranes in all, so as to provide a greater clearance between the cranes and the wide engines now used. The change was made at 8 a. m. on July 12. The minimum clearance now is 18 in. On the day of the change the mail cars were all equipped with two arms, the shorter arm being used before 8 o'clock and the longer one after that hour.

The Norfolk & Western has made a rate of $1.50 per ton on coal to Norfolk from the Pocahontas and Tug River districts and $1.60 from Clinch Valley and Thacker districts. These rates are for tons of 2,000 lbs., and are to be granted to all consignees alike. They are 5 cents higher than the "manufacturers' rates" heretofore in force, but 10 cents lower than the general rate. The Chesapeake & Ohio has made a similar change in the rates to Richmond.

Senator LaFollette, of Wisconsin, announces that at the next session of Congress he will renew his efforts to secure the passage of those amendments to the Interstate Commerce law which he offered during the discussion of the Hepburn bill, and which were rejected, and that he will propose others more drastic. He expects the co-operation of the President. The Senator declares that the railroad influence in both houses of Congress during the session just closed has been very strong, so strong that it had an undue influence even on the President.

A committee of the Louisiana Legislature which was instructed to investigate the State Railroad Commission met at Baton Rouge on July 10 and, according to the reports, "disagreed violently." Four of the five members united in a brief report, saying that the commission was doing as well as the most exacting critic could ask; the members were above reproach and were well fitted to perform their duties. The fifth member, who is the chairman, Mr. F. Amedee Tete, makes a minority report, saying that the investigation was no investigation at all. The other four members were so unanimously against him that he had to resort to the extreme measure of adjourning the committee without delay. The majority report gives no hint of the causes for the investigation, but the chairman touches upon two points—the taking of options on a railroad by one of the commissioners and the absence of the commissioners from their headquarters at Baton Rouge. The railroad commissioner who took options is held to have been indiscreet, though he did not fail in his duty as a railroad commissioner. It is declared that the commissioners ought to live in Baton Rouge. At present the business is done mostly by the secretary.

### Bequests of F. W. Webb.

F. W. Webb, who died at Bouremouth, England, June 4th, for many years Chief Mechanical Engineer of the London & North-Western Railway, England, left £211,543. He bequeathed £10,000 to found a nursing institution at Crewe; £5,000 to the Benevolent Fund of the Institute of Civil Engineers; £3,000 for St. John the Baptist Mission Church, Crewe; £6,000 for similar purposes in the parish; £2,000 to University College Hospital, preferably for the relief of London & North-Western Railway employees; £2,000 each to Owen's College, Manchester, and University College, Liverpool, for the benefit of the company's employees or their sons; £1,000 to the Men's Convalescent Home at Rhyl; £1,000 to the Devonshire Hospital and Bath Charity; £1,000 to the Manchester Royal Eye Hospital; £1,000 to the Railway Servants' Orphanage, Derby; £1,000 to the Institute of Civil Engineers; £500 to the Royal Albert Asylum for Idiots at Lancaster, and the residue of his estate (about £75,000) for a home for the orphans of employees of the London & North-Western Railway.—*London Times.*

### Addition to Power Plant of the Pittsburg Railways Company.

Almost 30,000 additional horse-power in boilers, engines and electrical machinery, to cost more than $300,000, will be added to the Brunot's Island power-house of the Pittsburg Railways Company this year. Large demands for power on this plant have recently been made because of the extension of lines in all directions, both in the Pittsburg and Allegheny and throughout the suburban districts. When the plant on Brunot's Island was built arrangements were made for increasing the capacity to 50,000 h.p. The additional power to be added will bring the plant up to this limit, and it may be further increased in the future. The new equipment contracted for consists of three turbine engines of 7,500 h.p. each and one of 5,000 h.p., making a total of 27,500 h.p. Besides this there will be additional boiler capacity, electric generators, switchboards and wiring. The turbine engines will be the initial installation by this company, and is the first installation of importance in the city. The Westinghouse Electric & Manufacturing Company and the Westinghouse Machine Company have the orders for the entire contract. The additional power will be used for the new traction lines, to be ready for operation soon, and for lighting purposes as well. A new line from Avalon to Emsworth has recently been completed, and work is to be started on the next division of the road down the Ohio river toward Beaver, which will run from Emsworth to Dixmont, passing around the rear of Sewickley. When that line is completed the distance between Pittsburg and Beaver will be nearly closed up with electric roads. These lines will be supplied with power from the central power station in Pittsburg. The new suburban line from Pittsburg to Canonsburg and Washington, Pa., will be completed this year and will demand more power, while the expansion of the city lines in many directions all call for additional power.

When the Brunot's Island power-house is fully equipped it will

be one of the largest of its kind in the world. There are some larger plants in hydraulic power in this and other countries. The first power-house of the Niagara Falls Power Company with hydraulic turbines contains only 50,000 h.p. capacity, and when built was the largest unit of horse-power known. Fuel for this plant will be obtained from a coal mine owned by the Pittsburg Railway Company adjacent to Brunot's Island, and which will give the company plenty of coal at practically the cost of mining. The fuel arrangements give the company quick handling of coal, and the ashes from the boiler are being used to fill up the low parts of the island, thus reclaiming them for commercial purposes. The total cost of this plant will be close to $2,000,000.

### Trucks for the Hudson Companies.

The American Locomotive Company is preparing designs for 50 motor and 50 trailer trucks ordered by the Hudson Companies. The preliminary specifications from which the designs are being made were prepared by Mr. L. B. Stillwell, consulting engineer for the Hudson Companies, and the designs of these trucks will be made in consultation with him. Each motor truck will carry two General Electric Company's No. 76 motors. The motor suspensions will be of the nose type, and a motor will be geared to one wheel on each axle, the wheel hub being extended to take the gear for the motor. Both motor and trailer trucks will be of the bar frame swinging bolster type. The bolsters of rolled steel float between transoms of channel iron with freedom to move vertically, and are suspended by four 3-point (or stable equilibrium) hangers. The long 3-point hangers allow the bolsters a good lateral motion and utilize the weight on the trucks to restore the hangers to their proper position without the use of springs, thereby eliminating the pendulum motion of the car body so distressing to passengers and giving the car the same easy riding qualities as a Pullman coach. These trucks will be very similar in design to the trucks built by this company for the Schenectady Railway Company, which have been so satisfactory. The specifications for the trucks are as follows:

*Motor Trucks.*

| | |
|---|---|
| Gage of track | 4 ft. 8½ in. |
| Wheel base | 6 " 6 " |
| Length over all | 10 " 6½ " |
| Transverse center of frames | 6 " 4 " |
| Load carried at center plate, total | 28,000 lbs. |
| Weight of truck, without motors, about | 10,500 " |
| Wheels | 34¼ in. |
| Journal bearings | 5x9½ " |
| Frames | Wrought iron |
| Transoms | 10-in. channel iron |
| Bolsters | Rolled steel |

*Trailer Trucks.*

| | |
|---|---|
| Gage of track | 4 ft. 8½ in. |
| Wheel base | 5 " 6 " |
| Length over all | 8 " 5 " |
| Transverse center of frames | 6 " 4 " |
| Load carried at center plate, total | 28,000 lbs. |
| Weight of truck | 9,000 " |
| Wheels | 30 in. |
| Journal bearings | 4¼x9½ " |
| Frames | Wrought iron |
| Transoms | 9 in. channel |
| Bolsters | Rolled steel |

### The Indiana Railroad Commission.

The Railroad Commission of Indiana was organized for business in May, 1905, and has been a valuable mediator between the shippers of the state and the railroads. One of the first complaints was one concerning a widespread shortage of cars, and the commission, by conciliatory mediation, adjusted amicably over 75 per cent. of these complaints. It was found that non-competitive points were being neglected. The commission called upon the railroads to make an equitable distribution, and with but few exceptions the requests were complied with. Railroads were issuing bills of lading for grain endorsed "subject to delay"; the commission secured the abandonment of this objectionable feature. At Indianapolis the railroads were induced to reduce a switching charge of $4 to $3. Between Indianapolis and New Castle an important reduction of fares was secured. In southern Indiana the railroads were induced to make a reduction in the rates on coal from Indiana mines, thus giving these mines a traffic of 60 to 100 tons a day. This coal goes mostly to Jeffersonville, which had before been supplied by mines in Virginia and Pennsylvania. An order for a reduction of 15 cents a ton on coal transported over the Chicago, Indianapolis & Louisville was appealed and is now pending in the courts, as are also a number of other cases. The commission has spent much time considering interlocking signals at crossings.

Shippers say that the moral influence arising from the fact that there is a commission is alone worth many times the cost of the commission to the state. The cost is less than $20,000 a year. The President of the commission, Mr. Union B. Hunt, was formerly Secretary of State.—*Elkhart Review.*

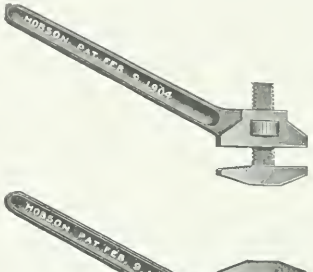
### A Crown Sheet Failure.

A dangerous leakage in a firebox, caused by an accumulation of scale on the top of the crown sheet, is the subject of the last accident report made to the British Board of Trade by Lieutenant Colonel Druitt. The accident occurred on the Lancashire & Yorkshire at The Oaks, April 19. The engine, which was nearly new, failed while drawing a passenger train, and the engineman was severely scalded. The crown sheet and a number of the stayholts holding it in place became so greatly overheated that the sheet bulged downward in the center, but there does not appear to have been any large rupture and there was no explosion, the pressure in the boiler having been gradually reduced as the staybolts gave way. Some of the hot water which fell on the engineman is believed to have been blown out through the tubes and up through the chimney.

The inquiry was made in conjunction with an inspector of the marine department of the Board of Trade, and the testimony of the men on the engine and the railroad inspectors, as well as the tests which were made by the Government inspectors, are reported at length, but the conclusion is, simply, that the crown sheet became overheated because of the accumulation of loose scale on its upper surface. This accumulation is charged to the carelessness of the men who last washed out the boiler. On the line where this engine is used boilers are washed out every eight days. The inspector does not say how much scale he found nor does he mention the thickness of the deposit. He found also on top of the crown sheet two pieces of lead fusible plugs which had been carelessly left there when plugs had been renewed. One of these pieces of lead, near the center of the sheet, was fused to the crown sheet, but the other, near the edge, was loose and was only partly melted.

### The Hobson Wrench.

A new design of wrench combining the advantages of an "end" wrench for use on either pipe or nut is shown herewith. As indicated by the two views, the head may be placed in either of the two positions shown, to the further advantage and utility of the device. The end grip enables the wrench to be used on practically all kinds of machinery and in locations inaccessible to a side-grip wrench, as on a pipe lying against a flat surface. There are many points about a locomotive where the side-grip wrench cannot be used to advantage, but where it is claimed this wrench is especially effective. It consists of only three parts, while combining the functions of practically all wrenches. The handle is cast steel and the head and nut drop forged. It is made by the Hobson Wrench Co., Indianapolis, Ind.



The Hobson Wrench.

### Panama Canal Bonds.

The $30,000,000 Panama Canal 2 per cent. bond issue was subscribed to several times over. Fisk & Robinson, New York, were awarded $15,000,000 at about 103.85; Samuel Byerly, New York, $5,879,000 at about 103.97; and $4,330,000 went to seven national banks at various prices.

### Government Control in Japan.

The Japanese Government will take over six railroads, paying for them about $125,000,000. It will allow the companies 5 per cent. interest on the purchase price until the necessary bond issue is made; this need not be done, according to the laws, for five years after the date of purchase. The dates set for the taking over of the roads are as follows: the Hokkaido-Tanko and the Kobu Railroads, October 1; the Nippon and the Ganyetsu, November 1, 1906; the Nishinari and the Sanyo, December 1.

### Disastrous Collision near Hamlet, N. C.

In a collision on the Seaboard Air Line last Sunday evening between Rockingham and Hamlet, N. C., 16 passengers and four trainmen were killed and 24 passengers and trainmen were injured. The collision was between eastbound passenger train No. 44 and a westbound freight. The baggage car and the second-class passenger car were demolished and eight freight cars were wrecked. It is said that the operator at Rockingham failed to deliver to the passenger train an order requiring it to wait for the freight.

### Manufacturing and Business.

The Strangen-Wick Railway Company, which operates a suburban line near Stockholm, Sweden, has contracted with the Westinghouse Electric & Manufacturing Company for the electrical equipment of its cars.

The new buildings being erected by the Damascus Brake Beam Company at its Sharon, Pa., plant will be completed, and all addi-

tional machinery will be installed by August 15th. This addition will enable the company to double its present output of both "Damascus" and "Waycott" brake-beams.

H. F. Vogel & Co. is the name of a new general railroad supply house in St. Louis, with office at 420 Rialto Building. The firm is made up of H. F. Vogel and Nic LeGrand, both previously with the St. Louis Car Co., the former as Vice-President and General Manager, and the latter as Manager of the Supply Department.

The American Railway Steel Tie Co., 42 Broadway, New York City, reports an order from the Pennsylvania Railroad for 3,000 steel ties which are to be placed on the main line near Blairsville, Pa. These ties are made out of a pressed steel flared channel section filled with asphalt. The purpose of the asphalt, which rests directly on the ballast, is to give resiliency. The tie is the invention of Mr. J. G. Snyder, the Vice-President of the company. The Central Iron & Steel Co., of Harrisburg, holds a considerable stock interest.

### Iron and Steel.

The Lehigh Valley has ordered 30,000 tons of rails from the Carnegie works of the United States Steel Corporation.

The Maryland Steel Co. has orders for 500 tons of rails for Chicago delivery, and also has orders for 160 tons of special girder rails.

The Chicago, Burlington & Quincy has ordered 10,000 tons of rails from the Carnegie Works for 1907 delivery. The Norfolk & Western and the Reading have each ordered, recently, 15,000 tons.

The New York, New Haven & Hartford has given an additional contract to the Pennsylvania Steel Co. for 4,000 tons of rails to be delivered in the fourth quarter of this year. Electric lines have given contracts for 5,000 tons additional for this year's delivery, and a number of the large steam roads are negotiating for 200,000 tons for 1907 delivery. The Vera Cruz Railway has bought 300,000 steel ties in Europe to be used in rebuilding its line from Mexico City to Vera Cruz. Inquiries are also being made for steel for bridge construction. In the Chicago market orders have been recently given for 1,500 tons of fabricated bridge material. Of these orders, the Pennsylvania Steel Co. secured 700 tons.

## OBITUARY NOTICES.

R. M. Oberteuffer, Assistant to the President of the Philadelphia & Reading, died in Philadelphia on July 22.

C. J. Ives, formerly President of the Burlington, Cedar Rapids & Northern, died on July 18 at Woodstock, Vt., at the age of 75.

Edgar Shellabarger, Master Mechanic of the East Broad Top Railroad, died on July 12 at the age of 68. Mr. Shellabarger served in the Civil War and began railroad work in the Pennsylvania shops at Paterson, Pa. After spending several years in the Baldwin Locomotive Works, he went to the East Broadtop in 1882 as machine shop foreman. He was later appointed General Foreman and, finally, Master Mechanic.

Russell Sage died on July 22 at Lawrence, Long Island. Mr. Sage was nearly ninety years old, having been born in Oneida County, N. Y., in 1816. He was the last survivor of the original directors of the New York Central Railroad, having served on that board during the first six years of its existence. On January 1, 1906, he was President, Treasurer and Director of the Albia & Centerville; President and Director of the Ponghkeepsie & Eastern; and Director of the Wabash, the Missouri Pacific, the Manhattan Railway Company, the Chattanooga Southern, the Iowa Central, the St. Louis, Iron Mountain & Southern, the St. Paul & Chicago, the Shore Line Railway of New Brunswick and the Texas & Pacific.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Birmingham Southern.*—J. A. Topping has been elected President, succeeding J. G. Moore, resigned. S. A. Cameron has been appointed Auditor, succeeding R. W. Bidgood, resigned.

*Chicago, Rock Island & Pacific.*—H. M. Sloan, Auditor of Disbursements, has been appointed Assistant to the Fourth Vice-President. C. W. Balch succeeds Mr. Sloan.

*Norfolk & Western.*—H. C. Frick and L. C. Weir have been elected Directors, succeeding J. B. Taylor and W. H. Barnes, resigned.

### Operating Officers.

*Birmingham Southern.*—F. H. Crockard has been appointed General Manager, succeeding J. G. Moore, resigned.

*Chicago & Alton.*—E. M. Stanton, formerly on the Chicago, Rock Island & Pacific, has been appointed Superintendent of Car Service.

*Chicago & North-Western.*—G. F. Bidwell, Manager of the Nebraska & Wyoming division, has been appointed General Manager of the Lines West of the Missouri river, with office at Omaha, Neb.

*Chicago, Burlington & Quincy.*—A. V. Brown, Superintendent at Hannibal, Mo., has been appointed Superintendent at Ottumwa, Iowa. Robert Rice, Assistant Superintendent at Ottumwa, succeeds Mr. Brown.

*Cleveland, Cincinnati, Chicago & St. Louis.*—D. F. Schaff, formerly Chief Clerk to the General Manager, has been appointed Superintendent at Indianapolis, Ind.

*Missouri Pacific.*—W. T. Caldwell has been appointed Superintendent of Terminals at Little Rock, Ark., succeeding H. L. Hungerford, transferred.

*Southern.*—The Augusta Southern will hereafter be operated as a separate division instead of as a part of the Charleston division. J. A. White, Assistant Superintendent at Alexandria, Va., has been appointed Superintendent of the new division, with office at Augusta, Ga.

*Wabash.*—G. M. Burns, Superintendent at Detroit, Mich., has resigned, to go into other business. J. J. Sim, trainmaster at Montpelier, Ohio, succeeds Mr. Burns.

### Traffic Officers.

*Birmingham Southern.*—H. R. Moore has been appointed Traffic Manager, succeeding R. W. Bidgood, resigned.

*Mexican Central.*—J. C. McDonald, Assistant General Passenger Agent at Mexico City, has been appointed to the new office of General Passenger Agent, at that place, and the office of Assistant General Passenger Agent has been abolished.

*Southern.*—Brooks Morgan, Assistant General Passenger Agent at Atlanta, Ga., has resigned, to engage in other business. G. B. Allen, Assistant General Passenger Agent at St. Louis, Mo., succeeds Mr. Morgan. J. C. Beam, Jr., District Passenger Agent at Atlanta, succeeds Mr. Allen. H. F. Cary has been appointed to the new office of Assistant General Passenger Agent at Washington, D. C.

### Engineering and Rolling Stock Officers.

*Chicago, Burlington & Quincy.*—R. D. Smith, Superintendent of Motive Power of the Lines West of the Missouri river, has resigned. Thomas Roope, Superintendent of Motive Power of the C., R. I. & P. at Topeka, Kan., succeeds Mr. Smith.

*Chicago Great Western.*—W. W. Chadbourn has been appointed Chief Engineer, with office at St. Paul, Minn., succeeding A. Munster, resigned. T. H. Bacon, Assistant Division Engineer at St. Paul, Minn., has been appointed Assistant Chief Engineer at that place.

*Chicago, Rock Island & Pacific.*—See Chicago, Burlington & Quincy.

*Illinois, Iowa & Minnesota.*—H. S. Rogers has been appointed Engineer of Maintenance of Way and Construction.

*Lake Shore & Michigan Southern.*—E. D. Bronner, Superintendent of Motive Power of the Michigan Central, has been appointed Superintendent of Motive Power of the L. S. & M. S., succeeding H. F. Ball, resigned, to engage in other business. S. K. Dickerson, Master Mechanic at Collinwood, Ohio, has been appointed Assistant Superintendent of Motive Power, succeeding L. G. Parrish, resigned to go to the Michigan Central. Joseph Chidley succeeds Mr. Dickerson. See Michigan Central.

*Michigan Central.*—L. G. Parrish, Assistant Superintendent of Motive Power of the Lake Shore & Michigan Southern, has been appointed Superintendent of Motive Power of the Michigan Central, succeeding E. D. Bronner, resigned to go to the L. S. & M. S. D. R. MacBain, Master Mechanic at Jackson, Mich., has been appointed to the new office of Assistant Superintendent of Motive Power. G. E. Parkes, Mechanical Engineer, succeeds Mr. MacBain. See Lake Shore & Michigan Southern.

*Pennsylvania Lines West.*—H. J. Shaw has been appointed Assistant Division Engineer at Toledo, Ohio, succeeding H. Eichler, resigned.

*Southern.*—P. S. Fitzgerald, Engineer of Maintenance of Way of the Western district, has resigned, to go into other business. F. M. Edwards, Resident Engineer at Chattanooga, Tenn., succeeds Mr. Fitzgerald, with office at Birmingham, Ala.

### Purchasing Agents.

*Birmingham Southern.*—W. A. Major has been appointed Purchasing Agent.

## LOCOMOTIVE BUILDING.

*The Temiskaming & Northern Ontario* has ordered two switching locomotives.

*The Grand Trunk* has ordered 20 passenger locomotives from the American Locomotive Co.

*The Norfolk & Southern* has ordered eight 10-wheel locomotives, two switching locomotives and seven 8-wheel locomotives from the Baldwin Locomotive Works.

*The Missouri Pacific* has ordered 35 six-wheel switching locomotives from the Baldwin Locomotive Works for October and November delivery. These engines will weigh 150,000 lbs.; cylinders, 20 in. by 26 in.; straight top boiler, with a working steam pressure of 180 lbs.; 274 tubes; total heating surface, 1,700 sq. ft.; firebox, 108 in. long by 42 in. wide; grate surface, 31.5 sq. ft.; tank capacity, 6,000 gallons; coal capacity, 8 tons. The special equipment will include: Railway Steel Spring Co.'s springs, Franklin boiler covering, Simplex injectors, Tower couplers, Westinghouse air-brakes, Ashcroft steam gages, Crosby safety valves, Nathan lubricators, Leach sanding devices and U. S. metallic piston and valve-rod packing.

*The Pittsburg, Binghamton & Easton* has ordered three simple 10-wheel locomotives from the American Locomotive Co. for September 1, 1906, delivery. These locomotives will weigh 168,000 lbs., with 130,000 lbs. on drivers. Cylinders, 21 in. by 26 in.; diameter of drivers, 62 in.; extended wagon-top boiler, with a working steam pressure of 190 lbs.; total heating surfaces, 3,000 sq. ft.; 342 Detroit cold-drawn seamless tubes, 2 in. in diameter by 16 ft. long; firebox, 98⅛ in. long by 65¼ in. wide; grate area, 44 sq. ft.; tank capacity, 7,500 gallons; coal capacity, 12 tons. The special equipment will include: Sectional Magnesia boiler lagging, Tower couplers, Dressel headlights, Nathan injectors, Jerome metallic piston and valve-rod packing, Leach pneumatic sanding devices, Detroit triplex sight-feed lubricators, Pittsburg Steel & Spring Co.'s springs, Midvale driving-wheel tires and cast steel wheel centers.

## CAR BUILDING.

*The Wisconsin Central*, it is reported, has ordered a large number of ore cars.

*The Denver & Rio Grande* is reported as in the market for freight equipment.

*The Chicago & Eastern Illinois* has ordered six baggage cars from the Pullman Co.

*The Tampa Northern* has ordered 70 freight cars of 60,000 lbs. capacity from the Georgia Car Co.

*The Central Ontario* has ordered 10 Hart convertible cars of 80,000 lbs. capacity from Rhodes, Curry & Co.

*The Temiskaming & Northern Ontario* has ordered five cabooses and is in the market for four passenger cars.

*The Duluth, Missabe & Northern*, it is reported, is in the market for upwards of 1,500 steel ore cars of 100,000 lbs. capacity.

*The Atchison, Topeka & Santa Fe*, it is reported, is considering the purchase of 100 refrigerator cars as well as a large number of box cars.

*The Philadelphia & Reading*, it is reported, will build 25 cabooses at its Reading shops. They will be equipped with steel underframes.

*The Atlantic Coast Line* is in the market for from 400 to 500 box cars of 60,000 lbs. capacity and from 400 to 500 40-ft. flat cars of 60,000 lbs. capacity.

*The Chihuahua & Pacific* has ordered 30 box cars from the Mt. Vernon Car Manufacturing Co., in addition to the two cabooses reported in our issue of July 13.

*The Florida East Coast* has ordered 300 flat cars from the South Atlantic Car & Manufacturing Co. These are in addition to the 200 cars reported as ordered in our issue of July 13.

*The Seaboard Air Line*, as reported in our issue of July 6, has ordered 611 40-ft. flat cars from the American Car & Foundry Co. These cars will be 42 ft. 4 in. long by 9 ft. 6 in. wide, by 4 ft. 3 in. high, all outside dimensions. The bodies and underframes will be of wood. The special equipment will include: S. A. L. standard brake-beams, Westinghouse air-brakes, Tower couplers, Symington journal boxes and 33-in. cast iron wheels.

*The Jersey & Hudson River Railway & Ferry Co.* has ordered 43 closed cars from the J. G. Brill Co. for August and September, 1906, delivery. These cars will seat 44 persons, and will measure 43 ft. 6 in. long by 8 ft. 6 in. wide by 11 ft. 6¼ in. high, outside dimensions. The bodies and underframes will be of wood. The special equipment will include: built-up bolsters, Corning brake-shoes and Standard Rolled Steel Co.'s wheels.

*The Intercolonial* has ordered 200 hopper cars of 30,000 lbs. capacity from Rhodes, Curry & Co. These cars will weigh 20,700 lbs. and will measure 15 ft. 10½ in. long by 8 ft. 3 in. wide, inside measurements. The bodies and underframes will be of wood. The special equipment will include: Simplex brake-beams, Christy brake-shoes, Westinghouse air-brakes, Miner tandem draft rigging, Harrison dust guards, helical springs and cast iron wheels.

*The Canadian Pacific* has completed at its Angus shops 600 stock cars and 50 refrigerator cars, orders for which were placed last fall, and is building at its Angus shops 50 additional refrigerator cars of 60,000 lbs. capacity. These cars will measure 38 ft. 8 in. long over end sills and 9 ft. ½ in. wide over frame. The special equipment includes: Simplex bolsters and brake-beams, Westinghouse air-brakes, Tower couplers, Miner tandem draft rigging, Harrison dust guards, McCord journal boxes and Diamond pattern trucks.

*The Lake Shore & Michigan Southern* is building 49 baggage automobile cars at its Collinwood shops, and work will soon be begun on four for the Lake Erie & Western. These cars measure 58 ft. 2⅞ in. long by 9 ft. and ⅜ in. wide inside. The outside dimensions are 60 ft. long by 9 ft. 9⅝ in. wide. The height inside is 9 ft. 2⅛ in., and the over all height 14 ft. 2 in. from the rail. The bodies and underframes are of wood. They are equipped with double body bolsters, Diamond Special brake-beams, Westinghouse air-brakes, Tower couplers, Gould friction draft gear, Gold heating system, Lake Shore standard journal boxes, Safety Car Heating & Lighting Co.'s lighting system, Gould platforms, small end doors, and Davis wheels.

*The Wabash* has ordered 2,000 box cars from the American Car & Foundry Co. and 2,000 gondola cars from the Western Steel Car & Foundry Co. The box cars are of 80,000 lbs. capacity, and are for August and September, 1906, delivery. They will measure 41 ft. long by 9 ft. 1¼ in. wide by 14 ft. 5 in. high, outside measurements. The bodies and underframes will be of wood. The special equipment will include: American Steel Foundries bolsters, Damascus and Waycock brake-beams, Westinghouse air-brakes, St. Louis spiral brasses, Climax couplers, National door fastenings, Climax doors, Miner draft rigging and McCord journal boxes. The gondola cars are for October and December delivery. They will measure 41 ft. 5¾ in. by 9 ft. 9¾ in. wide by 8 ft. 9¾ in. high, outside measurements. The bodies will be of wood and the underframes of steel. The special equipment will include: Scullin-Gallagher bolsters, Western Steel Car & Foundry Co.'s brake-beams, Westinghouse air-brakes, St. Louis spiral brasses, Climax couplers, Miner, McCord and Fowler draft rigging and McCord journal boxes.

## RAILROAD STRUCTURES.

Birmingham, Ala.—An officer writes that the Illinois Central, through its subsidiary line, the Alabama Western, is putting up freight terminals and a new freight house. The contract for the building has been let to the Leonard-Martin Construction Co., of Chicago. The company's forces are laying the track, which will aggregate about two miles.

Chattanooga, Tenn.—Bids for the Chattanooga Railway car shops were to be opened July 23. The shops will be 110 ft. x 200 ft., of brick, 1½ stories high, to cost about $50,000. D. J. Duncan is General Manager.

Cincinnati, Ohio.—The Cleveland, Cincinnati, Chicago & St. Louis has submitted plans and specifications for a new steel bridge to be built over its tracks on West Fifth street.

Cleveland, Ohio.—The Cleveland Short Line has given contracts to the American Bridge Co., New York, for building a steel viaduct over Cuyahoga Valley for $500,000, for the steel work only. The masonry will cost an additional $300,000.

New York, N. Y.—The New York City Railway Company will soon replace the old car stables at Twelfth avenue and 42d street, which were destroyed by fire several months ago. The new building is to be about 200 ft. by 200 ft., with facades of ornamental brick, and will cost $100,000.

Omaha, Neb.—Plans are being made in the office of the Chief Engineer of the Union Pacific Railroad at Omaha for new shop buildings and improvements in shop yards that will necessitate an expenditure of about $750,000 during the current year. These shops will consist of a series of buildings so arranged and of such size as will facilitate the handling of shop work in the most expeditious manner, and will enable the road to turn out its repair work without loss of time. The yards are situated on a level plat near the Missouri river a little north of the main part of the city of Omaha. For several years the company has been establishing shop facilities on this land, and already has completed and is using a model locomotive plant, blacksmith shop, offices and laboratory buildings. These new shops are to consist of two large buildings. The freight car and coach repair shop will be 492 ft. long facing to the south with one wing 342 ft. extending towards the north one story in height with steel framing and brick curtain wall construction. It will be fitted with cranes, machinery and modern conveniences for handling and repairing all classes of cars. Facing the building and

erving it and the paint, wheel and truck shop, which will be built directly north of the car shop proper, will be installed a transfer table 90 ft. x 350 ft. The paint, wheel and truck shop will be similar in general construction to the car shop building, but will be 302 ft. long by 178 ft. wide. It will be fitted with cranes and other apparatus for easy handling of wheels and trucks. Near this building, but separated from it, will be the paint storage house. Heavy cranes for service near the coach shops and for wrecked trucks will be set up in the yards, and there will be a wheel platform, depressed tracks and transfer table.

ROCHESTER, N. Y.—Plans have been filed by the Buffalo, Rochester & Pittsburg for a new freight house on the site of the present one on Oak street. The new building is to be 300 ft. long, 60 ft. wide and 26 ft. high. H. H. Edgerton has the contract for the masonry work, and Henry Rice for the wood work.

TULSA, IND. T.—The St. Louis & San Francisco has given a contract to Anderson & Brothers, of St. Louis, for putting up a new station here.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

AMERICUS, SYLVESTER & SOUTHERN.—Application will shortly be made for a charter by a company under this name to build from Americus, Ga., on the Central of Georgia and the Seaboard Air Line southeast through the counties of Sumter, Lee, Worth, Colquitt and Berrien, to Hartpine, on the Georgia Southern & Florida. Rights of way have been secured for most of the distance. The names of the promoters are not given.

ATLANTIC, QUEBEC & WESTERN.—This company has been formed under special acts to build two railroads aggregating 362 miles. One line is to run from the deepwater harbor at Gaspe, Que., west, through Gaspe County to Amqui on the Intercolonial, thence south to Edmundston on the St. John river, 260 miles. At Edmundston connection can be made with the Canadian Pacific, and with the proposed Grand Trunk Pacific. The other line is to run from a point at or near Gaspe Harbor along the coast in a southerly direction through Douglas, Newport, Port Daniel, Hope and Cox to Paspebiac on the Atlantic & Lake Superior, 102 miles. The Provincial Government of Quebec has authorized the granting to the company of land amounting to 4,000 acres per mile for the 150 miles mentioned in the act. Bonds are now being offered in London to secure funds to carry out this project. Charles Brien and Joseph Lavoie, of Gaspe, are directors, and E. Stanley Elvey, Secretary.

CANADIAN NORTHERN.—Grading on the extension from Oakland, Man., to the Delta spur north of Portage la Prairie, has been commenced by James Cowan, who has the contract. Chief Engineer McLeod states that rails are to be laid at once between Ridgeway and Vassar.

CHICAGO, MILWAUKEE & ST. PAUL.—Local reports state that contracts for the Butte & Whitehall division of this road, which is building through Montana, have been let at about $3,000,000. At the present time there are more than 5,000 men at work on the line between Miles City, Mont., and Harlowton.

CINCINNATI, COLUMBUS & TOLEDO.—This company, with office at Cincinnati, has been incorporated in Ohio with $10,000 capital stock by R. C. Swing, H. J. Gibson, H. E. Frost, H. H. Huffman and C. D. Mathews. The company proposes to build a railroad from Cincinnati to Toledo.

DAKOTA MIDLAND.—An officer writes that this company, which was recently incorporated in South Dakota, will let contracts in September for building its proposed line from Sioux City northwest to a point in Campbell County, approximately 385 miles. The work will not be difficult though it includes two tunnels. L. R. Giddings is President, and J. A. Frederickson, Chief Engineer, both of 1341 Vine place, Minneapolis, Minn. (July 13, p. 10.)

DENVER & RIO GRANDE.—Announcement is made by this company that the present narrow gage line from Orange Junction, Colo., to Montrose, and the North Fork branch, from Delta to Somerset, will be changed at once from narrow gage to standard gage.

FRONT ROYAL, RAPAHANNOCK & TIDEWATER.—This Virginia company has completed its organization as follows: Colonel S. J. Millar is President; James H. Fletcher, First Vice-President; John J. Millar, Second Vice-President; H. H. Downing, Third Vice-President; E. H. Jackson, Fourth Vice-President; N. M. Johnson, Treasurer, and U. E. Naylor, Secretary. The office of the company is at Front Royal, Va.

GRAND TRUNK PACIFIC.—The Transcontinental Commissioners have called for bids for ties for the Winnipeg-Lake Superior section of the Grand Trunk Pacific. They want 275,000 ties delivered at St. Boniface, near Winnipeg, at dates from Aug. 31 to Nov. 15 of the present year. Bids are also asked for 200,000 ties to be delivered at later dates, at a point east of Winnipeg, where the Grand Trunk Pacific crosses the Canadian Pacific. Bids are also asked for 525,000 ties to be furnished at other places and times.

LAKE ERIE & PITTSBURG.—A contract is reported let by this company for a continuation of its line to Youngstown, Ohio. (See Construction Record.)

LANCASTER & NORTHERN.—Incorporated in Pennsylvania with $100,000 capital to build a line from a point on the Pennsylvania between Conestoga creek and the New Holland turnpike northwest to a point near Millway on the Philadelphia & Reading, about 10 miles. H. G. Seip is President. The directors are: R. W. Bowlby, A. Dufworth, F. Reeder, Jr., F. C. Rockafellow, W. Coil and A. Sausser, of Easton, Pa.

LIBERTY-WHITE.—It is reported that this company, which operates a line from McComb to Liberty, Miss., is to be extended northwest to Natchez, about 50 miles, crossing the Yazoo & Mississippi Valley near Roxie. An extension is now being built east from McComb to Columbia. It is supposed that the Illinois Central is back of the company. (See Construction Record.)

MALONE, FORT COVINGTON & HOPKINS POINT.—Incorporated in New York with $200,000 capital by W. F. Wright, of New York, and J. M. Cantwell and Lewis Mitchell, of Malone, to build a line from Malone in Franklin County north to a point in the Province of Quebec, about 18 miles. It is proposed to use gasolene cars.

NEW YORK, AUBURN & LANSING (ELECTRIC).—This company, incorporated in New York to build an electric line from Ithaca to Auburn, 34.6 miles, with five miles of siding, is selling bonds to secure funds to carry out the work. W. L. Fairchild, of New York, is Consulting Engineer. (See Construction Record.)

OHIO RIVER & WESTERN.—President S. L. Mooney is quoted as saying that this road, part of which is now 3 ft. gage, is to be made standard gage throughout.

OHIO ROADS (ELECTRIC).—George Ross, of Cleveland, is Chief Engineer of the company which is building an electric line from Lima via Kenton to Marion. The company, which has a capital of $100,000, is being promoted by J. W. Ogan, of Indianapolis.

OKLAHOMA CENTRAL.—Surveys for this line, it is said, have been completed to the proposed southern terminus at Paris, Tex., and track will be laid into Chickasha, the northern terminus, during the present year. Construction from Lehigh south will be under way in September.

OREGON ELECTRIC RAILWAY.—W. S. Barstow & Co., Inc., Engineers, report that plans are being considered for building several miles of extensions in connection with the Oregon Electric Railway Co., for whom Barstow & Co. are now building and equipping about 60 miles of road. Part of the main line between Portland and Salem, it is expected, will be put in operation September 1.

PENNSYLVANIA.—According to announcement made at Newcastle, Pa., this company has bought about 400 acres of land between Lawrence Junction and Moravia as a site for new yards. The tract is over three miles long.

PHILADELPHIA INTERURBAN LINE.—Work is to be begun next month on an electric line, from Pottstown to Paoli, to be built by this company, chartered under the laws of Pennsylvania some time ago. Right of way has been secured, and it is understood that the new line will reach 63d and Market streets, Philadelphia, over the tracks of the Philadelphia & Western. The line will run through Phoenixville, Linfield, Royersford and Valley Forge.

PORTLAND & SEATTLE.—James J. Hill is quoted as saying that this road may be extended to Spokane. Surveys are now being made, and if the grade is found to be easy the road will be extended to that place. It is proposed to work a part of the road by electricity. (See Construction Record.)

RALEIGH & SOUTHPORT.—This company, it is said, has begun to operate its extension from Lillington, N. C., south to Fayetteville, 30 miles, where connection will be made with the Atlantic Coast Line. (See Construction Record.)

ST. LOUIS & SAN FRANCISCO.—Surveys are reported made for a line from Joppa, Ill., the southern terminus of the Joppa branch of the Chicago & Eastern Illinois, south to Jackson, Tenn., as a connecting link between the Chicago & Eastern Illinois and the proposed northern terminus of the Mobile, Jackson & Kansas City at Jackson.

SAN PEDRO, LOS ANGELES & SALT LAKE.—Senator W. A. Clark is building a line from Las Vegas north to Bullfrog. The Senator denies the report that he has bought the Goldfield & Bullfrog, which is under construction. He says he is having an independent survey made. The engineers are now 31 miles out of Bullfrog. The road is to be built immediately from Bullfrog to Goldfield and Tonopah. It will connect with the San Pedro, Los Angeles & Salt Lake at Las Vegas.

Schoodic.—The state railroad commissioners have approved the location of the line of this Maine railroad. The proposed route is from the main line of the Bangor & Aroostook, 1½ miles north of Millinocket, Me., to Burntland Rips, on the Penobscot, west branch, below the mouth of the Schoodic, about 12 miles.

South & Western. The Cumberland Corporation has recently issued bonds to complete the extension of this road to a connection with the Seaboard Air Line at Rutherfordton, N. C. When finished to Rutherfordton the South & Western will be 107 miles long.

South Bethlehem & Saucon (Electric).—Incorporated in Pennsylvania with $42,000 capital to build a line seven miles long, from South Bethlehem to Centre Valley, where connection is to be made with the Philadelphia line of the Lehigh Valley Transit Company. The stockholders are C. P. Hoffman and William H. Lauer, of South Bethlehem; U. H. Wieand, of Emaus, and Hugh E. Crilly, P. F. Cannon and T. H. Mulligan, of Allentown. With the completion of this line the North Penn Railroad will be paralleled every foot of its way by trolley roads.

Thomasville & Gulf.—Residents of Thomasville, Ga., in connection with C. R. Knight, formerly of the Atlantic Coast Line, are having surveys made for a line from that place, which is on the Atlantic Coast Line and the Atlanta, Birmingham & Atlantic, southwest to a junction with the Apalachicola Northern, about 50 miles. The Apalachicola Northern is building from St. Joseph on the Gulf of Mexico northward to Apalachicola and River Junction on the Atlantic Coast Line, the Louisville & Nashville and the Seaboard Air Line.

Versailles & Sedalia.—Incorporated in Missouri with $50,000 capital to build a railroad in that state. The line, six miles long, is to connect the Chicago, Rock Island & Pacific and the Missouri Pacific with the coal fields which are being developed by the Missouri Cannel Coal Co. James Applewhite is President; W. W. Farris, Vice-President; G. R. Able, Vice-President and General Manager; J. C. Ottinger, Treasurer, and S. W. Tate, Secretary, all of Memphis, Tenn., excepting Vice-President Able.

Youngstown & Southern.—A contract has been let to J. G. White & Co., of New York City, as engineers for the electrification of this road operating between Youngstown and Columbiana, O., 16 miles. This road was built by J. G. White & Co. several years ago. The Youngstown & Southern is now engaged in extending this line to Leetonia, an additional five miles, and this extension will also be electrified by J. G. White & Co. The contract covers the necessary rolling stock, transmission, overhead, sub-stations, etc. (See Construction Record.) The road is to be eventually extended south to East Liverpool, 30 miles from Leetonia, and will provide through service from East Liverpool to Youngstown and from Canton, Akron, Alliance and Salem to Youngstown. J. G. White & Co. will actively push this work, and expect to have it completed late this summer.

## RAILROAD CORPORATION NEWS.

Boise, Nampa & Owhyee.—See Idaho Northern.

Boston & Maine.—Stockholders have been given the right to subscribe, up to August 15, 1906, to an issue of $5,331,900 of common stock, 42,037 shares of which were recently authorized, the remainder being stock already held in the company's treasury. Stockholders are to have the right to subscribe for the new stock at 165 at the rate of one share for every five shares already held. Payment can be made in full, in which case the stock is entitled to the next dividend, or it can be paid for in four equal instalments up to December 31, 1907, the stock in this case participating in the dividend distribution in proportion to the amount paid up.

Brooklyn Rapid Transit.—During the fiscal year ending June 30, 1906, this company carried 452,604,203 passengers, an increase of about 16 per cent. The car mileage increased only about 10½ per cent., the average car load having increased from 6.76 passengers to 7.12 passengers.

Canadian Northern Ontario Railway.—See James Bay Railway.

Canadian Pacific.—This company has redeemed the last of its $15,000,000 3½ per cent. land grant bonds. These bonds were secured on the unsold lands granted to the company, and the Dominion Government guaranteed the interest for 50 years. The railroad company has been turning over to the government proceeds from the sales of its lands, forming a sinking fund for the redemption of the bonds. Of the 28,425,000 acres originally granted, the company now has about 11,000,000 acres unsold; this property is estimated to be worth about $150,000,000.

Cumberland Corporation.—This company owns the stock of the Clinchfield Coal Company, the stock of the South & Western Railroad and part of the stock of the Seaboard Company, the last named company being a holding company organized a year ago in connection with the reorganization of the Seaboard Air Line. The Cumberland Corporation has $25,000,000 common stock, $15,000,000 6 per cent. preferred stock, and has sold $15,000,000 6 year 5 per cent. notes to Blair & Co., Speyer & Co., and the Old Colony Trust Company. The proceeds of the sale of the notes will be used to complete the South & Western.

Delaware & Hudson.—See Hudson Valley.

Hudson Valley.—This company was recently reorganized, and among the new securities created were $2,500,000 2 per cent. debenture B bonds which, after two years, can be exchanged at par for 5 per cent. preferred stock. E. Clarence Jones & Co., and C. W. Morse have been, supposedly, in control and are said to have bought a large amount of the debenture bonds at about 30. The Delaware & Hudson, which also owns stock, is now suing the above named interests to prevent the exchange of the bonds for the preferred stock on the ground that, under the New York State law, preferred stock cannot be issued at less than par and, if the proposed arrangements are carried out, it will amount to the debenture bond holders getting preferred stock at a cost of only about $30 a share.

Idaho Northern.—This company has taken over the Boise, Nampa & Owhyee, which runs from Nampa, Idaho, to Murphy, 30 miles.

James Bay Railway.—The name of this company has been changed to the Canadian Northern Ontario Railway.

Kansas City, Mexico & Orient.—The President has gone to Europe to sell $15,000,000 bonds. There are at present outstanding $5,242,000 first mortgage 4 per cent. bonds of 1951, and these, together with equipment trust certificates and certain obligations of the K. C., M. & O. subsidiary construction companies, make the total outstanding debt at present between $7,000,000 and $10,000,000. The first mortgage bonds are issuable at the rate of $22,500 per mile of single main track; $15,000 per mile of yard and terminal track, and $12,000 per mile of double track built or acquired. The mortgage also provides for the issue of $17,500,000 for the very expensive construction through the Sierra Madre Mountains, for terminal facilities and for future requirements and additional rolling stock.

Nashville Railway & Light.—The stockholders have authorized the issue of $15,000,000 refunding mortgage 5 per cent. bonds. The company owns all the street railroads of Nashville, amounting to about 72 miles of line, and also has lighting properties. Of the new bonds, $7,500,000 will be sold immediately; $6,000,000 for the retirement of all the present outstanding bonds, and the remainder for improvements and extensions.

Pittsburg & Lake Erie.—See Wabash-Pittsburg Terminal.

Seaboard Air Line.—See Cumberland Corporation.

South & Western.—See Cumberland Corporation.

Underground Electric of London.—A call of 25 per cent. per share (par value $48.50) has been made upon the holders of the about $24,250,000 outstanding common stock, which is 50 per cent. paid up. The call is payable in two equal instalments, August 15 and September 13, 1906.

Union Pacific.—The gross earnings of this company during the month of May, 1906, were $5,666,931, an increase of $950,061.

United Railways & Electric Company of Baltimore.—A plan of reorganization of the finances of this company has been approved by the Board of Directors and the income bondholders' committee. The plan provides for the issue of $14,000,000 5 per cent. 30-year bonds, of which $1,400,000 will be issued at once to be exchanged at face value for the coupons representing five semi-annual instalments of interest in default on the $14,000,000 4 per cent. income bonds. The plan also provides for the consolidation of the Baltimore & Annapolis Short Line with the new Maryland Electric. The B. & A. S. L. is a steam line running from Cliffords, Md., to Annapolis, 22 miles, and has no funded debt. This line will be electrified, and the consolidated company will make a mortgage securing $8,000,000 5 per cent. 25-year bonds, of which about $4,000,000 will be issued soon to provide for the acquisition of terminal stations, car barns, and extensions, which will belong to the consolidated company but will be leased to the United Railways & Electric.

Wabash-Pittsburg Terminal.—This company has made an agreement with the Pittsburg & Lake Erie, according to the terms of which the P. & L. E. gets some of the Wabash terminal property in Pittsburg on the south side of the Monongahela river, east of the W.-P. T. bridge into the city of Pittsburg proper. The P. & L. E. will build freight terminal facilities on the property. In exchange, the W.-P. T. gets trackage rights over the P. & L. E. enabling it to reach this hitherto undeveloped terminal property.

# GENERAL NEWS SECTION

## NOTES.

The Indiana State Tax Board has increased the valuations of railroad property about $12,000,000 over the total for last year.

The Montana State Board of Equalization has increased by 12½ per cent. the rate of assessment of railroads in that state for taxation; that is to say, from $14,500 a mile to $16,236.

The Trades League of Philadelphia announces that about 40 excursions of merchants from the West and South are coming to that city this summer and 20 have come already. Most, or all, of these excursionists have reduced-rate tickets to New York City, but they have the privilege of stopping over at Philadelphia.

The last company to announce that it has never killed a passenger on its trains is the Missouri, Kansas & Texas. The company was organized in 1870. A similar statement has been made concerning the Canadian Pacific lines west of Winnipeg. The Canadian Pacific main line through to the Pacific coast was opened in the year 1886.

The management of the Intercolonial Railway has issued a circular informing employees that hereafter they can have only one pass a year, and none at all for their wives—from which it appears that working for a railroad operated by a benevolent government is not all that it is cracked up to be—especially when there is no Election Day approaching.

An officer of the Pennsylvania, replying to newspaper complaints that the road was favoring Baltimore at the expense of Philadelphia, says that the company's grain elevator capacity at Philadelphia is being increased. Elevator A, at Girard Point, is being torn down to make room for other facilities, but this elevator has been practically out of service for several years and room in other elevators is now available, so that the company expects to handle at that port 750,000 bushels more grain than last year.

At Calhoun, Ga., one day last week there were 8,000 crates of peaches lying around on the ground in the vicinity of the railroad station waiting to be shipped, but with no cars in sight. At other points in Georgia, according to the local papers, the same scarcity of cars exists, and, in addition, there is too much rain, causing the peaches to rot. The prayers heard in the churches in that region are, therefore, for less rain and more refrigerators. On the Chattanooga Southern Railroad, it is said, 10,000 crates of peaches were thrown into the river because of lack of cars.

The railroads between the Missouri river and Chicago, which for two or three weeks seem to have been doing their best to get up a grain rate war, have agreed to restore all tariffs, according to one statement on August 11 and according to another on August 26. The Chicago Great Western having reduced to 10¾ cents the rate on grain, and subsequently made the rate on flour 2¾ cents less than that on grain, the other roads, one after another, made similar reductions, and the announcements by the different lines followed one another in bewildering succession, but after a few days the "contest" was reported settled.

Press despatches from San Francisco on Tuesday of this week report the blockade of freight at and around that city as worse instead of better; although by strenuous efforts and by "missionary work" among the consignees, many hundreds of cars had been unloaded during the past week; and the Southern Pacific announced that until further notice only foodstuffs, perishable goods and crude oil would be received for San Francisco. The number of loaded cars in the yards of San Francisco and Oakland was estimated at 5,000. To keep the peace with the workmen in the freight houses of Oakland the Southern Pacific was compelled to advance their pay to 25 cents an hour. Mr. Kruttschnitt is at San Francisco.

The General Manager of the Metropolitan Street Railway, which operates the surface street car lines in Manhattan, New York City, speaking to a reporter, says that the rule to forbid smoking on street cars is poorly enforced because the public—that is to say, the passengers—do not give to the conductors the moral support necessary to carry out such a regulation. The rule which prohibits spitting has, however, produced a marked improvement in the habits of passengers, and for the reason that the company secured the backing and co-operation of the Board of Health. After getting the board interested in it "our way was easy; once we had the prestige of a municipal department behind us, most of our troubles ceased."

A German newspaper correspondent at Tokio, speaking of the proposition to put all of the railroads of Japan into the hands of the Government, says that the people have abundant reason for disapproving of the scheme, for the reason that one branch now belonging to the Government—that from Tokio to Kobe—is a model of mismanagement. Sleeping accommodations must be reserved days ahead; the cars, even those of the first class, are overcrowded, and the officials are careless about attending to their duties. There is no consideration for non-smokers, though the natives of both sexes smoke incessantly. Heating and lighting are of the most primitive description. It is feared that state control will reduce all the roads to this level, and that the rates will be raised, as a new form of taxation. The value of competition is illustrated on the line from Tokio to Yokohama, which, for the first time, has put on real express trains that cover the distance in half an hour, the cause of this new departure being a rival electric line.—*New York Evening Post.*

### National First Aid Association.

This association held its first annual meeting at Boston June 7, and the report of the meeting has just been issued. It contains brief articles showing what has been done in the way of instructing railroad employees and others in first aid to the injured in Maine, Massachusetts, New York, New Jersey, Michigan and Virginia, and much other general information on the subject. Lists are given of physicians who have given lectures on this subject in these states and also in Indiana and the District of Columbia. The Secretary of the Association is Miss Mary I. Kensel, 6 Beacon street, Boston.

### Railroad Records Under the New Law.

The Interstate Commerce Commission has notified the railroads of the country that they may continue keeping their accounts, records and memoranda according to their own plans until the Commission prescribes a method or methods. Attention is called to the fact that annual reports of railroads must be filed on or before September 30 of this and subsequent years unless additional time is granted by the Commission.

### Large Gas Engines for Gary, Ind.

The Westinghouse Machine Co. has a contract for eight large gas-driven blowing engines to be installed in the United States Steel Corporation's plant to be built at Gary, Ind. This type of engine will also be used for generating electricity. Each engine, as an electric unit, will have a rated capacity on blast furnace gas of nearly 3,000 h.p., corresponding to a rating of 4,000 h.p. on natural gas. The unit will be arranged in twin tandem fashion, each side consisting of two double acting gas cylinders and one blowing cylinder in the opposed or "vis-a-vis" arrangement. Power cylinders are 42 in. and the air cylinders 68 in. in diameter, with a common stroke of 54 in., the unit running at a maximum speed of 75 r.p.m. for blowing and 84 r.p.m. for electric work. The capacity of air delivery at this speed will be 33,000 cu. ft. of free air per minute at 18 lbs. pressure, with a maximum pressure delivery of 30 lbs. per sq. in. For several months a 350-h.p. engine of this type, installed largely for experimental purposes, has been in regular operation on blast furnace gas at the Edgar Thomson Works, Pittsburg, generating electricity for motor-driven foundry machinery.

### Manufacturing and Business.

E. N. Chilson has been appointed Purchasing Agent of J. G. White & Co.

J. W. Strahl has been appointed Superintendent of the works of the Dayton Pneumatic Tool Co., Dayton, Ohio.

Henry M. Steele, until recently Chief Engineer of the Central of Georgia, has been appointed Chief Civil Engineer for J. G. White & Co., of New York.

D. F. Jennings, for a number of years General Manager of the Hoosac Tunnel Fast Freight Line, is now in the sales department of the Cardwell Manufacturing Co., of Chicago.

F. K. Shults, eastern sales agent of the Camel Co., Chicago, for many years, has resigned to take a position in the sales department of the American Steel Foundries, with headquarters in New York.

W. C. Webster has been appointed Manager of the New York sales office of the Westinghouse Electric & Manufacturing Co., succeeding E. W. T. Gray, who resigned recently to go into other business.

The Independent Pneumatic Tool Co., of Chicago, announces that Messrs. Lake, Hale & Co., 11 Front street, San Francisco, Cal., have been appointed the exclusive Pacific coast representatives of the company.

The More-Jones Brass & Metal Co., of St. Louis, has bought a tract 80 ft. by 236 ft., including switching facilities, adjoining its

present foundry property, on which it plans to build new buildings in the near future.

J. W. Cregar, formerly proprietor of the J. W. Cregar Agency, of Philadelphia, is now in charge of the miscellaneous department of the Niles-Bement-Pond Co., in Philadelphia, the Cregar agency having retired from business.

Charles C. Newton, President of the Newton Machine Tool Works, Philadelphia, died recently. The officers of the company are now as follows: H. W. Champion, President; William M. Graham, Treasurer, and Ellis J. Hannum, Secretary.

The Link-Belt Co. is the new name of the Link-Belt Machinery Co., of Chicago. The Link-Belt Co. owns the Link-Belt Engineering Co., of Philadelphia, and the Ewart Mfg. Co., of Indianapolis, which have been associated with the Link-Belt Machinery Co.

The Crocker-Wheeler Company, of Ampere, N. J., has opened two new offices on the Pacific coast, one an office and warehouse at 208 First street, near Howard street, San Francisco, with H. C. Baker as local manager; the other in the Pacific Electric Building, Los Angeles, with L. Cummins as local representative. The company plans soon to open an office in Seattle.

The Electro-Dynamic Co. has recently had orders from the General Pneumatic Tool Co. for 160 variable speed motors; from the National Elevator Co. for 48 motors, and from the United States Printing Co. for 21 motors. Other orders have been received from the Board of Water Supply of New York City, Farrel Foundry & Machine Co. of Ansonia, Solvay Process Co. of Syracuse, Ball & Wood Co. of Elizabeth, and Gould & Eberhardt, of Newark, N. J. Preparations are being made for enlarging the plant at Bayonne, N. J.

### Iron and Steel.

The Temiskaming & Northern Ontario has decided to give contracts for 8,500 tons of rails to the Dominion Steel & Iron Co., and to the Algoma Iron & Steel Co.

The American Ship Building Co. has given orders for 1,600 tons of plates and structural shapes to the Illinois Steel Co., and will soon be in the market for some additional supplies. About 1,000 tons of steel will be needed to carry out the work of lowering the Chicago river tunnels, for which contracts have been let. The Southern has given an order for 30,000 tons of rails and has nearly completed negotiations for the purchase of an additional 30,000. The Chicago, Burlington & Quincy has given orders for 10,000 tons for 1907 delivery; the Chicago & Eastern Illinois 5,000 tons, the Evansville & Terre Haute 1,300 tons, and Swift & Co. 1,500 tons. It is said that the Carnegie works of the American Steel Co. has recently received orders amounting to 52,000 tons. The Philadelphia & Reading has bought from the Pennsylvania Steel Co. 15,000, and the New York, New Haven & Hartford 3,500 tons. The American Bridge Co. has an order for 4,100 tons of bridge material from the Cleveland Belt Railroad for the proposed structure to be built over the Cuyahoga river.

## OBITUARY NOTICES.

Mrs. Theodore N. Ely, wife of the Chief of Motive Power of the Pennsylvania Railroad System, died on July 24th at her home at Bryn Mawr, Pennsylvania.

Robert William Smith, of Philadelphia, who on June 1, 1904, retired under the pension rules as Treasurer of the Pennsylvania Railroad, died on August 1st at Spring Lake, N. J. Mr. Smith was 70 years old.

John William Mackenzie, Chief Claim Agent of the Merchants Despatch Transportation Company, at New York, who for 17 years had been connected with the freight claim department of the company, died in New York City on July 30th.

Col. Alva J. Smith, General Passenger Agent of the Lake Shore & Michigan Southern, died on July 26, at Harriettstown, N. Y., near Paul Smith's in the Adirondacks. Mr. Smith was born at Churchville, N. Y., in 1840. He began railroad service in 1866 as a clerk in the general ticket office of the Cleveland, Columbus, Cincinnati & Indianapolis, now part of the Big Four. He was later made chief clerk in the same office, and, in 1874, was appointed Assistant General Passenger Agent, being made General Passenger Agent four years later. In 1881, he went to the Indianapolis & St. Louis, now also part of the Cleveland, Cincinnati, Chicago & St. Louis, as General Passenger Agent, and, later, had his authority extended also over the Cincinnati, Hamilton & Dayton, and the Dayton & Union. In 1887, he went to the Lake Shore & Michigan Southern to take the office which he held at the time of his death. Mr. Smith was Secretary of the National Association of General Passenger and Ticket Agents for a quarter of a century—1879 to 1904. He was elected Vice-President of this association in October, 1904, and President in October, 1905.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Master Car and Locomotive Painters' Association.

The thirty-seventh annual convention of this Association will be held in Washington, D. C., Sept. 11 to 14. Headquarters will be at the Hotel Arlington, the daily sessions to be held in the convention hall of the hotel. Arrangements have been made for the following hotel rates to the members of the Association and their families: American plan $3.50 per day, each person, in single rooms; all double rooms to be occupied by two persons, $7 per day; bath-rooms $2 per day additional.

The programme includes papers on the following subjects:

"The Lustre and Life of Varnish," by Charles E. Copp, J. H. Pitard, and John Hartley.

"Canvas Roofs for Passenger Equipment," by F. A. Wels, J. A. P. Glass and D. L. Paulus.

Essay: "The Well-Equipped Sand-Blast as a Factor in the Labor-Saving Economy of the Railway Car and Locomotive Paint Shop," by J. H. Whittington.

"The Painting of Freight Equipment," by J. D. Wright, John Gearheart, T. J. Hutchinson and David Murray.

"Is It to the Advantage of Railroad Corporations to Manufacture the Paints and Varnishes which they Consume?" By Joseph Maycock, Chas. F. Copp, A. T. Schroeder, and John T. McCracken.

"The Apprenticeship System in the Railway Paint Shop: Is It Receiving the Attention which it Merits?" By B. E. Miller, C. E. Cross and Fred. S. Ball.

"Brushes: Their Selection, Care and Keeping," by E. R. Clare, Thomas Cowan, A. L. Holtzman and George Durnbaugh.

There will also be discussions on the following queries:

"Is it Advisable to Cut In, Rather than to Touch Up Passenger Equipment?" Discussion opened by A. L. Allen.

"Is It Advisable to have Stationary Scaffolds in a Locomotive Paint Shop?" By D. A. Little.

"Is It Advisable to Cut or Thin Shellac with Wood Alcohol?" By W. O. Quest.

"Does Not the Superior Appearance and Extra Strength of Polished Plate Glass More than Counterbalance any Extra Cost over Double Thick Window or Crystal Sheet?" By W. E. Hibbard.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Little Falls & Dolgeville.*—W. H. Newman, President of the New York Central & Hudson River, has been elected President, succeeding Dumont Clarke.

*New York Central & Hudson River.*—See Little Falls & Dolgeville.

### Operating Officers.

*Birmingham Southern.*—Charles T. Kalbaugh, formely Trainmaster on the Pittsburg & Lake Erie, has been appointed to the new office of General Superintendent, with headquarters at Birmingham, Ala.

*Chicago & North-Western.*—Frank Walters, Assistant General Superintendent at Fremont, Neb., has been appointed to the new position of Assistant General Manager with headquarters at Omaha, Neb.

*Chicago, Burlington & Quincy.*—J. R. Phelan, General Superintendent of the Wyoming district, has resigned, to go into business on his own account. L. B. Allen, Superintendent of the lines east of the Missouri river, with headquarters at Ottumwa, Iowa, succeeds Mr. Phelan as General Superintendent, with headquarters at Alliance, Neb.

*International & Great Northern.*—C. Hightower, Ticket Agent at San Antonio, has been appointed Assistant Superintendent of the Gulf division, with headquarters at Palestine, Tex. Marvin H. Trice, Car Accountant, has been appointed Assistant Superintendent of the Fort Worth division, with headquarters at Mart, Tex.

*Southern.*—E. J. Stevens has been appointed Car Accountant of the Western district, with headquarters at Birmingham, Ala.

H. W. Beecroft, Car Accountant of the Indiana Harbor (Indiana Harbor Belt), has been appointed Car Accountant of the Middle district, with headquarters at Knoxville, Tenn.

*Wabash.*—John J. Sim, who was recently appointed Superintendent of the Buffalo division, was born on Oct. 5, 1858, at Cambridge City, Indiana. He attended the high school at that place and, in 1877, began railroad work as an operator on one of the lines now controlled by the Pennsylvania Company. Two years later he went to the Wabash as operator, was despatcher for 10 years from 1882 to 1892, chief despatcher from 1892 to 1893, and in December, 1893, was made trainmaster of the Detroit division, with headquarters at Montpelier, Ohio. His new appointment as Superintendent of the Buffalo division, with headquarters at Detroit, took effect August 1.

### Traffic Officers.

*Boston & Maine.*—Dana J. Flanders, General Passenger and Ticket Agent, has been promoted to be Passenger Traffic Manager, effective September 1st. Mr. Flanders' whole railroad service has been connected with the roads which make up the Boston & Maine. He began work in early youth, became a telegraph operator, was in 1869 chief of telegraph at the Boston terminal and was in 1874 made General Ticket Agent. Since that time he has been in charge of the road's passenger department.

Mr. Flanders' successor as General Passenger Agent is Charles Morrison Burt, now General Passenger Agent of the Central Railroad of New Jersey. Mr. Burt is 44 years old. He was educated in the public schools at Meadville, Pa. In 1879, he began railroad service in the Auditor's department of the New York, Pennsylvania & Ohio, now part of the Erie. In 1883, he entered the Passenger Department of the New York, West Shore & Buffalo, and was with this road and its successor, the West Shore Railroad, until 1888. He was then made chief rate clerk of the Trunk Line Association at New York, and, in 1896, chief clerk in charge of passenger traffic of the Joint Traffic Association at New York. On August 1, 1899, he was appointed General Passenger Agent of the Fitchburg and on July 1, 1900, Assistant General Passenger and Ticket Agent of the Boston & Maine. He went to the Central Railroad of New Jersey on June 1, 1901, as General Passenger Agent, and his term of office has been characterized by a marked improvement in the passenger service of the road, which is now unexcelled among the lines leading out of New York City. Since October, 1904, Mr. Burt has been Secretary of the American Association of General Passenger and Ticket Agents.

Charles M. Burt.

*Chicago & Eastern Illinois.*—F. C. Reilly, Assistant General Freight Agent at Chicago, has been appointed General Freight Agent, succeeding S. J. Cooke, resigned.

*Louisiana Western.*—See Morgan's Louisiana & Texas.

*Morgan's Louisiana & Texas.*—C. S. Fay, General Freight Agent of this road and the Louisiana Western, has been appointed Traffic Manager, a position which has been vacant since the death in 1904 of W. H. Masters.

*Seaboard Air Line.*—A. Pope, Assistant General Freight Agent at Norfolk, Va., has resigned. His successor is Louis E. Chalenor, Assistant General Freight Agent at Savannah, Ga., whose headquarters have been transferred to Portsmouth, Va. T. P. Thompson, General Agent at Baltimore, has been appointed Assistant General Freight Agent at Savannah, to succeer Mr. Chalenor.

### Engineering and Rolling Stock Officers.

*Great Northern.*—G. Willius, Mechanical Engineer, has resigned, to go into other business. His successor is R. D. Hawkins, General Master Mechanic of the Central district. F. M. Fryburg, Master Mechanic of the Montana Central, with headquarters at Great Falls, Mont., succeeds Mr. Hawkins, with headquarters at Minot, N. Dak.

*Lake Shore & Michigan Southern.*—S. K. Dickerson, who was recently appointed Superintendent of Motive Power, was born in 1859 and began railroad service in 1880 as a machinist on the Missouri, Kansas & Texas. He was for two years on the Pennsylvania and then went to the Norfolk & Western, where, in 1894, he was appointed Master Mechanic of the Radford division. In 1900, he was made Master Mechanic of the Toledo division of the Lake Shore & Michigan Southern. Later in the same year his authority was extended over the Eastern and Franklin divisions, and, in 1902, he was made Master Mechanic at Collinwood, Ohio, where he remained until his recent promotion.

*Lehigh Valley.*—Willard Kells, Master Mechanic at Sayre, Pa., has been transferred to Buffalo, N. Y., to succeed F. R. Cooper, resigned.

*St. Louis Southwestern.*—J. J. Bartholomew has been appointed Air-Brake Inspector of the St. Louis Southwestern and the St. Louis Southwestern of Texas.

*Michigan Central.*—LeGrand Parish, who was recently appointed Superintendent of Motive Power, was born in New York State in 1866. He began railroad work as clerk in the car department of the Lake Shore & Michigan Southern in 1891. Before that time he had worked in various machine shops and in the laboratory of Thomas A. Edison, and later with the Gilliland Electric Company. In 1896, he was made general foreman on the Lake Shore, three years later Master Car Builder of the Western division, and, in 1900, had his authority extended over the Michigan division. In 1904, he was appointed Superintendent of Motive Power of the Lake Erie & Western and of the Indiana, Illinois & Iowa.

LeGrand Parish.

*Pennsylvania Lines West.*—The following changes in the motive Power of the Southwest System were made on August 1st: P. F. Smith, Jr., appointed Master Mechanic of the Indianapolis division, with headquarters at Columbus, Ohio, succeeding W. C. A. Henry, promoted; George B. Fravel appointed Master Mechanic of the Pittsburg division with headquarters at Dennison, Ohio, succeeding Mr. Smith; Joseph J. Walsh, Master Mechanic of the Northwest System at Chicago, appointed Master Mechanic of the Logansport division, succeeding Mr. Fravel.

*Southern.*—F. M. Edwards, who was recently appointed Engineer of Maintenance of Way of the Western district, was born in South Carolina in 1871 and graduated from the South Carolina Military Academy in 1890. He began railroad service the same year as draftsman for the Macon Construction Company, and later in the year he was appointed Assistant Engineer of Construction and Maintenance of the Georgia Southern & Florida. During the next six years, he was engaged in construction work for several different companies in Florida and Georgia, being part of the time Assistant City Engineer at Jacksonville. In 1896, he was appointed Resident Engineer of Construction on the Mobile, Jackson & Kansas City, and two years later went to the Southern to do similar work. He was then, for a year, Assistant Engineer on the location and construction of the Canton, Aberdeen & Nashville, now a part of the Illinois Central, and, in 1899, returned to the Southern as Assistant Engineer of Construction and Maintenance at Chattanooga, Tenn. Later he was appointed Resident Engineer at that place, which position he held until his recent promotion.

### Special Officers.

*Missouri Pacific.*—James M. Siebert has been appointed Commissioner of Statistics, with headquarters at St. Louis.

## LOCOMOTIVE BUILDING.

*The Tidewater* is reported in the market for 100 locomotives.

*The Wabash*, it is reported, is asking prices on 80 locomotives.

*The Philadelphia & Reading* is building 10 freight locomotives in its own shops.

*The Great Northern*, it is reported, will shortly receive five Mallet compound locomotives from the Baldwin Works, and is reported as in the market for 50 locomotives.

*The Mexican Central*, it is reported, has ordered 32 oil burning consolidation locomotives from the American Locomotive Co. for November, December and January delivery.

*The Western Maryland* has just ordered 24 simple consolidation locomotives from the Baldwin Locomotive Works for November, December and January delivery. These locomotives will weigh 200,000 lbs., with 182,000 lbs. on drivers; cylinders, 22 in. by 30 in.; diameter of drivers, 57 in.; straight top boiler, with a working steam pressure of 200 lbs. per sq. in.; total heating surface, 2,887 sq. ft.; 352 tubes, 14 ft. 10 in. long by $2\frac{1}{4}$ in. in diameter; firebox, 108 in. long by 70 in. wide; grate area, 52.5 sq. ft.; tank capacity, 7,000 gallons, and coal capacity, 12 tons. The special equipment will in-

cluding Walschaert valve gear, Westinghouse air-brakes, K. & M. boiler lagging, Simplex brake beams, American Brake-Shoe & Foundry Co.'s brake-shoes, National Malleable Casting Co.'s couplers, Adams & Westlake headlights, Trojan piston and valve rod packings, consolidated safety valves, Leach sanding devices, Nathan bull's-eye lubricators, Railway Steel Spring Co.'s springs, Ashton steam gages, Latrobe driving wheel tires and cast-steel wheel centers.

*The Norfolk & Southern* has ordered eight 10-wheel freight locomotives, seven eight-wheel passenger locomotives, and two six-wheel switching locomotives from the Baldwin Locomotive Co. for December, 1906, delivery. The 10-wheel locomotives will weigh 138,000 lbs., with 102,000 lbs. on drivers; cylinders, 18 in. by 26 in.; diameter of drivers, 56 in.; wagon top boiler, with working steam pressure of 200 lbs.; grate area, 29.2 sq. ft.; tank capacity, 5,000 gallons. The eight-wheel locomotives will weigh 116,000 lbs., with 72,000 lbs. on drivers; cylinders, 18 in. by 24 in.; diameter of drivers, 61 in.; wagon top boiler, with a working steam pressure of 180 lbs.; total heating surface, 1,496 sq. ft.; grate area, 18.7 sq. ft.; tank capacity, 4,000 gallons. The six-wheel locomotives will weigh 100,000 lbs.; cylinders, 18 in. by 24 in.; diameter of drivers, 54 in.; working steam pressure, 180 lbs.; grate area, 17.1 sq. ft.; tank capacity, 3,000 gallons. The special equipment for all will include: Westinghouse air-brakes, Otis steel axles, Cook bell ringers, Johns-Manville boiler lagging, Pennsylvania brake-beams, Gould couplers, Dressel 18-in. headlights, Seller's injectors for the six-wheel switching locomotives and for the eight-wheel passenger locomotives, Nathan injectors for the 10-wheel freight locomotives, Ajax Metal Co. journal bearings, U. S. metallic valve rod and piston rod packing, Potts sanding devices, Nathan bull's-eye sight feed lubricators, Pittsburg Steel Spring Co.'s springs and Gold steam heat equipment.

## CAR BUILDING.

*The Missouri Pacific* is in the market for 100 flat cars of 80,000 lbs. capacity.

*The Tidewater* has ordered 50 flat cars from the American Car & Foundry Co.

*The Delaware, Lackawanna & Western* will build 3,500 cars at its own shops.

*The Northwestern Elevated*, Chicago, has ordered 34 electric cars from the Jewett Car Co.

*The Mexican Central*, it is reported, is in the market for upwards of 1,400 box cars.

*The Denver & Rio Grande* has ordered 250 ore cars from the American Car & Foundry Co.

*The Northern Electric Co.*, Chico, Cal., has ordered four electric cars from the Niles Car Works.

*The Mississippi River & Bonne Terre* has ordered 200 dump cars from the American Car & Foundry Co.

*The Guayaquil & Quito*, it is reported, is in the market for a number of box cars of 50,000 lbs. capacity.

*The Great Northern* is reported to have ordered 4,000 box cars from Haskell & Barker and is figuring on 250 dump cars.

*The Baltimore & Ohio*, it is reported, is considering the purchase of upwards of 600 freight cars and 125 passenger coaches.

*The Indiana, Columbus & Eastern Traction*, it is reported, among other improvements is considering the purchase of additional rolling stock.

*The Cleveland, Akron & Columbus*, it is reported, at a directors' meeting authorized the purchase of 616 freight cars at a cost of about $750,000.

*The Canadian Pacific* has ordered five dining cars, 20 first-class coaches, 10 baggage and express cars, and 25 box cars, to be built at its Angus shops.

*The Grand Trunk Pacific* has, it is reported, contracted with Rhodes, Curry & Co. for 2,500 cars, delivery to commence this year and to extend over a period of five years.

*The Duluth & Iron Range* has asked bids on 700 steel ore cars of 100,000 lbs. capacity. It is reported that additional orders for 200 flat, box and refrigerator cars will soon be placed.

*The Duluth, Missabe & Northern* has asked bids for 1,500 steel ore cars of 100,000 lbs. capacity, and 60 gondola cars of 80,000 lbs. capacity. It is expected that orders will be placed this week.

*The Norfolk & Southern* has ordered two mail and express cars, two baggage cars, and one first-class coach for December, 1906, delivery from the Harlan & Hollingsworth Co.: 75 ventilated furniture cars of 60,000 lbs. capacity, 50 gondola cars of 60,000 lbs. capacity, and 600 ventilated box cars of 60,000 lbs. capacity from the Mt. Vernon Car & Manufacturing Co., for January, 1907, delivery, and 210 flat cars of 60,000 lbs. capacity from the American Car & Foundry Co. for November, 1906, delivery. The mail and express cars and the first-class coaches will measure 60 ft. over all and will be fitted with Monarch hollow brake-beams. The ventilated box cars will be 36 ft. over all. The special equipment will include: Westinghouse air-brakes, Monarch steel couplers, excepting the mail and express, baggage and first-class coaches will be fitted with Janney couplers; McCord dust guards, Gold heating system, McCord journal boxes, Pittsburg Steel Spring Co.'s springs, Adams & Westlake lamps, and Gold heating system for the first-class coaches; Symington journal boxes and Sterlingworth draft rigging and Winslow improved roofs for furniture cars.

The *Mobile & Ohio*, reported in the market for 200 gondola cars in our issue of July 10, has ordered 600 drop-end gondola cars of 80,000 lbs. capacity and 10 first-class passenger coaches from the American Car & Foundry Co. for fall 1906 delivery; also 10 cabooses from the Mt. Vernon Car & Mfg. Co. for fall delivery. The dimensions for the gondola cars are as follows: Weight, 34,000 lbs.; length inside, 37 ft. 11½ in.; length over all, 40 ft.; width inside, 9 ft. 8 in.; height inside, 3 ft. 9 in. The bodies and underframes are to be of wood. The special equipment includes Scullin & Gallagher body bolsters, Iron & Steel Co.'s truck bolsters, Simplex brake beams, Westinghouse brakes, Latrobe couplers, Minor draft rigging, Harrison dust guards, Eureka journal bearings, McCord journal boxes, Union gravity side bearings, Railway Steel Spring Co.'s springs, and diamond arch bar trucks. The first-class coaches will measure 65 ft. long by 9 ft. wide; the bodies and underframes will be of wood. The special equipment will include Pullman vestibules, Ajax diaphragms, National Lock Washer Co.'s curtain fixtures, Safety Car Heating & Lighting Co.'s steam heating system, also Spear heaters, Pintsch gas for lighting, Gould hand brakes, Commonwealth Steel Co.'s double cast steel body bolsters, Tower couplers, Railway Steel Spring Co.'s springs, Westinghouse high-speed brakes, Minor gravity side bearings, Paige wheels, McCord journal boxes, Eureka journal bearings, Waycott brake beams, Streeter brake shoes, Harrison dust guards. These cars will also be equipped with American Car & Fdry. Co.'s platforms and anti-telescoping devices. The cabooses weigh 34,000 lbs. and measure 33 ft. 5½ in. long x 8 ft. 1½ in. wide inside x 6 ft. 10½ in. high. The special equipment includes Scullin & Gallagher bolsters, Simplex brake beams, Westinghouse brakes, Chicago couplers, Minor draft rigging, Harrison dust guards, McCord journal boxes, Eureka journal bearings, Minor gravity side bearings, Railway Steel Spring Co.'s springs and diamond arch bar trucks. These cars will be partitioned to form baggage and passenger rooms. The baggage room will have large sliding doors hung on Moore's anti-friction hangers and will be equipped with coach platforms at both ends for handling passengers.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Albany, Cairo & Gulf.—Incorporated in Georgia to build a line from Albany, Ga., via Quincy, Fla., to St. Joseph's Bay, about 175 miles. The names of the projectors are not given.

Atlanta, Birmingham & Atlantic.—A contract has been given to the Callahan Construction Co. for building the Atlanta branch of this road, from Chalybeate Springs through Woodbury, Senoia and Fairburn to Atlanta, Ga.

Beaumont, Sour Lake & Western.—A sub-contract has been let to King & Galvin, of Houston, for grading 12 miles of this road east from Houston, Tex. The contract calls for the completion of the work by September 15. Sunderman & Dolson also have a sub-contract and are building from Sour Lake west towards Houston. The line is being extended 65 miles from Sour Lake, the present western terminus of the road, to connect at Houston with the proposed extension of the Trinity & Brazos Valley. (See Construction Record.)

Buffalo, Lockport & Rochester (Electric).—This company, incorporated in June of last year, is a consolidation of the Albion Electric Railway, the Albion & Lockport, and the Albion & Rochester Railway. Work is now under way on 54 miles of road from Rochester west to Lockport. From Lockport the company expects to use the tracks of the International Traction Company into Buffalo. A private right of way has been secured, excepting in the towns where the necessary franchises have been granted. The contracts already let call for two tracks, but the second will not be laid for some time. The company expects the line to be in operation by May of next year. The capital is $4,000,000, and it has been underwritten by the Transit Finance Co., of New York, and the Mackenzie & Mann syndicate, of Toronto.

Canadian Pacific.—Surveys are being made for a suitable route through the bog near Magog, Quebec, to do away with some long trestles. The cost of the improvement is to be about $85,000. At Cascade, B. C., the company proposes to get rid of a bridge by making a fill 1,300 ft. long and 200 ft. high. The cost of the work will be about $500,000.

A contract has been given by this company to the Toronto Construction Co. for the construction of a branch to be called the Georgian Bay and seaboard branch from Victoria Harbor, Ont., on Georgian Bay, southeast to Peterborough via Orillia, a distance of about 96 miles. Work is to be begun shortly.

CHICAGO & NORTH-WESTERN.—See South Dakota Construction.

CHICAGO, BURLINGTON & QUINCY.—This company has completed surveys for an extension of its Centralia-Herrin branch from Duquoin, Ill., to Christopher.

CHICAGO, MILWAUKEE & ST. PAUL.—Official announcement has been made that the contract for building the Butte & Whitehall division in Montana has been let to Orman & Crook at about $3,000,000. (July 27, p. 25.)

See South Dakota Construction.

CINCINNATI, COLUMBUS & TOLEDO.—An officer writes that this company, recently incorporated in Ohio to build from Cincinnati to Toledo, will at once let contracts for the work. H. H. Hoffman, Norwood, O., is President. (July 27, p. 25.)

CROSS ISLAND TRACTION.—Incorporated in New York, with $500,000 capital, to build an electric line from Brookhaven, Long Island, to West Sayville, 42 miles. William Moyer, L. Baldwin and Paul T. Brady, of New York, are directors.

DAKOTA MIDLAND.—See South Dakota Construction.

ERIE.—An officer writes respecting the proposed improvements to shorten the line from Cleveland that plans are not ready and surveys have not been made. According to reports this company is planning to lay 12 miles of second track between Galion, O., and Ashland, and eight miles from Ravenna to Leavittsburg.

GRAND TRUNK PACIFIC.—This company has filed plans of its proposed line from Edmonton, Alb., west for 77 miles, and bids are to be asked for at once for the construction of this section.

IDAHO & NORTHWESTERN.—B. R. Lewis, of Spokane, President of the Lewis Lumber Co., announces that work on the final survey for this proposed road across the Coeur d'Alene Indian Reservation will begin at once. The Department of the Interior will be applied to for permission to carry out the work. For a time it is to be used as a logging road. From Mica Bay it will be pushed into the St. Joe and St. Maries valleys, and later will be made a passenger and freight line. A length of 18 miles of the line is now in operation.

INLAND EMPIRE (ELECTRIC).—This company has completed its line from Spokane, Wash., to Waverly, 34 miles, and announces that the lines will be extended south to Lewiston, Idaho, a total of 125 miles. Jay P. Graves, of Spokane, is President. (See Spokane & Inland in Construction Record.)

KALAMAZOO, GULL LAKE & NORTHERN.—Incorporated in Michigan with $200,000 capital to build a line from Kalamazoo, Mich., to Richland and Prairieville, with a branch to Gull Lake, a total of 20 miles. The stockholders are: J. T. Upjohn, Kalamazoo; H. K. Whitney, S. O. Howes and A. A. McKay, all of Battle Creek; M P. Huick, A. H. Brown and E. B. Hosmer, of Chicago.

LAKE ERIE & PITTSBURG.—A sub-contract has been given by the Carter Construction Co. to F. A. Maceli & Co., of Rochester, N. Y., for extending this line from Metz to Youngstown, O. (July 27, p. 25.)

LORAIN & ASHLAND.—Joseph Ramsey, Jr., is quoted as saying that this road, which has been consolidated with the Industrial Railway, is completed for a distance of 22 miles from Lorain to Wellington. Surveys are now under way to the Ohio river at or near Point Pleasant, and for two branches to run to coal fields in southern and southwestern Ohio. It is the intention of the company to seek connection with the tidewater at or near Point Pleasant. The Industrial Railroad, now merged with the Lorain & Ohio, is a belt line about 10 miles long at Lorain, with a spur to Oak Point. The maximum grades on the new line will be 26 ft. to the mile.

MEXICAN INTERNATIONAL.—This company, it is said, will build a branch from Allende to Las Vegas opposite Del Rio, Tex. The distance is about 60 miles.

MINNEAPOLIS & ST. LOUIS.—See South Dakota Construction.

MISSISSIPPI CENTRAL.—An officer writes that work is now under way by the Worthington Construction Co., of Brookhaven, Miss., and the O. A. Gibson Construction Co., of Natchez, Miss., extending the line from the present western terminus at Brookhaven, Miss., to Natchez, 66 miles. There are to be four steel girder bridges. (July 20, p. 19.)

MISSOURI RIVER & GULF.—Chartered on August 1st at Topeka, Kan., to build from Kansas City, Kan., south to Denison, Tex., the northern terminus of the Houston & Texas Central, with branches from Lehigh, Ind. T., southeast to Shreveport, La., and from a point in Cherokee County, Kan., east to Joplin, Mo.

NORTH COAST.—Robert E. Strahorn, President of this company, announces that he has practically secured the right of way for the line from a point 69 miles west of Spokane, across the state of Washington, to a point 75 miles east of Tacoma, and he expects to begin work early next year. The line will cross the Yakima Indian Reservation and forest reserve. Local reports say that it is backed by the Chicago & North-Western.

OREGON RAILWAY & NAVIGATION COMPANY.—J. P. O'Brien, Vice-President and General Manager of this company, recently announced that the line from Riparia, Wash., east to Lewiston, Idaho, 72 miles, was to be put in operation at once. (See Construction Record.)

PEEKSKILL LIGHTING & RAILROAD COMPANY.—See Putnam & Westchester Traction.

PENNSYLVANIA.—The last spike was driven July 27 at Quarryville, completing the low-grade line of this company which has been building for the past three years from Yorkhaven, Pa., on the Northern Central, east to Atglen, on the main line, 47 miles west of Philadelphia. (July 13, p. 12.)

A contract has been given to the John A. Kelley Co. for grading, masonry and track-laying on the whole of the proposed cut-off on the West Jersey & Seashore, from a point on the Cape May division, north of Westville, east to a connection with the Delaware river bridge line near West Haddonfield Junction. By this cut-off, which is to be five miles long, freight from the West Jersey & Seashore main line, and its branches in southern New Jersey, can be sent to the Amboy division at Delair without taking it through Camden. The contract also includes changing the Delaware river bridge tracks in West Haddonfield.

This road is reported planning to establish new yards at Buffalo. The plan includes a line to connect the Pittsburg line with the Western New York & Pennsylvania line, both of which are parts of the Pennsylvania. The cost is estimated at $500,000.

PHILIPPINE RAILWAY CO.—At a recent meeting of this company at 43 Exchange Place, New York, the following officers and directors were elected: William Salomon, Chairman; Charles M. Swift, President; H. M. Steele, Vice-President; C. Lewis, Treasurer; G. H. Ashmead, Secretary. The directors are William Salomon, Charles M. Swift, Cornelius Vanderbilt, Alonzo Potter, C. Lewis, Thomas H. Hubbard, J. G. White, Frederick H. Reed and Henry R. Wilson.

POINT JUDITH.—A corporation has been organized at Narragansett Pier, with $100,000 capital, to build a line from Narragansett Pier, R. I., to Point Judith, and to operate it in connection with a line of steamers running between Point Judith and the eastern end of Long Island to connect with the Long Island Railroad. Jeremiah Robinson, of New York, and Wakefield, R. I., was elected President; Frank P. Sturges, of New York, Vice-President, and Isaac R. Robinson, of New York, Secretary and Treasurer.

PUTNAM & WESTCHESTER TRACTION.—An officer writes that contracts will be let and work started in September of this year on this proposed electric road. The route is from Main street, Peekskill, N. Y., northeast to Oregon, Putnam County, 3.75 miles. The road does not cross the county line, but is to be wholly in Westchester County. It is to be operated by the Peekskill Lighting & Railroad Co. J. S. Ladd is President and I. W. Reynolds, Chief Engineer, Peekskill, N. Y. (July 20, p. 19.)

ST. LOUIS, HILLSBORO & SOUTHERN (ELECTRIC).—According to H. M. Bowen, of Alton, Ill., President and General Manager of this Missouri company, which was organized in 1902, work is to be started at once and the road completed in about ten months. A contract was let early in July to an eastern contractor and grading is to be begun shortly. The right of way has been secured except for a short distance in Jefferson County. The proposed route is from St. Louis, Wis., south through the towns of Bobring, Sappington, Fenton, Highridge, Byrnesville and Cedar Hill to Hillsboro, Mo. R. E. Williams is President; H. D. Brandt, Secretary, St. Louis, and J. H. Winer, Hillsboro, Treasurer.

SAN ANTONIO & GULF.—See Southern Pacific.

SCHENECTADY & MARGARETVILLE.—Incorporated in New York, with $1,000,000 capital, to build a line from Schenectady, N. Y., southwest to Margaretville, Delaware County, which is on the Ulster & Delaware, with branches from Schenectady to Scotia, and to Rotterdam Junction, connecting with the New York Central and the Boston & Maine. The directors are: Frank J. Whan, A. H. Whan, George M. Turner, Edward J. Welch, George E. Relyes, M. Caswell Heine, Albert S. Brown, George S. Fulton, of New York City, and James H. Richards, of Cranford, N. J.

SOUTHERN PACIFIC.—It is unofficially stated at the headquarters of the Sonora Railway that the main line which the Southern Pacific is to build into western Mexico will run from Benson, Ariz., to Nacozari, thence down the valley of the Yaqui river via Alamos and Culican to the port of Mazatlan, and to Guadalajara, where it will connect with the Mexican Central. It is stated that the Cananea, Yaqui River & Pacific will form the connecting link in this main line.

According to Captain J. M. Lee, Superintendent of Construction on the extension of the Stockdale branch from Stockdale, Tex., east

to Cuero, 40 miles, the line is completed and is to be opened at once. This new line has been built under the name of the San Antonio & Gulf. The line connects at Cuero with a direct line to the gulf at Port Lavaca. (See Construction Record.)

South Dakota Construction.—The building of new railroads is being pushed in a number of different parts of the state. On the eastern end of the Chicago & North-Western's extension, from the Missouri river at Pierre to Rapid City in the Black Hills, 10 miles of track are already laid and a track-laying machine has just been put at work. The company now expects to have the line in operation as far as Midland, 60 miles west of the river, by the first of September. A pile bridge across the Missouri is again being put in, the former one having been out ever since the ice went out last spring. The new bridge is to be used until spring, when it will probably be similarly carried out by the ice. A great deal of material for the permanent bridge is being assembled and preliminary work is being done, but active work on the new bridge has not yet been begun. From the western end of the extension, about 20 miles of track is laid east from Rapid City, and work is being pushed eastward as rapidly as possible. The construction crews at both ends of the line are short of men, although on the western end the shortage is made up to some extent by employing Indians on the rougher work.

The Chicago, Milwaukee & St. Paul is also building an extension from the Missouri river to Rapid City, under the corporate name of the White River Valley Railway. This is now completed from Chamberlain, the previous terminus of a St. Paul line, to Murdo, about 60 miles west, and grading crews are at work all along the line to Rapid City. There is some rough country through the Bad Lands to be dealt with, and it is hardly possible that the line will be put through to Rapid City before next spring or summer. The new Pacific Coast line of the St. Paul strikes west from the Missouri river in the northern part of South Dakota. The line now terminates at Evarts, turning south a few miles to reach this point. A new location about 12 miles further up the river has been selected as the crossing of the new trans-continental line, and a branch has been built from Glenham, the first town on the railroad back from the river, to the new crossing site at Flora. The track from Glenham to Evarts is to be abandoned. Preliminary work is being done west of the river, and some of the grading is already under way.

The Minnesota, Dakota & Pacific, the extension of the Minneapolis & St. Louis from Watertown west to the Missouri river, 150 miles, with a 100-mile branch, although not announced until late in the spring, is doing fast construction work and is likely to have trains running to the river late this fall.

The Dakota Midland is a new line lately incorporated whose backing is not yet known. It is locally credited to each the North-Western, the Minneapolis & St. Louis, and the Illinois Central. This company has a surveying crew followed by right-of-way men at work northwest from Sioux City to Pierre. A reason for believing that this is a North-Western project is the fact that the Dakota Midland route would give the North-Western a shorter line from South Dakota into Sioux City and Omaha than at present. With the completion of the Rapid City extension, the Black Hills traffic of the North-Western instead of turning to the southward before coming east will be able to come directly east through Pierre, and this would be a reason for improving the connections from Pierre eastward. The projected route of the new road lies through territory already well occupied by the St. Paul.

Spokane-Pend d'Oreille Rapid Transit Company.—R. A. Hutchinson, General Manager of this company, which is building an electric line from Spokane northeast to Lake Pend d'Oreille, Idaho, has filed deeds showing the right of way at Rathdrum, Idaho, and announces that work will begin early in August. The cost of the line, which is to be 34 miles long, will be about $3,000,000. (May 11, p. 144.)

Texas, New Mexico & Pacific.—Local reports state that work has been started on this new line, which is to run from McKinney, Tex., to Roswell, N. Mex., about 450 miles. (March 30, p. 99.)

West Jersey & Seashore.—See Pennsylvania.

Youngstown & Ohio River.—A contract has been let to the P. G. Guthrie Construction Co., of Columbus, for building six miles of this line from East Liverpool to Lisbon. Work is to be started at once.

## RAILROAD CORPORATION NEWS.

Berkeley Railroad.—The Berkeley Railroad, a standard gage road running from Chicora, S. C., to Monck's Corners, on the Atlantic Coast Line was sold at foreclosure sale on July 23rd for $10,000 to the E. P. Burton Lumber Co., of Charleston, S. C.

Canadian Northern.—The Canadian Northern has bought the Qu'Appelle, Long Lake & Saskatchewan, until recently the Prince Albert branch of the Canadian Pacific, which runs from Regina, Assin., north to Prince Albert, 249 miles. The purchase price is reported to be $500,000 cash, besides taking over the bonded debt, which consists of $3,809,840 first mortgage bonds of 1911. These are 6 per cent. bonds, but have been receiving a lower rate of interest, the balance being paid in certificates to be redeemable out of surplus earnings. The Canadian Pacific, which has for a number of years operated the road, is said to have allowed an option to buy it for $195,000 to expire.

See Canadian Northern Ontario.

Canadian Northern Ontario Railway.—This road, formerly called the James Bay Railway, which is being built by Canadian Northern interests from Toronto, Ont., north to Sudbury, 268 miles, is to issue 3½ per cent. debenture stock at the rate of $20,000 a mile, or $5,360,000. This stock is to be payable in 1936, and is guaranteed principal and interest by the government of the province of Ontario. The line is reported as practically finished from Toronto to Parry Sound, about 150 miles, with most of the grading and bridge work completed for the rest of the distance.

Canadian Pacific.—Earnings for the past fiscal year ended June 30, 1906, show surprising increases. Gross earnings were $61,669,758 against $50,181,882 in 1905, and about $16,500,000 in 1904, an increase for 1906 over 1905 of 22 per cent. Net earnings for 1906 show even more remarkable gains, being $22,973,313, against $15,475,088 in 1905 and some $14,200,000 in 1904, an increase over last year of nearly 50 per cent.

Chesapeake & Ohio.—For the year ended June 30, 1906, the Chesapeake & Ohio earned $24,602,989 gross, against $20,724,371 in the previous year. Net earnings increased from $7,473,405, in 1905, to $9,733,340. The operating ratio was 60.4 per cent. against 63.9 per cent. in 1905.

Colorado & Southern.—This road, with the same operated mileage as in the previous year, earned in the fiscal year closed June 30, 1906, according to the preliminary statement just issued, $11,879,953, an increase of $2,222,373, or about 23 per cent. over 1905. Net earnings were $3,489,325, an increase of $1,220,668 over 1905.

Fort Smith & Western.—This railroad company, which operates a line from Fort Smith, Ark., to Guthrie, Okla., 217 miles, has bought the St. Louis, El Reno & Western, which runs from Guthrie southwest to El Reno, 42 miles. The purchase price is reported to have been $1,000,000. It is planned to make an extension of the newly acquired line from El Reno southwest to a point on the Kansas City, Mexico & Orient.

Great Northern.—According to a despatch from St. Paul dated July 31st, during a hearing on merchandise rates in Minnesota, before the state Railroad and Warehouse Commission, R. I. Farrington, Second Vice-President of the Great Northern, made the statement that, no matter how great the earnings of the company, President James J. Hill had laid down the rule that stockholders should never receive a higher dividend than 7 per cent. Mr. Farrington also said that improvements were paid for out of surplus until a new issue of stock became necessary, when stock was issued $25,000,000 at a time. It was also shown that the Great Northern now has on hand a surplus of over $19,000,000.

Little Falls & Dolgeville.—See New York Central & Hudson River.

New York Central & Hudson River.—Official announcement was made on July 27, at Utica, that the New York Central had secured a controlling interest in the Little Falls & Dolgeville Railroad. New officers have been elected representing the New York Central interests. The Little Falls & Dolgeville is a 10-mile road connecting Dolgeville, a manufacturing town, with the main line of the New York Central at Little Falls. On June 30, 1904, it had $250,000 stock and $250,000 3 per cent. bonds maturing in 1932, outstanding. Gross earnings for the year ended on that date were $42,306; net earnings, $10,914.

Northern Pacific.—From the report of estimated gross earnings recently issued by the road, it appears that the Northern Pacific will be one of the leaders in the increase column of the records for the last fiscal year. The gross earnings of the system for the year ended June 30, 1906, are estimated at $62,140,410, against $51,729,362 in 1905. This is an increase of over $10,400,000, more than 20 per cent. The total length of road has in the same period increased 749 miles, from 5,632 to 5,781 miles.

St. Louis, El Reno & Western.—See Fort Smith & Western.

Southern Railway.—The year's gross earnings for the period ending June 30, 1906 were $53,641,439, against $48,145,108 in 1905, an increase of nearly $5,500,000. Operating expenses at the same time increased $4,690,000, leaving gross earnings of $13,868,300, an increase of $805,706 over 1905. The operating ratio increased from 72.87 per cent. in 1905 to 74.15 in 1906. These figures are exclusive of the Mobile & Ohio, Cincinnati, New Orleans & Texas Pacific, Alabama Great Southern and Georgia Southern & Florida.

# GENERAL NEWS SECTION

## NOTES.

The Governor and Executive Council of Iowa have fixed the valuation of the railroads of the state for taxation at $62,289,775, which is $4,099,586 larger than in 1905.

The Western Union Telegraph Company has secured rights between Great Falls and Butte, Mont., over the Great Northern, and now uses the wires of that road for commercial purposes throughout the Great Northern lines.

On July 31 a special officers' train over the Canadian Pacific was run from Winnipeg to Moose Jaw, 399.2 miles in eight hours. This included water stops, a change of engines and two meetings with regular passenger trains.

The railroads centering in Minneapolis have secured a temporary injunction against the ticket brokers of that city and St. Paul restraining them from dealing in the round-trip tickets which are to be issued for the encampment of the Grand Army of the Republic in Minneapolis.

The large flour warehouse of the New York Central at West Albany, used by Henry Russell, was destroyed by fire on August 3, together with 35,000 barrels of flour and several freight cars. Loss, $300,000. The building was 1,900 ft. long and 35 ft. wide. The wire sign on the top of the building, running its whole length, cost $5,000 and was insured for $4,000.

It is announced in Philadelphia, apparently on the authority of some officer of the Pennsylvania, that the line to Atlantic City, which is being electrified, will be ready for operation by electric power on September 10. There have been so many unforeseen delays that it was found necessary to postpone the establishment of elctric train srvice until after the close of the heavy travel of the summer.

At St. Paul, August 6, President Stickney, of the Chicago Great Western, testifying before the State Railroad Commission, said that the practice of filing new freight tariffs very frequently and for small changes had now become very common among the railroads of the West, so common that the practice may be said to take the place of the secret rebating and other forms of manipulation formerly practiced.

Press despatches from London, August 2, reporting the half-yearly meeting of the shareholders of the London & South Western, represent the Chairman, Sir Charles Scotter, as saying that the speed of the train which was wrecked at Salisbury, July 1, was over 60 miles an hour, and that the rule required a speed well under 30 miles an hour. Up to the time of the Salisbury disaster no passenger had been killed on the London & South Western since January 1, 1889.

The city of Harrisburg has begun a suit in the County Court to prevent the Pennsylvania Railroad from using within that city any of the water obtained from the sources outside the city recently acquired by the company and made available at different places along the line of the road by extensive pipe lines. The railroad is now paying the city of Harrisburg $15,000 a year for water, and the city contends that it alone has the right to supply water within the city.

At Long Island City, N. Y., August 3, President Ralph Peters, of the Long Island Railroad, appeared before Magistrate Mathew Smith to answer a criminal charge concerning the nuisance of soft coal smoke from the railroad company's locomotives. The examination of Mr. Peters was set for August 10. It appears that the city officers have concluded that the numerous arrests of locomotive enginemen which they have made are not having the desired effect of suppressing the nuisance.

The State Corporation Commission of Virginia, which recently decided that the Legislature had no power to pass a law requiring railroads to furnish mileage tickets at 2 cents a mile, did so on the ground that the constitution lodges all such power in the hands of the Commission itself; and, pursuant to its duty, thus interpreted, the Commission now proposes to limit all fares, and announces that on November 1 it will hear any one who wishes to object to a proposed order limiting all fares throughout the state to 2 cents a mile.

The State Tax Commissioners of Oregon have made up their return of the values of railroads in the state, and the total is 69½ millions, as compared with less than eleven millions by the last preceding valuation. The former valuation was based on that made by the county assessors, whose rule was to value railroad property at about 15 per cent. of its true value, though other property in the state was taxed at about 33 per cent. of its actual value. The higher valuation now fixed by the State Tax Commission is based on the net earnings of the railroads, capitalized at an arbitrary percentage.

The Virginia State Corporation Commission has ordered the railroads of the state to maintain telephones at every passenger and freight station and to be prompt and polite in answering inquiries over the wires. This action is taken in pursuance of a law which was passed last March, making it the duty of railroads to maintain telephones at every station which could be conveniently connected with an exchange not more than 25 miles distant. The statute empowers the Corporation Commission to inflict fines for non-compliance. September 1 is the date fixed for the Commission's order to go into effect.

### Master Blacksmiths' Convention.

The fourteenth annual convention of the International Railroad Master Blacksmiths' Association will be held at the Sherman House, Chicago, on August 21, and will last for three days. The following subjects will be discussed: Frogs and Crossings; Flue Welding; Classification of Work in the Shop; Tools and Formers for Bulldozers; Steam Hammers and Forging Machines; Discipline, and How to Obtain the Best Results in a Railroad Blacksmith Shop; Case Hardening Methods; Best Method of Annealing and Tempering High Speed Steel; Best Coal for Use in Blacksmith Shop and Kind of Fires Used; Subjects for 1907 Meeting; Piece Work vs. Day Work; Thermit Welding and Casting; Making and Repairing of Locomotive Frames. A. L. Woodworth, Lima, Ohio, is Secretary and Treasurer.

### Further Prosecutions Under Coupler and Brake Law.

Attorney-General Moody has directed prosecutions of the following railroads for violations of the safety appliance act: Belt Railway of Chicago, Chesapeake & Ohio, Chicago & North-Western, Chicago, Burlington & Quincy, Chicago, Rock Island & Pacific, Elgin, Joliet & Eastern, Grand Trunk Western, Kansas City Southern, Minneapolis & St. Louis, Missouri Pacific, St. Louis & San Francisco, St. Louis, Iron Mountain & Southern, St. Louis Southwestern, Southern Railway, Union Pacific, Union Railway Company (of Memphis), Union Stock Yards Company of Omaha.

### Holding Company for N. Y. C. Coal Properties.

The Beech Creek & Eastern Coal Company, recently announced in New York City, with a capital of $8,000,000, has been formed to take over the coal mining companies in western Pennsylvania which are controlled by the New York Central & Hudson River Railroad, and which, in accordance with the new Federal law, must be separated from the railroad. The mines included in the new arrangement embrace 117,000 acres of coal lands in Cambria, Blair and Indiana counties, Pennsylvania, and 1,000 coke ovens.

### French Engineers in America.

Messrs. Jacques Le Chatellier, Jacques Danlos and Paul Nivoit, engineer officers of French railroads, are now in America studying railroad practice, with a view, it is said, to embodying in the plans for certain new railroads which are to be built in France any useful lessons which they may learn here. The visitors have passed over the Intercolonial, the Grand Trunk and the Canadian Pacific, and expect to go to the Pacific Coast before they reach New York and Washington.

### Charles A. Bragg.

Charles Addison Bragg, District Office Manager of the Westinghouse Electric & Mfg. Company, at Philadelphia, died in that city on Sunday, July 29, after an illness of over two months' duration. Mr. Bragg was one of the pioneers in the electrical business, and was associated with the United States Electric Lighting Company as early as 1882. His connection with the Westinghouse Electric & Mfg. Company began in the year 1889, when he was made the manager of the Philadelphia office, which position he filled successfully up to the time of his death. Mr. Bragg had a most genial disposition, which endeared him to all with whom he came in contact. He was born and reared in Franklin County, Mo. Following his early education, he attended Yale College, from which he was graduated. He was 56 years old. Mr. Bragg is survived by his wife and one daughter.

### Grand Trunk Trains All to the Right.

On Sunday, August 22, at 9 a. m., the Grand Trunk Railway changed its plan of running trains from right-hand to left-hand throughout the double track divisions (all east of Detroit and Sarnia) where left-hand running has heretofore been the fashion. In a notice given to the newspapers the principal reason given for

that, as the engineman is in the right-hand side of the engine cab and as semaphores and other signals ought to be outside of the two tracks, it will facilitate the observance of the signals to run on the right-hand track. A number of other railroads run trains short distances over the Grand Trunk, and by this change the practice of the Grand Trunk lines will be made uniform with that of the other lines referred to. Cross-over tracks have been changed so as to make the switches trailing. For a short time following the change enginemen were instructed to continue to be guided by the existing signals when approaching stations—mostly station semaphore signals—without regard to whether the signal had or had not been changed to a new position. Placards, printed in large type, were posted at the stations and at other places to warn the public of the change.

### New York Municipal Ferry.

Deckhands on the municipal ferryboats are about to demand an increase from $60 and $75 a month, now paid them, to $75 and $90 a month. There is now in the employ of the Dock Department twice the force at from 25 to 50 per cent. per capita higher pay than is used by any of the great railway corporations operating ferries here.

A complete crew is kept idle on the payrolls for the tied up boat (four out of five are in use), which is usually in dry dock undergoing repairs or being painted. Therefore the city is paying for a triple crew (one for each eight hours of the day) for the laid up boat every day in the year. The system was inaugurated by the former Commissioner and has been continued by the administration under pressure from the political powers, who have found in the municipal ferry a patronage bonanza.

While each boat is provided with three complete crews, fifteen in all, there are extra men besides. There are 15 pilot quartermasters, 33 engineers, 31 oilers, 56 stokers, 75 deck hands and 30 water tenders.

Following is a list of the employees in the Bureau of Ferries:

| | |
|---|---|
| Superintendent | $4,000 a year |
| Assistant superintendent | $2,500 a year |
| Mechanical engineer | $4,000 a year |
| Mechanical engineer (naval) | $1,800 a year |
| Clerks | 3 at $1,500 to $2,100 a year |
| Junior clerks | 5 at $50 a month |
| Stenographers and typewriters | 2 at $1,000 to $1,500 a year |
| Collectors | $1,800 a year |
| Messenger | $1,200 a year |
| Attendants | 35 at $50 to $55 a month |
| Financial clerks | 23 at $60 to $80 a month |
| Captains | 16 at $1,920 a year |
| Pilot quartermasters | 15 at $100 a month |
| Engineers, Chief | 15 at $1,800 a year |
| Engineers, assistant | 18 at $1,650 a year |
| Oilers | 31 at $90 a month |
| Stokers | 56 at $90 a month |
| Deck hands | 75 at $60 to $75 a month |
| Water tenders | 30 at $100 a month |
| Ship carpenters | 6 at 50 cents an hour |

On the Pennsylvania, Central of New Jersey, West Shore, Erie, Lackawanna and other ferries half of the men start at work noon Monday, and work until 9 at night. By 10 the boat is cleaned and the men ready to turn in. They sleep until 7 Tuesday morning, when they go on duty, and at noon are off for twenty-four hours, or until noon Wednesday. In this way a man works ten hours one day and five hours next. He has an entire day of twenty-four hours to himself at the end of each forty-eight hours. The following comparison tells its own story:

| Positions. | Municipality. | Railroads. |
|---|---|---|
| Captains | $160.00 a month. | $135.00 a month. |
| Quartermasters | 100.00 " | 55.00 " |
| Engineers | 150.00 " | 120.00 " |
| Assistant engineers | 137.50 " | None employed. |
| Oilers | 90.00 " | 65.00 a month. |
| Water tenders | 100.00 " | None employed. |
| Stokers | 90.00 " | 62.50 a month. |
| Deck hands | 60 to 70 " | 50.00 " |
| Ship carpenters | .50 an hour. | None employed. |

A municipal boat has an engineer and an assistant, two oilers, three or four stokers, five deck hands, two water tenders and a ship carpenter; whereas a Pennsylvania or Central of New Jersey boat carries one engineer, one oiler, three deck hands, two stokers, no water tenders and no carpenters.—*New York Herald.*

### Railroad Subsidies in Canada.

The railroad subsidies brought forward by the Minister of Railroads for the consideration of Parliament call for payments of $3,200 a mile up to a cost of $15,000 a mile for construction, and above that sum 50 per cent. of the cost of construction up to a maximum of $6,400 a mile. There are 43 lines to be subsidized. They cover a length of 2,885 miles, and on the basis of the minimum subsidy of $3,200 a mile represent a total of $9,320,000, including a lump subsidy to the projected Brockville, Westport & Sault Ste. Marie Railroad.—*Consular Report.*

### Locomotive for Pennsylvania State College.

The Pennsylvania Railroad has sent to the Mechanical Engineering Department of the Pennsylvania State College one of its D-8 passenger locomotives to be used for experimental and instruction purposes. It goes to the college direct from the repair and paint shops, with necessary taps and connections for complete testing. During the coming school year it will be used principally for road testing on the Bellefonte Central Railroad and for certain special experimental work. During the past two years many test runs have been made on one of the engines of the Bellefonte Central under the direction of Prof. A. J. Wood, and this work will be considerably extended the coming year with the increased facilities. All mechanical engineering students are required to take some work in railway mechanical engineering, and those who so desire may in their senior year elect special studies in the advanced theoretical and applied work along this line. The leading dimensions of the locomotive are as follows:

| | |
|---|---|
| Driving wheels: No. | 4; diameter 62 in. |
| Total engine wheelbase | 23 ft. 5½ " |
| Size of cylinders | 17 x 24 " |
| Type of boiler | Wagon top, crown bars |
| Total heating surface | 1,392 sq. ft. |
| Steam pressure | 130 lbs. |
| Total weight of engine | 91,300 lbs. |
| Total weight of tender, loaded | 60,000 lbs. |
| Fire grate area | 17.6 sq. ft. |
| Tractive power (with M. E. P. = ⅞ boiler press.) | 11,640 |

### Retirement of the General Manager of the Midland Railway.

A striking personality has been lost to British railroad personnel by the retirement, on grounds of ill-health, of Mr. John Mathieson, who has been general manager of the Midland Railway of England for the past five years. Without influential friends, he rose from the lowest rung in the ladder to nearly the highest. His commanding personality and bluff manners made him deservedly popular all through his railroad career.

John Mathieson.

He was born at New Cumnock, Ayrshire, and began his railroad service at the age of thirteen as a clerk to the Glasgow & South Western in the station of his native village. About seven years later he was appointed station-master at Stewarton, whence after four years he was transferred to Glasgow. There he was after a brief period appointed assistant to the superintendent of the line, and on the death of his chief was appointed to succeed him, being at the time only 29 years old. The conspicuous ability which he displayed in this position led to his being offered and accepting, in 1889, the post of Chief Commissioner of the Queensland Railways, Australia, at a salary of $15,000. There, in spite of jealousy and dissension, his administration gave such good results that seven years later he was called to undertake the still more responsible duties of Commissioner of the Victorian Railways, Australia, at a salary of $17,500. At that time the Victorian Railways were in a deplorable state in consequence of the political control exercised over every department. One of the first things that the new Commissioner did was to make a tour of inspection of the system, and he found that there were no less than 32 lines, aggregating 509 miles, which did not pay working expenses. His influence soon began to make itself felt, and his judicious economies coupled with tactfully granted facilities brought the railroads into a valuable property for the colony. A man of ideas, he had the strength to carry them out, and in so doing won both respect and affection.

In 1901 the directors of the Midland Railway of England wanted a new general manager and selected Mr. Mathieson. His successor in Victoria is Mr. Thomas Tait, previously Manager of Transportation of the Canadian Pacific. Mr. Mathieson's work in England did not, of course, afford him the same opportunities for improvement as he had in Australasia, but under his management the Midland has continued, both with travelers and traders, to be the most popular of the English roads. During his five years' management the Midland has started its own steamship services between England and Ireland and bought up a large Irish railroad.

### Commerce Through the Soo Canals.

The amounts of both eastbound and westbound freight through the canals at Sault Ste. Marie, Mich., and Ontario, Canada, during July of this year, show large increases over the figures for July, 1905. The net tonnage eastbound was 6,273,734, an increase of 778,856, the most noticeable increase being in grain, there being 4,936,511 bushels of wheat carried, an increase of 2,235,346 bushels, and 4,736,253 bushels of grain other than wheat, an increase of 3,185,002 bushels. The net tonnage of the westbound freight was 1,459,037, an increase of 250,155 tons. The shipments of hard coal in this direction decreased about 9 per cent., while the soft coal carried increased about 20 per cent.; other important increases were in manufactured iron and general merchandise. The number

of vessels passing through the canals was 3,365 as compared with 3,181 during the same period last year.

### Renumbering Pennsylvania Railroad Freight Cars.

For a task combining multiplicity of details with simplicity of plan the renumbering of the cars of the Pennsylvania Railroad System (East and West) is probably as shining an example as could be found. The numbers are classified so as to run as high as 999,999. Nearly 100,000 of the freight cars east of Pittsburg have already been changed, and an officer gives us the following note of the progress of the work:

"Nearly 100,000 cars on the lines east have been renumbered, and probably more than half the equipment on lines west of Pittsburg. The Pennsylvania Railroad Lines East of Pittsburg take the numbers from 10,001 to 500,000 and the lines west of Pittsburg from 500,001 to 999,999. The numbers below 10,000 are reserved for passenger equipment, and when all cars have been renumbered there will be no duplicate numbers of any ownership or sub-ownership either east or west of Pittsburg.

"In renumbering, all cars of the same dimensions, capacity and kind are grouped together, so that when the work is completed, if the kind, size or capacity be needed it can be found in the *Official Railway Equipment Register* without having to inquire of the owners for the information or to examine the car. The new numbers, arranged in groups, are already shown in the *Equipment Register*. At present we are renumbering all cars above 100,501; the numbers from 10,001 to 100,501 being reserved for box cars. As soon as we get all of these other kinds of cars out of the series between 1 and 100,500 we shall renumber and reclassify the box cars.

"The cars on the lines east of Pittsburg and Erie when painted and renumbered will bear the word "Pennsylvania" over the car number on the side, and "P. R. R." over the car number on the ends; but if the renumbering is done before the car is repainted, it will bear the present ownership initials until such time as it goes to the paint shop. In the same way the cars on the lines west of Pittsburg will be repainted and renumbered, "Pennsylvania Lines" above the car numbers on the sides and "P. L." above the car number on the ends; but if renumbered before repainted they will temporarily bear the present ownership initials."

## TRADE CATALOGUES.

*Street Cars.*—An order guide for supplies and car and truck specialties (No. 165) has just been issued by the J. G. Brill Co., of Philadelphia; the G. C. Kuhlman Car Co., of Cleveland; the American Car Co., of St. Louis, and the John Stephenson Co., of Elizabeth, N. J., the four companies which are associated in the manufacture of cars and car equipment for street and electric railways. This guide is a $12\frac{1}{2}$ in. x 10 in. pamphlet, with illustrations of the various parts of the cars, made clear by reference numbers to an index for each photograph. It also includes information about special types of cars, such as the Brill grooveless-post semi-convertible car, the "Narragansett" car, the centrifugal sprinkling car, and standard snow sweeper and snow plow. These types cover the general division of the pamphlet on special types of cars. The other three parts into which the book is divided are: Trucks, Relating to Trucks, and Car Specialties and Appliances.

*Insulation for Pipes.*—A small illustrated pamphlet issued by the H. W. Johns-Manville Co., New York, contains a brief description of its Portland conduit system for the protection and insulation of steam, gas and water pipes. The conduit used in this system is furnished in 3-ft. lengths and is divided longitudinally into two sections, forming the top and bottom halves of the conduit. Asbestos-sponge conduit filling is used for insulation. A brief summary of a test on an installation of this system at the Phillips Academy, Andover, Mass., is given.

*Electric Car Lighting.*—Bulletin 3 of the Bliss Electric Car Lighting Co., Milwaukee, Wis., describes this company's system for electrically lighting railroad cars. Every part of the equipment is described, and illustrated in detail with half-tone engravings. Wiring diagrams also are given. The pamphlet, which is 8 x $10\frac{1}{2}$, has 23 pages and is printed in two colors, presenting a neat and attractive appearance.

*Steam Shovel News.*—The July number of this magazine contains articles on "Iron Mining on a Big Scale," "A Rival for Panama," "Lake Erie and Ohio Canal," and "Comparison of Western Irrigation Resources and the New Croton Dam." Also illustrations and miscellaneous matter of interest in connection with steam shovels and their work.

### Manufacturing and Business.

One of the orders recently booked by the Allis-Chalmers Company is for one 32-in. and 68-in. by 60-in. Reynolds heavy duty cross compound condensing Corliss engine for the Cleveland Electric Railway.

The Electric Storage Battery Company, of Philadelphia, announces that the number of chloride accumulator and other batteries made by that company now in use in connection with railroad signals, mainly automatic block signals, aggregates 58,000 cells. Forty per cent. of this quantity has been put into service within the past seven months.

The firm of Mansfield Merriman and C. W. Hudson, Consulting Engineers, will begin business on September 1 at 45 Broadway, New York. They will specialize on bridges and steel buildings and on the hydraulics of water power and water supply. Professor Merriman is Professor of Civil Engineering in Lehigh University and has been granted a leave of absence for one year. Mr. Hudson is Assistant Engineer of the Phoenix Bridge Co. and has resigned from that position, effective on the above date.

### Iron and Steel.

The Seaboard Air Line has ordered 25,000 tons of rails and the Southern Railway 5,000 tons.

The Western Pacific has ordered 5,500 tons of bridge steel. This order is reported to have been given to the Pennsylvania Steel Company.

The total exports of iron and steel from the United States during June amounted in value to $14,985,003 as compared with $11,821,097 for the same period in 1905. For the year ending June 30, the value of the exports of iron and steel was $160,984,985 as compared with $134,728,363 in 1905.

The Pennsylvania has given a supplementary order for 3,500 tons of rails for 1907 delivery, and also orders for bridge material aggregating 900 tons of structural steel. According to western reports, the American Shipbuilding Co. now has contracts for 19 large steamers, aggregating an amount of $8,000,000.

## OBITUARY NOTICES.

Elmer Church Smith, Assistant Engineer of the Colon division of the Panama Canal, died recently at the Isthmus.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Alaska Central.*—F. A. Heinze, of Butte, Mont., has been elected a Director.

*Central of Georgia.*—W. C. Askew has been appointed Assistant Treasurer, with office at Savannah, Ga.

*Dublin & Southwestern.*—See Wrightsville & Tennille.

*Indianapolis Southern.*—This company operates a line from Indianapolis, Ind., to Bloomington, and the line from Effingham, Ill., to Switz City, Ind., formerly operated by the Illinois Central. J. C. Welling, Vice-President of the Illinois Central, is President of the Indianapolis Southern.

*Live Oak, Perry & Gulf.*—J. H. Powell has been elected Treasurer, with office at Jacksonville, Fla., succeeding F. M. Bowling.

*Mississippi Central.*—G. F. Royce is Comptroller, with office at Scranton, Pa.

*Montana.*—T. A. Mapes has been appointed Secretary, with office at Helena, Mont., succeeding F. W. Sharpe, who remains Treasurer and Auditor.

*Pennsylvania.*—S. B. Lloyd has been appointed Assistant General Solicitor of this company, the Philadelphia, Baltimore & Washington, the West Jersey & Seashore and of the Northern Central, there being now three Assistant General Solicitors instead of two as formerly.

*Stillmore Air Line.*—See Wadley Southern.

*Wadley & Mt. Vernon.*—See Wadley Southern.

*Wadley Southern.*—This company is a consolidation of the Wadley & Mt. Vernon and the Stillmore Air Line. The officers are: H. P. Smart, President; W. A. Winburn, Vice-President; W. A. Beymer, Auditor; T. N. Cunningham, Treasurer, and T. Wells, Car Accountant, all with offices at Savannah, Ga., and P. Holloman, General Superintendent, with office at Wadley, Ga.

*Wrightsville & Tennille.*—Otis Ellison, Treasurer, has been appointed Auditor, succeeding D. R. Thomas, appointed Superintendent. Mr. Thomas retains his position as Secretary. P. C. Thomas, Jr., has been appointed Acting Treasurer, succeeding Mr. Ellison.

### Operating Officers.

*Augusta Southern.*—James Andrew White, who was lately appointed Superintendent of the Augusta Southern, with headquarters at Augusta, Ga., was born on Feb. 16, 1858, at Petersburg, Va. He was educated at the University of Virginia and entered railroad service on Jan. 1, 1882, as Superintendent of the Oxford & Henderson Railroad, now part of the Southern Railway. This position he held for five years until Oct. 1, 1887, when the Oxford & Henderson was leased to the Richmond & Danville, and he was appointed Agent of the Richmond & Danville at Oxford, N. C. After this he was Agent of the Richmond & Danville and its successor, the Southern, at a number of different places, and on Nov. 1, 1900, was appointed Superintendent of the Danville & Western. In 1903, he became Assistant Superintendent of the Washington division of the Southern, which he held until his recent appointment.

*Chesapeake Western.*—M. L. Mardis, General Manager and Traffic Manager, has resigned. The duties of General Manager are now performed by the President, and C. A. Jewett, General Freight and Passenger Agent, has been appointed Traffic Manager.

*Coal & Coke.*—Edwin Bower has been appointed to the new office of Assistant General Manager.

*Dublin & Southwestern.*—See Wrightsville & Tennille.

*Fort Worth & Denver City.*—H. A. Gausewitz, Assistant Superintendent of the Colorado & Southern at Trinidad, Colo., has been appointed Superintendent of the Ft. W. & D. C., with office at Childress, Tex., succeeding W. W. Millar, resigned.

*Louisiana & Arkansas.*—F. W. Green, Superintendent of the Memphis division of the St. Louis, Iron Mountain & Southern, has been appointed General Superintendent of the L. & A., with office at Stamps, Ark., succeeding J. H. White, resigned.

*Midland Valley.*—The offices of the General Superintendent and of the Car Accountant have been moved from Fort Smith, Ark., to Muskogee, Ind. T.

*Missouri Pacific.*—C. E. Carson, formerly Superintendent of the Colorado & Southern at Denver, Colo., has been appointed Superintendent of the Kansas City terminals of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, succeeding E. K. Carnes, resigned.

*St. Louis, Iron Mountain & Southern.*—H. L. Hungerford, Superintendent of Terminals at Little Rock, Ark., has been appointed Superintendent at Wynne, Ark., succeeding F. W. Green, resigned. W. T. Caldwell succeeds Mr. Hungerford. See Louisiana & Arkansas.

See Missouri Pacific.

*Southern.*—J. Lasseter, Trainmaster at Tuscumbia, Ala., has been appointed Assistant Superintendent at Birmingham, Ala., succeeding C. L. Harris, promoted. F. B. Pelter has been appointed Assistant Superintendent at Columbus, Miss., succeeding J. W. Web.

*Vera Cruz & Pacific.*—John Mas has been appointed Car Accountant, with office at Vera Cruz, Mex., succeeding F. Morgan. J. B. Melville has been appointed Superintendent, with office at Tierra Blanca, Mex., succeeding C. D. Taylor.

*Wrightsville & Tennille.*—D. R. Thomas, Auditor, has been appointed Superintendent, succeeding T. T. Hollomon, resigned to go to the Wadley Southern. Mr. Thomas continues to be Secretary of the company.

### Traffic Officers.

*Central Railroad of New Jersey.*—W. C. Hope, Assistant General Passenger Agent, is to be appointed General Passenger Agent on September 1st, succeeding C. M. Burt, who on that date resigns to go to the Boston & Maine as General Passenger Agent.

*Chesapeake Western.*—See Chesapeake Western under Operating Officers.

*Coeur d'Alene & Spokane.*—W. G. Paine, Traffic Manager, has been appointed General Passenger Agent and J. H. Lothrop has been appointed General Freight Agent, both with offices at Spokane, Wash.

*Columbia Southern.*—See Oregon Railroad & Navigation.

*Ilwaco Railway & Navigation Company.*—See Oregon Railroad & Navigation.

*Oregon Railroad & Navigation.*—William McMurray, Assistant General Passenger Agent at Portland, Ore., has been appointed General Passenger Agent of this company, of the Southern Pacific lines in Oregon, of the Columbia Southern and of the Ilwaco Railway & Navigation Co., succeeding A. L. Craig, resigned to go to the Great Northern. J. M. Scott succeeds Mr. McMurray.

*St. Louis Southwestern.*—J. B. Watson has been appointed Assistant General Freight Agent, with office at St. Louis, Mo., succeeding T. C. Frew, resigned.

*Seaboard Air Line.*—P. B. Thompson, who was recently appointed Assistant Freight Agent, with headquarters at Savannah, Ga., began his railroad service with the Merchants' & Miners' Transportation Company. He was, from 1900 to 1902, later joint Agent for ten associated railroads of Virginia and the Carolinas at Norfolk, Va., and the latter year went to Baltimore as Agent of the Seaboard Air Line. Later he was appointed General Agent of the company at Baltimore, representing the Seaboard Air Line Railroad, the Seaboard Savannah Line, the Seaboard Despatch and the Air Line Despatch fast freight lines, from which post he was promoted to his present position.

*Southern Pacific.*—See Oregon Railroad & Navigation.

### Engineering and Rolling Stock Officers.

*International & Great Northern.*—C. M. McLain, Master Mechanic at Taylor, Tex., has resigned. Mr. McLain is succeeded by B. P. Meyers.

*Isthmian Canal Commission.*—Joseph Ripley, formerly General Superintendent of the Sault Ste. Marie Canal and one of the assistant engineers in its construction, has been appointed Principal Assistant Engineer.

*Lake Shore & Michigan Southern.*—LeGrand Parish, recently promoted from Assistant Superintendent of Motive Power of the L. S. & M. S. to be Superintendent of Motive Power of the Michigan Central, has been transferred to the same position on the Lake Shore & Michigan Southern. See Michigan Central.

*Michigan Central.*—E. D. Bronner, recently appointed Superintendent of Motive Power of the Lake Shore & Michigan Southern, has gone back to his former position (with the same title) on the Michigan Central. The change is made at his own request. See Lake Shore & Michigan Southern.

*Midland Valley.*—The office of the Master Mechanic has been moved from Fort Smith, Ark., to Muskogee, Ind. T.

*Pennsylvania Lines West.*—W. C. A. Henry, who has been Master Mechanic of the Columbus shops, has been appointed to the new office of Assistant Superintendent of Motive Power, with office at Columbus, Ohio.

N. M. Loney, Assistant Engineer of Motive Power of the Northwest System, at Fort Wayne, Ind., has been appointed Master Mechanic of the Northwest System, with headquarters at Chicago, succeeding Joseph J. Walsh, transferred.

### Purchasing Agents.

*Birmingham Southern.*—W. A. Major has been appointed Purchasing Agent.

## LOCOMOTIVE BUILDING.

*The Chicago, Lake Shore & Eastern*, it is reported, will soon be in the market for locomotives.

*The Tidewater*, as reported in our issue of August 3d, denies being in the market for locomotives.

*The Lehigh & New England*, it is reported, has ordered five large freight locomotives from the Baldwin Works.

*The Charlotte Harbor & Northern* is asking prices on five locomotives, two for passenger and three for freight service.

## CAR BUILDING.

*The Chicago, Milwaukee & St. Paul* is in the market for six flat cars.

*The Chesapeake & Ohio* has ordered 10 passenger cars from the Pullman Co.

*The Indiana Union Traction Co.* is reported in the market for electric cars.

*The Chicago, Lake Shore & Eastern* is reported in the market for 1,950 coal cars.

*The New York Central & Hudson River* has ordered one buffet car from the Pullman Co.

*The Western Pacific*, it is reported, is in the market for 500 ballast cars and 200 flat cars.

*The Lehigh & New England* is negotiating for the purchase of several hundred freight cars.

*The Nashville, Chattanooga & St. Louis*, it is reported, will build 500 coal cars at its own shops.

*The Grand Trunk Pacific* directors, it is reported, have decided to spend $15,000,000 on rolling stock.

*The Canadian Pacific*, it is reported, will build two additional steam motor cars in its Angus shops.

*The Buffalo, Lockport & Rochester* (Buffalo) is in the market for 17 electric cars. C. B. Hill is President.

*The Cumberland Railway & Coal Co.* is reported in the market for 250 gondola cars of 100,000 lbs. capacity.

*The Union Railroad of Pittsburg* is reported to have ordered 500 steel ore cars from the Pressed Steel Car Co.

*The Wabash*, it is reported, is asking prices on 4,000 cars of 100,000 lbs. capacity and 2,000 cars of 80,000 lbs. capacity.

*The Tonopah & Goldfield* has ordered one passenger car, one express and mail car and one baggage car from the Pullman Co.

*The Northern Pacific* is in the market for from 3,000 to 5,000 box cars, and will probably ask bids for 500 stock and 500 gondolas.

*The Harriman Lines* are in the market for 4,000 box cars, 1,400 flat cars, 1,000 refrigerator cars, 875 oil tank cars, 600 hopper cars, 500 gondola cars and 500 stock cars.

*The Illinois Central* has ordered 20 passenger coaches, 5 chair cars, 2 mail cars, 10 baggage cars and 8 combination mail and baggage cars from the Pullman Co.

*The Charlotte Harbor & Northern* is in the market for 30 drop bottom gondola cars, 20 ventilated box cars, four coaches and two combination passenger and baggage cars.

*The Chicago, Rock Island & Pacific*, it is reported, has reserved space with the American Car & Foundry Co. for 5,000 box cars and is asking bids on 5,000 additional box cars.

*The Chicago & North-Western* has ordered 700 box cars of 80,000 lbs. capacity, 500 flat cars of 80,000 lbs. capacity, 300 gondola cars of 80,000 lbs. capacity, 600 stock cars of 60,000 lbs. capacity, 25 cabooses, 20 vestibule coaches, ten 60-ft. baggage cars, 10 combination passenger and baggage cars, 4 dining cars, 3 standard parlor cars, 3 observation parlor cars and 10 chair cars from the Pullman Co., and 1,000 box cars of 80,000 lbs. capacity and 400 ore cars from Haskell & Barker. The dimensions and specifications are Chicago & North-Western standard, the same as the last ordered. (Nov. 17, 1905, p. 1158.)

*The Nashville, Chattanooga & St. Louis* is building 500 gondola cars of 80,000 lbs. capacity at its Nashville shops. The dimensions and special equipment are as follows: Weight, 35,000 lbs.; length over all, 36 ft. 9 in.; width over all, 9 ft. 9 in.; height over all, 8 ft. 3 in.; Commonwealth Steel Co.'s bolsters, Simplex Railway Appliance Co.'s brake-beams, Westinghouse brakes, N., C. & St. L. brasses, Tower couplers, N., C. & St. L. doors, Thornburgh draft rigging, N., C. & St. L. dust guards and journal boxes, Railway Steel Spring Co.'s springs, N., C. & St. L. trucks, and Louisville Car Wheel Co.'s wheels.

## RAILROAD STRUCTURES.

Aberdeen, S. Dak.—The Minneapolis & St. Louis is ready to let contracts for putting up about 25 station buildings at the new towns on the extension from Watertown to Leola, and Conde to the Missouri river. George Cooke has charge of this work. At Conde, Leola and Scranton the stations are to be larger than the rest, and roundhouses and freight houses will also be put up. The station at Aberdeen is to be larger than at any place on the road; plans are being made for a model building and several freight sheds.

Akron, Ohio.—The County Commissioners and the Northern Ohio Traction Co. have decided to jointly build a new bridge at Alexanders.

Brandon, Man.—The Brandon, Saskatchewan & Hudson Bay line of the Great Northern is to put up a large passenger station here.

Charleston, W. Va.—The Chesapeake & Ohio has given a contract to A. M. Walkup, Richmond, Va., for a $15,000 brick freight station.

Denver, Colo.—Work has been begun by the Colorado & Southern on a new freight station to cost about $50,000, and to be used for inward freight. The old house will be devoted to outbound freight.

Englewood, Kan.—It is reported that the Atchison, Topeka & Santa Fe has decided to build a new passenger station at this place.

Henderson, Ky.—It is said that the Illinois Central will build its own bridge over the Ohio at Incline, three miles above this place.

Jackson, Tenn.—An appropriation of $1,000,000 has been made by the Mobile & Ohio for new second main track and for a new freight yard near Jackson 250 ft. wide and one mile long.

Little Rock, Ark.—The St. Louis, Iron Mountain & Southern will accept the terms of the ordinance recently passed granting certain streets of this company as approaches to a new union station. Work on the structure is to be started early in September. The cost of the improvements will be about $400,000.

Mount Carmel, Pa.—Bids are being asked for building a new wooden passenger station for the Lehigh Valley at this place.

Muskegon, Mich.—Plans are being made for putting up a new passenger station here for the Grand Trunk, to cost $20,000.

Norfolk, Va.—Raymond Dupuy, General Manager of the Tidewater Railroad, is quoted as saying that the company will not build its shops and roundhouses at Salem in Roanoke County, but has selected a site in Lunenburg County, 165 miles from Norfolk.

Oklahoma City, Okla.—Work is to be started early next year on the union passenger station for the St. Louis & San Francisco and the Chicago, Rock Island & Pacific. It will cost about $300,000.

Philadelphia, Pa.—The Philadelphia Rapid Transit Co. has given contracts to F. T. McGuire for building eight stations along the line of the Market street elevated road. The American Bridge Co. has the contract for furnishing the steel for the structural work. Work is to be started at once.

San Angelo, Tex.—A contract is reported let by the Santa Fe for putting up a new passenger station here, to cost $25,000.

Saskatchewan, Sask.—Local reports state that the Canadian Pacific has bought a large plot of ground for a station.

Shreveport, La.—It is stated that the Kansas City Southern shops at this place are to be enlarged and 14 acres of land to be added to the yards, the cost of the improvements being about $150,000.

Spokane, Wash.—Contracts have been given by the Oregon Railroad & Navigation Co., to McCreary & Williard, of this place, for putting up steel bridges at a total cost of about $250,000. There is to be a steel bridge over Hood river 710 ft. long; over Sandy river, near Troutfale, a bridge 420 ft. long; over Umatilla river at Umatilla, and another 300 ft. long over the same river at Pendleton. There will also be short bridges over the Deschutes, the Walla Walla and Burnt rivers.

Washington, D. C.—The Baltimore & Ohio has awarded the contract for building two roundhouses, each having room for 25 locomotives, two turntable pits, machine shop, power house, oil and store house, ash pit, inspection pit, signal towers and other buildings, in connection with the Union Terminal work at Washington, D. C., to the Wells Brothers Company, of New York and Baltimore. The same contractors are just completing the new thirteen-story general office building of the railroad company at the northwest corner of Baltimore and Charles streets, Baltimore.

Waynesboro, Va.—Contracts have been given to A. M. Walkup, Richmond, Va., by the Chesapeake & Ohio for a brick passenger station at this place, to cost about $20,000.

Winchester, Ky.—The Chesapeake & Ohio and the Louisville & Nashville have given the contract to A. M. Walkup, Richmond, Va., for a freight station at this place, to cost $18,000, and to be finished about October 20.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Argentine Central.—This road, which runs from Silver Plume, Col., to an elevation of 14,000 ft. at the summit of Mt. McClellan, was on August 1 opened to traffic. (May 18, p. 149.)

Arkansas, Red River & Paris.—Incorporated in Arkansas to build a line from Morris' Ferry on the Kansas City Southern east to a point near Harris' Ferry on the Red river, approximating 38 miles. The incorporators include: T. S. Brown, W. S. Pryor, of Kansas City; F. A. Locke, W. C. Martin and W. E. Kinsworthy, of Ashdown.

Atlanta, Birmingham & Atlantic.—A contract is reported let to C. D. Smith & Co. to build this line from Talladega to Pelham, Ala., which is 19 miles from Birmingham. The line will enter Birmingham through Reader's Gap and the city of Bessemer. The route from Reader's to Pelham has not yet been decided upon. The sections between Montezuma and LaGrange, Ga., and between LaGrange and Roanoke, Ala., are practically completed.

Buffalo Creek Extension.—This company has been incorporated in New York State to build a road, eight miles long, from the Buffalo Creek Railroad in Buffalo to a point connecting with the Terminal Railway of Buffalo at Gardenville, Erie County, with a branch connecting with the Lehigh Valley in Buffalo. The capital stock is $400,000. The directors include F. D. Underwood and George F. Brownell, President and Vice-President, respectively, of the Erie.

Canadian Pacific.—A new branch of the Ontario division, called the Elmira branch, has been opened for business, extending from Guelph, Ont., to Elmira, Ont., 16 miles.

Surveys, it is said, are being made by this company for a branch line from the end of the Lacombe section to Hanley, Sask., on the Prince Albert branch.

On the Toronto-Sudbury branch of this company, which starts from the Owen Sound branch at Bolton, a length of 70 miles has been finished, and it is expected that the whole branch will be in operation early next spring.

Surveys are being made by this company for a line from London, Ont., to the St. Clair river at Corunna via Strathroy and Petrolea.

Cardenas Railroad & Terminal.—Incorporated in New Jersey with $1,000,000 capital to build a line from Cardenas, Cuba, west to the Peninsula of Hicacos, thence along the peninsula to Puenta Gorda, passing through El Veradero. The office of the company will be at Cardenas. The incorporators are: John S. Fiske, Dewitt Bailey and Paul R. E. Steier, 15 Exchange place, Jersey City, N. J.

Cherryvale, Oklahoma & Texas.—Local reports state that W. R. Stubbs, of Lawrence, and Senator Sam Porter, of Caney, have completed the financing for this proposed road, which is to be 320 miles long. The proposed route is from Cherryvale, Kan., on the A., T. & S. F. and the St. L. & San Francisco, southwest to Geary, Okla., on the Rock Island. The work will cost about $4,000,000. A charter which was granted in Oklahoma describes a line 900 miles long. It is the intention of the promoters eventually to extend the line to El Paso. (May 4, p. 136.)

Chesapeake & Nashville.—The Chesapeake & Nashville Railway, which runs from Gallatin, Tenn., on the Louisville & Nashville via Hartsville Junction and Westmoreland to Scottsville, Ky., 35 miles, with a branch from Hartsville Junction to Hartsville, 12 miles, has been acquired and is now operated by the Louisville & Nashville.

Chicago & North-Western.—On July 29 the new line between Manitowoc, Wis., and Fox river, 34.7 miles, was opened for traffic.

The Loano branch of the Ashland division has been extended from Long Lake, Wis., to Saunders, 14 miles.

Chicago, Burlington & Quincy.—The Lincoln division has been extended northward to Sioux City, Iowa, 33 miles. This official notice indicates that the new connection with the Great Northern will be operated by the Burlington. (See Great Northern, June 15, page 175.)

Chicago, Cincinnati & Louisville.—Press despatches from Muncie, Ind., state that this company is surveying an extension from Griffith, Ind., to Chicago, Ill., 29 miles. At present the C., C. & L. uses the Grand Trunk tracks between these points.

Chicago, Lake Shore & South Bend (Electric).—Surveys and estimates have been completed by J. G. White & Co., of New York, for building this proposed electric line from South Bend, Ind., west to the Illinois-Indiana state line in Hammond, approximately 70 miles. It is said that the road is to be financed by the Transit Finance Co., of New York, and the promoters hope to make a connection with the Illinois Central so as to reach Chicago. From Hammond, east, the line will run through the new United States Steel Corporation Works at Gary, thence via Dune Park, Michigan City and New Carlisle to South Bend. (See Construction Record.)

Chicago, Milwaukee & St. Paul.—A new branch has been opened for business on the Southern Minnesota division extending from Madison, Wis., to Colton, 19 miles.

Chicago, New Washington & Bucyrus (Electric).—This company proposes to build an electric line from Chicago, Ohio, through New Washington to Bucyrus, to connect with the Ohio Central Traction lines. E. L. Williams, of Chicago, is President, and R. B. Seers, of Bucyrus, Secretary and Treasurer.

Chicago, St. Paul, Minneapolis & Omaha.—The Radisson line of the Wisconsin division has been extended from Winter, Wis., to Draper, 10 miles.

Cleveland, Cincinnati, Chicago & St. Louis.—Local reports state that preliminary surveys have been made by this company for building a cut-off about one mile long to connect the Chicago division with the new Chicago, Indiana & Southern at Sheff, Ind.

Contracts have been let to W. F. Nugent & Bros., Louisville, Ky., for 10 miles of double-tracking on the line from Indianapolis, Ind., to Greencastle. Work has already begun.

Colorado & Southern.—It is reported that this company is making surveys with a view to extending its Catskill branch 50 miles westward from the present terminus at Martensen, Colo. The extension is to reach an extensive pine lumber land. Parts of the existing branch will be rebuilt.

Eldorado, Marion & Southwestern.—An officer writes that work has been started on this proposed line. The company was recently incorporated in Illinois to build from Eldorado through Marion, west to a point on the Mississippi river. A contract has been let for the grading east of Marion to Charles E. Larue. The work is not difficult, maximum grades being $^{7}/_{10}$ per cent. and the curvature 4 deg., with some light bridge work. S. T. Brush, of Carbondale, is President; S. H. Bundy, Carterville, Treasurer, and F. Hutchinson, Chief Engineer. (July 20, p. 18.)

Fording Valley.—This Canadian railroad company is reported to have just started building 100 miles of road in Alberta and British Columbia. Some time ago it obtained federal and local charters for a line from Michel on the Crow's Nest Pass section of the Canadian Pacific to a point on the main line of the Canadian Pacific east of Calgary. The first section to be built by the company, of which W. Herbert Evans, of Montreal, is President, will be from Michel northward 30 miles to the property of the Imperial Coal & Coke Company, where extensive development work has already begun.

Gulf, Colorado & Santa Fe.—On August 1st the Gulf, Colorado & Santa Fe, having leased the Jasper & Eastern, began to operate that part of the line extending from Kirbyville, Tex., to De Ridder, La., 39.6 miles.

Houston & Texas Central.—A new line, called the Navasota-Mexia cut-off, has been opened for business, extending from Mexia, Tex., southward to Jewett.

Illinois Central.—The line from Effingham, Ill., to Switz City, Ind., formerly operated by this company, is now operated as part of the Indianapolis Southern.

Indianapolis, New Castle & Toledo (Electric).—This road is to be built by the Electrical Installation Company of Chicago. Its main line will be from Indianapolis to New Castle, Ind., with branch lines as follows: Indianapolis to New Castle, 45 miles; Maxwell to Greenfield, five miles; Shirley to Anderson, 16 miles; New Castle to Muncie, 20 miles; New Castle to Winchester, 28 miles; New Castle to Richmond, 26 miles; total, 140 miles. The road will serve as the only means of railroad communication with Indianapolis for a large population. A private right-of-way 50 ft. wide and terminal facilities are controlled by the company in the city of Indianapolis. In addition to the passenger traffic, the company's franchise permits the transportation of freight without any restriction. The engineering features include the building and equipment of a main power station near New Castle, and ten permanent and one portable substations, one sub-station being installed in the main power plant building. The main power station will contain units of 1,000 k.w. each, two Allis-Chalmers steam turbo-generating units being installed for present use to supply 25-cycle alternating current to the line by a system of step-up transformers operating at 33,000 volts. The contract for the entire construction of buildings and roadbed has been let to the Electrical Installation Company. Complete Allis-Chalmers power and electrical equipment will be installed in the main power station and three rotary converter sub-stations, which will be built at once. The equipment for the main power station will, for the present, consist of two 1,000 k.w. Allis-Chalmers turbo-generators to operate at 175 lbs. steam pressure and 50 deg. F. superheat, the electrical ends of these units being wound for 25-cycles, three-phase, 2,300 volts.

Indianapolis Southern.—See Illinois Central.

Jasper & Eastern.—See Gulf, Colorado & Santa Fe.

Jennings & Southwest.—Chartered in Louisiana to build from Lake Arthur, Calcasieu Parish, northwesterly to Jennings and then north of Jennings to a point that will intersect the Colorado Southern, New Orleans & Pacific road now building from De Quincy west to Baton Rouge. The road is capitalized at $1,000,000, and the following will compose the first board of directors: S. L. Cary, Alba Heywood, O. W. Heywood, A. C. Wilkins, S. C. Morse, W. Krielow, E. P. Fox, George Hathaway and E. F. Rouson.

Kansas City, Lawton & Pacific.—This company has been incorporated in Oklahoma, with $40,000,000 capital stock, to build from Kansas City to San Diego, Cal., about 1,600 miles. The proposed line follows the border between Kansas and Missouri, touching Arkansas, to Wewoka, in the Indian Territory, thence through Texas, New Mexico, Arizona and California. The first portion to be built will be from Dustin, Ind. T., to Wewoka, 28 miles air line. The headquarters will be at Lawton. The incorporators are: G. M. Paschal, G. F. H. Barber, G. C. Robertson, W. F. Barber and W. C. Stevens, all of Lawton; A. J. Brown, of Wewoka; C. M. Rawling and Henry Briggs, of Kansas City; H. W. Scott, of New York, and E. A. Hill, of Muskogee.

Kansas City, Mexico & Orient.—According to an official report made to the Mexican Government, this company has completed and opened for traffic the following lines: West of Chihuahua 200 miles, east of Chihuahua 60 miles and east of Topolobampo 75 miles. Grading is furnished for an additional 25 miles.

An extension of the Third district has been opened from Oakwood, Okla. T., southwestward to Clinton, 36 miles.

An extension of the Chihuahua division has been opened for business from San Sostenes, Mex., eastward to Picachos, Mex., a distance of eight miles.

Kansas City Western (Electric).—This company, which op-

erates an electric line 39 miles long from Ft. Leavenworth to Kansas City, Kan., with trackage rights to Kansas City, Mo., is the successor of the Kansas City-Leavenworth Railroad. It has completed a two mile cut-off at Lansing and three other important cut-offs are nearing completion. These cut-offs will shorten the line by about three miles, and in addition will give easier alinement and grades, making it possible to reduce the running time from Kansas City to Leavenworth by about 30 minutes.

Lafayette & Chicago (Electric).—This company has been incorporated in Indiana to build a traction line from Lafayette, Ind., to Chicago through Rensselaer, Crownpoint and Hammond.

Las Vegas & Tonopah.—This road has been extended from Johnnie, Nev., westward to Rose's Well, 25.5 miles.

Louisiana & Arkansas.—This road has been extended from Packton, La., southward into Alexandria, La., 37 miles.

Louisville & Eastern.—It is announced that grading on the extension of this road from Beard's, Ky., to Lagrange, 10 miles, is nearly completed and that the line will be in operation by September 15. Surveys are being made for a further extension from Lagrange to Frankfort.

Louisville & Nashville.—This company has acquired and now operates the Chesapeake & Nashville and the Yellow River railroads, which see.

Manistee & Grand Rapids.—This road has been extended from Dighton, Mich., eastward to Marion.

Marlborough Railroad.—Incorporated in Michigan with $25,000 capital to build a line from a connection with the Pere Marquette to the village of Marlborough in Lake County. C. B. Parsons, O. B. Taylor, W. S. Duncan, H. H. Parsons and Arthur Stansell, of Detroit, are directors.

Memphis, Paris & Gulf.—A contract for grading two miles from Little Rock, Ark., has been let to J. F. Anders, and work is to be started at once. (See Construction Record.)

Mexican Central.—Material, it is said, is on the ground for building a new line from Guanajuato to Marfil.

A contract has been entered into by this road and the Mexican Government by which a short line will be built from Apulco, the present terminus of a branch of the Mexican Central, north about 130 miles, to Tamos on the San Luis division of the road. This short line will give a more direct connection from the city of Mexico to Tampico on the Gulf of Mexico. Under the contract the Government will pay a subsidy of $6,500 a kilometer, 50 kilometers to be completed by June 30, 1908, and the remainder of the line by July 30, 1909. The construction work will be very heavy, the plans calling for about 40 tunnels. A bridge is to be built over the Panuco river by the Government at a cost of about $1,000,000.

Mid-Oregon & Eastern.—This company has been incorporated in Oregon, with $13,000,000 capital stock, to build a road from Portland southeast through the Cascade Mountains, and then east to a point on Snake river, something over 300 miles. The incorporators are: C. H. Monroe, David Leppert and C. L. Tobias.

Minneapolis & Rainy River.—Work is said to be under way on the extension of this line from Turtle Lake, Minn., to Big Fork. Turtle Lake is the present terminus of a four-mile branch from Jessie Junction, and Big Fork is at the junction of the Big Fork river and Rainy river. It is proposed to continue the line through the last named place along the south side of the Rainy river to International Falls, 70 miles.

Missouri River & Gulf.—This company, recently incorporated in Kansas, with $1,000,000 capital, and supposed to be a Harriman project, proposes to build a line from Kansas City south across the eastern end of Kansas, and through Indian Territory to Denison, Tex., with branches to Shreveport, La., and Joplin, Mo. The directors are: E. F. Winey, Kansas City, Mo.; K. L. Browne, A. L. Berger, C. K. Wells, S. N. Prouty, B. R. Lane and W. Freeman, of Kansas City, Kan. (Aug. 3, p. 31.)

Mobile & Ohio.—An appropriation has been made for double-tracking this road from Jackson, Tenn., to Corinth, Ala.

Muncie & Portland Traction.—This company is to at once begin work on its extension from Portland, Ind., to Celina, Ohio. It is expected that the line will be in operation by May, 1907.

New York, Auburn & Lansing (Electric).—This company is offering through A. H. Flint & Co., New York City, $1,000,000 5 per cent. gold bonds, due June 1, 1935, but redeemable at 105 and accrued interest after 1915, to secure funds to build its proposed electric line from Auburn, N. Y., south through Fleming, Scipio, Venice, Genoa and Lansing, to Ithaca, 34.6 miles. The line is to be built for high speeds, and the company proposes to make extensive freight connections. A contract has been made with the Niagara, Lockport & Ontario Power Co., for power. The track will be laid with 75-lb. rails. (July 27, p. 25.)

Pennsylvania Lines West.—Plans are being considered for a cut-off from Smiths Ferry, Pa., through Columbiana County, Ohio, to a connection with the Pittsburg, Fort Wayne & Chicago just east of Alliance, Ohio, 40 miles air line. The route goes through the townships of St. Clair, Madison, Wayne, Center, Hanover, Butler and Knox.

Prescott & Northwestern.—The main line having been extended as far as Helbig, Ark., trains are now operated to that point from Prescott, Ark., a distance of 40 miles.

Quebec & Lake St. John.—An officer writes that this company has track laid and is pushing the grading work on the balance of its new line now under construction from La Tuque Junction, on the main line, 78 miles northwest of Quebec, west to La Tuque Falls on the St. Maurice river.

Rahway Valley.—Regular service was begun on August 6th over the new branch of this road from Aldene, a suburb of Roselle, N. J., to Summit.

Roanoke & Northern.—Incorporated in Virginia with $100,000 capital to build railroads. L. H. Vaughan is President; J. P. Wood, Vice-President; W. P. Huff, Secretary, and J. L. Vaughan, Treasurer, of Roanoke, Va.

Rochester-Corning-Elmira Traction.—Incorporated in New York to build an electric line 120 miles long from Rochester, N. Y., southeast through Monroe, Livingston, Steuben and Chemung Counties to Elmira. The directors include: M. H. Schultz, C. O. Greer, H. G. Abel, F. Eckstein and F. S. Breckingham, of New York City. The office of the company is 42 Broadway, New York City.

St. Joseph & Southern.—This company has been incorporated in Missouri with $500,000 capital stock to build from St. Joseph, Mo., to Kansas City. The promoters say that the road will be double-tracked and will connect with the Union Terminal Company at Kansas City so as to give a connection with St. Joseph to those companies which now run to Kansas City but not to St. Joseph. The incorporators are: John Donovan, John D. Richardson, N. D. Biles, Edward C. Smith, James N. Burns, Henry Krug, Jr., J. G. Schneider and Jesse T. Roberts, all of St. Joseph.

St. Louis, Rocky Mountain & Pacific.—This company, chartered to build a line from Des Moines, N. Mex., west to Farmington in San Juan County, with a branch from Clifton House on the main line, north to Raton, has completed 80 miles of grading and laid about 40 miles of track. The bridge over the Red river has been completed and other bridges are under way. The Crow Creek branch is practically completed to the Koehler Mine, and coal shipments will be begun over this section of the line within two months. At this point about 200 coke ovens are to be built. Plans are being made for shops and roundhouses at Cimarron and this work is shortly to be started. (See Construction Record.)

St. Louis, Webster & Valley Park.—Announcement has been made that $1,500,000 worth of bonds have been issued, securing the necessary money to resume work on this road. The Trust Company, of St. Louis County, is trustee. It is to be a double-tracked line from West End Heights, Mo., to Valley Park.

Tennessee Railway.—This road has been extended from Winona, Tenn., southward to Montgomery Mills, 12 miles.

Texas & Gulf.—This road has been extended from Timpson, Tex., southward to Walterman, 15.4 miles.

Western Oklahoma.—Incorporated in Oklahoma with $6,640,000 capital to build three lines of railroad in Oklahoma and Indian Territory. One is to run from Lindsay in the Chickasaw nation, on the A., T. & S. Fe and the C., R. I. & P. northwest, touching the Santa Fe at Alston in Woodward County, Oklahoma. Another is from Oklahoma City to connect with the first line in Woodward County, and the third line is to run from Guthrie west to a connection with the second line at a point in the western part of Blaine County, a total of about 350 miles. Henry Ash and a number of Guthrie capitalists are said to be interested.

Wynne, Newport & Western.—This company has applied for a charter from the state of Arkansas. This is to be a short line about 50 miles long to connect Wynne, Cross County, with Newport, Jackson County. Such a line would connect with the Cotton Belt at Fair Oaks, the Iron Mountain at Wynne and the Rock Island at Newport. The capital stock is $280,000, of which $90,000 has been subscribed. The officers are: O. N. Killough, Wynne, President; Isaac Goldman, St. Louis, Vice-President; W. H. Barnes, Wynne, Secretary; Sigmund Wolf, St. Louis, Treasurer, and M. M. Stuckey, Newport, Attorney.

Yellow River.—This road, which runs from Crestview, Fla.; on the Louisville & Nashville via Laurel Hill to Florala on the Central of Georgia, 26 miles, and has been controlled but not operated by the Louisville & Nashville, is now operated as a branch of its Pensacola division.

## RAILROAD CORPORATION NEWS.

Alafia, Manatee & Gulf Coast.—See Charlotte Harbor & Gulf.

Atchison, Topeka & Santa Fe.—With 8,445 miles operated the Santa Fe earned in the fiscal year closed June 30, $78,044,347 against $68,375,837 in 1905. Operating expenses increased less than $3,000,000, leaving net earnings of $29,546,829 against $22,858,453 in 1905, an increase of $6,688,376.

Baltimore & Annapolis Short Line.—See Maryland Electric.

Canadian Northern Quebec.—Under this name the Great Northern of Canada, the Chateaugay & Northern and the Quebec, New Brunswick & Nova Scotia have been amalgamated. The C. & N. has heretofore been operated under lease by the Great Northern. The total length of the roads in the new company is about 250 miles.

Charlotte Harbor & Gulf.—This is the new name of the Alafia, Manatee & Gulf Coast. The company has taken over 7 miles of road between Brownville, Fla., and Liverpool, formerly owned by the Peach River Phosphate Mining Co., and is building an extension to Charlotte Harbor, on the Gulf of Mexico, 38 miles.

Chateaugay & Northern.—See Canadian Northern Quebec.

Chesapeake & Nashville.—See Louisville & Nashville.

Chicago & Wabash Valley.—It is reported that this road has been sold to Vanderbilt interests. It owns 24 miles of road from Kersey, Ind., on the Chicago, Indiana & Southern, to McCoysburg on the Chicago, Indianapolis & Louisville. It has no bonded debt.

Chicago, Indiana & Southern.—See Chicago & Wabash Valley.

Great Northern of Canada.—See Canadian Northern Quebec.

Hocking Valley.—J. P. Morgan & Co. announced on August 1st the plan for the consolidation of the Hocking Valley and the Kanawha & Michigan. This provides for the formation of a new company (whose name is not given), the retirement of the preferred stock of the Hocking Valley, which is redeemable at par, and the creation by the new company of a general lien mortgage which is to provide for refunding outstanding equipment obligations and floating indebtedness, to furnish resources for betterments, improvements, and to be issued in exchange for the $11,000,000 Hocking Valley preferred stock. The common stock of the present Hocking Valley company and the stock of the Kanawha & Michigan are to be exchanged for stock of the new company. There are to be $30,000,000 new general lien 4 per cent. gold bonds maturing July 1, 1936. Of these, $17,000,000 are to be issued for use in connection with the consolidation, and $13,000,000 to be reserved for betterments and improvements and refunding. The new stock is to be $13,750,000, of which $11,000,000 will be exchanged share for share for the existing common stock of the Hocking Valley, $2,694,000 for $4,490,000 Kanawha & Michigan stock outstanding in the hands of the public, the remaining $56,000 to be exchanged for the $4,510,000 controlling Kanawha & Michigan stock, now held by the Hocking Valley. This covers the total $9,000,000 Kanawha & Michigan stock outstanding, the remaining $1,000,000 being treasury stock which is to be canceled. The rate at which Hocking Valley preferred stock is to be exchanged is $100 in preferred stock for $110 in new bonds. Kanawha & Michigan stock is to be exchanged at the rate of $100 in Kanawha & Michigan for $60 in new stock. Stockholders of the two companies have the opportunity on or before September 29 to agree to the consolidation plan.

Illinois Central.—The gross earnings for the fiscal year ended June 30 were $51,636,405, against $49,508,650 in 1905, an increase of $2,127,755. The operating expenses increased $1,325,764, leaving net earnings $15,198,935, against $14,396,944 in 1905, an increase of $801,991.

See Indianapolis Southern.

Indianapolis Southern.—This road, now open for business, comprises a line from Indianapolis, Ind., southward to Bloomington, Ind., 56 miles, and the line from Effingham, Ill., on the main line of the Illinois Central, to Switz City, Ind., 89 miles, formerly operated by the Illinois Central. In other words, the Illinois Central, which controls the Indianapolis Southern, has transferred to that company the branch of its own line which will, on filling in of a 40-mile gap now existing, form the western end of the connection between Indianapolis and the main line. The President of the Indianapolis Southern is John C. Welling, Vice-President of the Illinois Central.

Kanawha & Michigan.—See Hocking Valley.

Louisville & Nashville.—This company has acquired the Chesapeake & Nashville, a road operating 47 miles of line from Gallatin, Tenn., to Scottsville, Ky., including a 12-mile branch. In the year ended June 30, 1904, this company had gross earnings of $65,443 and net earnings of $8,964. No statement of capitalization is available.

The Yellow River Railroad, which runs from Crestview, Fla., to Florala, 26 miles, and has been controlled for some time by the Louisville & Nashville, but until recently not operated as part of the system, is now operated as a branch of the Pensacola division.

Maryland Electric.—The Baltimore & Annapolis Short Line and the Maryland Electric Railway Company have been merged under the name Maryland Electric Railways Company, which will have $1,200,000 capital stock. There is outstanding $350,000 stock of the Baltimore & Annapolis Short Line, and this will be exchanged for stock of the consolidated company at the rate of three shares of new stock for one of the old. An issue of $8,000,000 5 per cent. bonds of the new company will be authorized and one-half of this amount will be issued soon.

New Brunswick Railway.—This company, a subsidiary of the Canadian Pacific, has declared an annual dividend of 4 per cent. on the $3,000,000 outstanding capital stock. The rate last year was 2½ per cent.

New York Central Lines.—The gross earnings of this system in July are shown in the following table:

| | 1906. | Increase. |
|---|---|---|
| New York Central & Hudson River | $1,729,222 | $593,924 |
| Lake Shore & Michigan Southern | 3,584,431 | 480,227 |
| Lake Erie & Western | 433,240 | 61,464 |
| Chicago, Indiana & Southern | 166,078 | *1,539 |
| New York, Chicago & St. Louis | 808,722 | 139,894 |
| Michigan Central | 2,118,972 | 248,279 |
| Cleveland, Cincinnati, Chicago & St. Louis | 2,143,365 | 252,452 |
| Peoria & Eastern | 244,637 | 30,745 |
| Cincinnati Northern | 88,553 | 17,423 |
| Pittsburg & Lake Erie | 1,315,773 | 246,199 |
| Rutland | 249,924 | 19,501 |
| Total | $18,882,627 | $2,088,569 |

*Decrease.

Pennsylvania System.—The earnings of the Pennsylvania lines during the month of June increased so much as to partly offset the comparatively small earnings of April and May. It is evident that if the earnings for the next six months increase in proportion to the first six months of the current year the 1906 earnings will make new records, both for totals and for the increase over the preceding year. The gross earnings of the lines east of Pittsburg directly operated for the six months ended June 30 were $69,826,849, an increase of $7,852,000; net earnings, $19,537,246, an increase of $3,873,900. The gross earnings for this period of the lines west of Pittsburg and Erie directly operated increased $4,408,400, and the net earnings increased $1,766,600.

Quebec, New Brunswick & Nova Scotia.—See Canadian Northern Quebec.

Rock Island Company.—The Chicago, Rock Island & Pacific gross earnings for the year ended June 30 were $51,237,858, an increase of $7,186,349. Operating expenses and taxes increased $4,030,750, leaving net earnings $14,538,909, an increase of $3,155,599 over 1905. These are not, however, the largest net earnings in the history of the company, as in 1903, with gross earnings of only $44,376,000, net earnings were $14,998,000. The 1906 mileage was 7,426 miles. The combined income account of the Rock Island and the Frisco systems, including the Chicago & Eastern Illinois, shows that with an operated mileage of 13,433 miles gross earnings for the year were $93,213,077 against $82,433,127 in 1905, an increase of $10,779,950. Operating expenses and taxes increased $6,200,000, leaving net earnings $28,173,747 against $23,599,265 in 1905, an increase of $4,574,382.

St. Louis Southwestern.—A meeting of the shareholders has been called for October 3 to vote on the guaranteeing of the principal and interest of an issue of not more than $4,000,000 first refunding and extension mortgage 5 per cent. 50-year bonds of the Gray's Point Terminal Railway, whose present bonded indebtedness is $500,000. The shareholders will also be asked to ratify an agreement with the same subsidiary road providing for the use of its property by the St. Louis Southwestern for 50 years, beginning August 1, 1906. The new bonds are improvements and extensions.

Stillmore Air Line.—See Wadley Southern.

Wadley & Mt. Vernon.—See Wadley Southern.

Wadley Southern.—This company is a consolidation of the Stillmore Air Line, running from Collins, Ga., on the Seaboard Air Line, to Wadley, 54 miles, and the Wadley & Mt. Vernon running from Wadley to Rockledge, 37 miles, with several extensions projected.

Yellow River.—See Louisville & Nashville.

# GENERAL NEWS SECTION

## NOTES.

The El Paso & Southwestern System has adopted the Brown system of discipline.

Lumber rates from Nashville, Tenn., to Pittsburg and Buffalo common points have been advanced 3 cents a hundred pounds.

Ballasting crews on the Lincoln (Neb.) division of the Chicago & North-Western have been withdrawn, owing to the heavy volume of regular traffic.

The passenger department of the Santa Fe has undertaken to help in the rebuilding of San Francisco by advertising throughout its lines the need of labor.

The Erie has sent solid silver annual passes in the form of watch charms, with the name of the holder engraved on each, to the presidents of other railroads.

The Great Northern and Northern Pacific have made considerable reductions in all classes of rates to Butte, Helena and Anaconda common points in Montana.

A test case is to be brought before the Texas Railroad Commission in regard to export lumber traffic, on which the commission desires to raise the freight rates.

A bill has been introduced in the Georgia senate prohibiting the building of any railroad within fifty miles parallel to the Western & Atlantic, which is owned by the state.

The Big Four on August 14th gave notice of a reduction of two cents a hundred on the three classes of export grain from interior points in Illinois to tidewater at Newport News.

An invention is now reported by which a moving locomotive automatically turns on electric lights along the track a mile in advance, thus doing away with the necessity of headlights.

The Southern Pacific, partly as the result of labor difficulties, has reduced the force at its Sacramento shops and plans to have most of the work done at some of its eastern shops in future.

Owing to the Graud Army encampment at Minneapolis this week there has been the heaviest passenger travel ever known in the Northwest. The total attendance is likely to exceed 100,000.

There are being turned out from the West Milwaukee shops of the St. Paul new freight cars which are stenciled "Chicago, Milwaukee & St. Paul Railway Company—Pacific Coast Extension."

The express business of the Texas Central, which is now carried on by the Pacific Express, is soon to be turned over to the Wells Fargo, adding 275 miles to the mileage of the latter company.

An investigation of railroads in the territory of Oklahoma has been begun by the Attorney General, at the suggestsion of the Governor. Its object is to discover discriminations in freight rates.

In order to improve the connections between the Louisville & Atlantic and the Queen & Crescent Route, an independent motor car company has put in service an automobile line which makes four trips a day.

The Canadian Pacific now runs a quick lunch car—a regular 72-ft. diner equipped with a lunch counter affording accommodations for more than 50 people. The car has a refrigerated cellar about 3 feet deep.

The new freight terminals of the Missouri Pacific System in St. Louis, bounded by Biddle, O'Fallon, Collins and Second streets, have been opened for business, making the third freight station of the road in that city.

The Wisconsin Railroad Commission on August 9 handed down a decision by which grain rates in the state will be reduced on the average about one cent a bushel. The order is the most sweeping yet issued by the commission.

William Anderson, track foreman of the Chicago, Burlington & Quincy at Louisville, Neb., has received from the company the gift of a gold watch, in recognition of his vigilance in watching the road during a time of heavy rains.

In order to provide a suitable thoroughfare for teams, the Central Railroad of New Jersey plans to repair and repave, at a cost of $100,000, one of the streets in Jersey City leading to its yards at the Communipaw terminal.

News comes from Omaha that all the railroads in that region, including all the Harriman Lines, have ordered all outstanding passes, both trip and annual, canceled after August 28, the day the new rate law goes into operation.

An order has been issued from the headquarters of the Pennsylvania calling the attention of division officials to the increase in the volume of freight traffic over last year, in order that all precautions may be taken to prevent congestion.

The Peavey Elevator Company, of Minneapolis, through the British American Elevator Company, Ltd., with head offices in Winnipeg, has given the contract for the first of 20 grain elevators which it is to build on the lines of the Canadian Northern.

Traffic officers are quoted to the effect that a car congestion more serious than last year's is imminent in the Northwest. In this connection the Canadian Pacific announces that it has 621 locomotives and over 20,000 cars in its western territory.

The Chicago Subway on August 14 began to move freight between the Santa Fe, Erie, St. Paul, Chicago & Alton, and Wabash freight stations, the wholesale warehouse of Marshall Field & Company and the plant of the Monarch Refrigerating Company.

Reductions are to be made in the Armour Car Line rates for transportation of fruits and vegetables from Oregon and Washington points to the East, averaging a reduction of $10 a car to Missouri river points. To New York the new rate is to be $42.50 instead of $65.

It is reported in Harrisburg, Pa., that the Pennsylvania Railroad, on completion of its new road from the Susquehanna river to Atglen, will be able to move through freight with a smaller number of engines, and that, therefore, about 200 brakemen and firemen will be "let out."

The Sheffield Elevator Company, at Minneapolis, is to increase by 500,000 bushels the capacity of its elevator K, and it is stated that with this increase, and three other similar ones now being made, the elevator storage capacity for grain in that city will aggregate 37,000,000 bushels.

A despatch from San Antonio, Tex., says that on August 11th a cloudburst at Langtry swept away six miles of Southern Pacific main line track and eight bridges in that region. Later despatches indicate that 20 miles of track has been swept away. Through traffic has been transferred to the Texas & Pacific.

The New York Central has compromised with its striking tugboat men by granting an increase in wages of $5 a month for both classes of deck hands. This satisfies the demands of all but the first-class deck hands, who asked for a $10-increase. Most of the other roads have not yet come to a final settlement with their men.

The Wisconsin Railroad Commission has given an opinion that the St. Paul road is not a common carrier of private cars, and that its past custom of carrying such cars does not have the force of law in compelling it to do so in the future. The opinion was given in answer to a complaint against the railroad company for refusing to carry private theatrical cars.

The steel freighter "Troy" of the Western Transit Company (N. Y. C. & H. R. R.) on August 11th collided with a draw span of the interstate bridge at Duluth, knocking it from the pier on which it revolved and blocking the channel on both sides, thus temporarily closing navigation to the upper harbor. The bridge is owned by the Great Northern. The draw span is 500 feet long, one of the longest in the world.

According to a St. Louis despatch, the Wabash, the Big Four and the Clover Leaf, on the first of their low-rate summer excursions on August 9, from St. Louis to Niagara Falls, carried 4,300 passengers in 13 special trains. The Wabash carried 2,600, the Big Four 1,200, and the Clover Leaf 500 of the excursionists. The rate was $10 for the round trip of about 1,500 miles. There are to be four other similar excursions.

The Texas & Pacific, answering the inquiry of the Interstate Commerce Commission in regard to the relations of railroads and grain elevators, says that, with one possible exception in which the facts are submitted to the commission's judgment, no special facilities have been given within the last three years to elevators, and that no official director or employe of the road, so far as can be ascertained, has been interested in the ownership of elevators.

A conference of some sixty representatives of the legal departments of the larger railroads east of the Mississippi, particularly those in Southern and New England territory, was begun in Atlantic City on August 14 to study the provisions of the new rail-

road rate law. Judge Edward Baxter, of Nashville, Tenn., the presiding officer, made a statement to the effect that the meeting was for the purpose not of trying to evade but of understanding the new law.

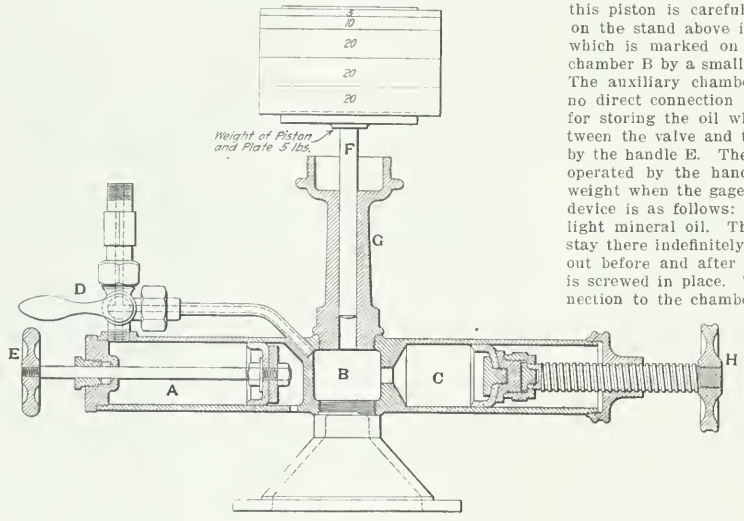
The Interstate Commerce Commission on August 15 issued an order to every railroad in the country to report not later than Sept. 1, 1906, the total number of freight cars owned on Aug. 1, 1906, together with the number of such cars equipped with air-brakes. This order is given by the commission to see whether or not the railroads are complying with the order of the commission dated Nov. 15, 1905, which made it compulsory for 75 per cent. of the cars in a train to be equipped with air-brakes.

We take the liberty of publishing the following item from the *Nashville American*:

**Doubles Its Motive Power.**

"Livingston, Tenn.—(Special).—H. E. Speyer, General Manager of the Overton County Railroad, in company with the engineer, Charles Corlton, left here yesterday for Cincinnati, where they will purchase a new engine for the road. Up to this time only one engine has been used, but it is unable to handle the business."

An agreement as to rate of pay is reported to have been made between the Pennsylvania and the men who will work on the electrified line of the West Jersey & Seashore between Camden and Atlantic City, to be opened next month. Conductors are to receive $3.85 and brakemen $2.04 for a 10-hour day. Motormen are to be paid two cents a mile to Atlantic City on a basis of 210 miles a day, 2¼ cents to Millville on the basis of 200 miles a day and 2¾ cents a mile between Camden and Woodbury.



The American Dead-Weight Gage Tester.

An investigation of some 15 railroads was begun on August 14 by the Interstate Commerce Commission in Toledo, through Judson C. Clements, a member of the Commission, regarding the interstate transportation of ice to and from that city. The first day's proceedings developed the fact that a former purchasing agent of the Ann Arbor Railroad, now under sentence of imprisonment for acts done as manager of the Toledo Ice & Coal Company, while in the service of the road had sold ice for the ice company. He also testified that both the former president and general manager of the Ann Arbor were directors of the ice company and that practically all the stock in the company was owned by railroad men. It was also charged that railroad real estate was used by the ice company without compensation and that laborers were transported for its account by the road without paying fare.

Some 400 Chinese laborers have recently arrived in Mexico from China to work on the Kansas City, Mexico & Orient in the northern part of the Republic.

On the Manzanillo extension of the Mexican Central 1,500 Japanese laborers are to be used, of whom 500 will arrive shortly and 1,000 some time in November.

The experiment of using Chinese labor on the Panama Canal is to be tried with 2,500 Chinamen at the start. If their work is satisfactory, it is probable that much larger numbers will be taken to the Isthmus.

At Jamestown, N. Y., August 10, the Federal grand jury reported indictments against the Standard Oil Company, of New York, the Vacuum Oil Company, and the Pennsylvania Railroad. The indictments are based on a charge of carrying oil from Olean, N. Y., to Rutland, Vt., in January, 1904, at less than published tariff rates.

At Chicago, August 8, the Federal grand jury returned an indictment, containing 19 counts, against the Standard Oil Company for accepting rebates from the Lake Shore & Michigan Southern. The rebates consisted of free storage of oil under circumstances where other oil shippers had to pay storage.

It is understood that following the grand jury investigations of the relations between the Standard Oil Company and the railroads, the Lake Shore has given notice to independent oil dealers that hereafter mileage fees on their oil tank cars will be computed on the same basis as on the cars of the Union Tank Line, belonging to the Standard Oil Company.

### The American Dead-Weight Gage Tester.

The accompanying illustration shows the American dead weight gage tester made by the American Steam Gage & Valve Mfg. Co., Boston, Mass. This device possesses all the advantages of the mercury column. It is compact in form and is absolutely reliable at all times, thus doing away with the necessity of returning test gages to the factory from time to time for readjustment so as to be assured of their accuracy. Referring to the illustration it will be seen that the device consists of a main pump cylinder B, connected directly with the cylinder G and piston F. The area of this piston is carefully figured, and when the weights are placed on the stand above it they give the exact pressure per sq. in., which is marked on them. The gage is connected to the piston chamber B by a small pipe in which is placed the three-way cock D. The auxiliary chamber A, which is used as an oil chamber, has no direct connection with B, but is simply used a an oil reservoir for storing the oil which is required for filling the connection between the valve and the gage. It has a plunger which is operated by the handle E. The cylinder C is provided with a screw plunger, operated by the handle H, for raising the piston F while under weight when the gage is in place for testing. The operation of the device is as follows: The chambers A, B and C are filled with a light mineral oil. The oil, when once put into the cylinders, can stay there indefinitely, and thus the necessity of pouring it in and out before and after testing is eliminated. The gage to be tested is screwed in place. The three-way cock D is then set to give connection to the chamber A. The plunger E is pulled out until the gage shows pressure, thus indicating that the connections are filled with oil. The three-way cock is then turned so as to close the connection to chamber A and to open the connection to chamber B. The weights corresponding to the pressure desired, less 5 lbs., the weight of the stand and piston, are then placed on the stand and the screw plunger C is forced inward, by turning the handle H, until the pressure acting on the piston F raises the weights, at which time the gage, if properly adjusted, will show the pressure indicated by the weights on the stand. After testing and before disconnecting the gage the handle E is pushed inward and the three-way cock turned to allow the oil from the gage connection to be collected in the oil reservoir A, thus preventing the loss of any oil during testing. All tests are made with dead weights in 5-lb. units. This device can be furnished for testing to any desired pressure up to 1,000 lbs.

### New Transcontinental Automobile Record.

The trip from San Francisco to New York, over 3,500 miles, seems likely to be covered in 15 days by a 30-h.p. six-cylinder automobile, which reached Conneaut, Ohio, on August 15, and was delayed one day there on account of an accident. The old record, made two years ago, was 33 days. The western end of the trip was made by roads following the Central Pacific-Union Pacific route. The time between Sacramento and the summit of the Sierra Nevada mountains, which involved a climb of 7,000 feet, nearly equaled that of the Overland Limited. Omaha was reached in nine days and Chicago in 11 days.

### The Fare to Coney Island.

On Saturday, August 11, Justice Gaynor of the Appellate Division of the Supreme Court of New York, in Kings County, handed down an obiter to the effect that the arrest of a passenger for refusing to pay a second fare while returning from Coney Island to New York over one of the lines of the Brooklyn Rapid Transit Company was not justified as the prevailing 10-cent fare to Coney Island was illegal. On the following day, Sunday, many persons, basing their action on this decision, refused to pay a second fare to Coney Island. The company had employed special policemen who ejected from the cars about 1,000 such protesting passengers. The service was greatly delayed, and one death was caused indirectly as a

result of the disturbance. On Monday there was again almost a riot which resulted in the abandonment at 6 p. m. of all service to Coney Island by the Brooklyn Rapid Transit. Service was later resumed on the winter schedule with half-hour headway. Throughout Tuesday and Wednesday passengers who refused to pay the second fare were ejected from the cars.

## TRADE CATALOGUES.

*Curtains and Fixtures, Sash Locks and Nut Locks.*—The National Lock Washer Co., Newark, N. J., is distributing the first edition of its catalogue. The book is handsomely done and contains detailed illustrations and descriptions of the various devices made by the company. These include car curtains, curtain fixtures, sash locks, sash balances and a number of designs of nut locks. Inserted at the back of the catalogue are a number of perforated specification blanks for curtains and sash balances, intended for use when asking quotations or ordering.

*Railroad Water Service Supplies.*—Catalogue C of the American Valve & Meter Co., Cincinnati, Ohio, is entitled "Railroad Water Service Department." The several styles of Poage water columns are illustrated and described in detail, prominence being given to style D with the Fenner drop spout. Detail parts are shown to illustrate their construction and lists of parts of the different styles given; also directions for setting up. Tank pipe valves, indicators, strainers, relief and float valves and other tank fixtures are also included.

*Electric Blue Print Machine.*—The Franklin automatic continuous-feed electric blue printing machine is described and illustrated in a pamphlet issued by Williams, Brown & Earle, Philadelphia, Pa. This machine is arranged so as to operate continuously and will print, wash, potash and dry blue prints and deliver them on a table top ready for use all in seven minutes from the time that tracings and sensitized paper are put into the machine.

*Electric Traction Supplies.*—Four recent bulletins sent out by the General Electric Co., Schenectady, N. Y., are the following: No. 4,443, dealing with the Sprague-General Electric Multiple Unit Control for A.C. and D.C. operation; No. 4,447, low voltage three-phase generator and feeder panels; No. 4,449, potential and synchronizing plug switches, and No. 4,450, list including prices of the parts of the type GE-80-A railway motor.

*Large Steam and Electric Locomotives.*—The American Locomotive Co. is distributing an illustrated reprint of a paper on large steam and electric locomotives read before the New York Railroad Club at its February, 1906, meeting by J. E. Muhlfeld, General Superintendent of Motive Power of the Baltimore & Ohio. An abstract of this paper was published in the *Railroad Gazette* of Feb. 23, 1906.

*Electric Batteries.*—An illustrated pamphlet issued by the Edison Manufacturing Co., Orange, N. J., describes a dozen primary batteries for small fan motors, gas engines and railroad signals. The batteries are of the caustic potash type and copper dioxide, compressed into briquettes; is used for the negative plate and also acts for a depolarizer.

*Coal Mining.*—A handsomely illustrated catalogue of coal mining machinery has been issued by the Sullivan Machinery Co., Chicago, Ill., makers of air compressors, coal cutting machines, rock drills, engines and similar mining equipment. A large part of the catalogue is taken up with a clear and comprehensive argument in favor of machine mining as compared with coal mining by hand.

*Lead Pencils.*—The Joseph Dixon Crucible Co., Jersey City, N. J., is distributing a pamphlet reproducing a speech made recently by J. A. Walker, Vice-President and General Manager of the Dixon Company, in which he gives a short history of lead pencils made in this country.

### Manufacturing and Business.

The office of the Pressed Steel Car Co., in the City of Mexico, has been moved from its former address, Calle de Gante No. 8, to Prolongacion del 5 de Mayo No. 9.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., has been awarded the contract for furnishing 405,000 lbs. of steel bars for the reinforcement of concrete at the Shoshone irrigation project, Wyoming.

### Iron and Steel.

The New York, New Haven & Hartford and the Long Island are reported to be in the market for steel bridge material. The New York Central has ordered material for 15 bridges on the Pennsylvania, West Shore and Harlem divisions. The Western Pacific has ordered 5,500 tons of bridge steel.

The Missouri, Kansas & Texas is reported to be in the market for rails. A projected Texas Railroad is reported to be in the market for 75,000 tons, and a railroad company in Cuba for 5,000 tons of rails.

## OBITUARY NOTICES.

John Mathieson, who recently retired as General Manager of the Midland Railway of England, died on August 9th. A portrait and sketch of Mr. Mathieson's career appeared in the *Railroad Gazette* of last week.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Alafia, Manitee & Gulf Coast.*—See Charlotte Harbor & Northern.

*Charlotte Harbor & Northern.*—The officers of this company, formerly the Alafia, Manitee & Gulf Coast, are as follows: J. M. Gifford, New York, President; P. B. Bradley, Boston, Vice-President; L. M. Fouts, Jacksonville, Fla., Second Vice-President and General Manager; G. S. Bruce, Chief Engineer; C. B. McCall, Superintendent, and F. B. Higgins, Auditor, all with office at Hull, Fla.

*Duluth & Iron Range.*—Horace Johnson, Secretary, has been appointed Vice-President and General Freight and Passenger Agent, succeeding A. H. Viele, resigned.

*New Park & Fawn Grove.*—The officers of this recently opened road are: J. H. Anderson, President; J. A. Gailey, Secretary, and A. M. Strawbridge, all of New Park, Pa., and J. C. Wiley, General Manager, and P. F. Morris, Superintendent, Fawn Grove.

*St. Louis, El Reno & Western.*—The officials of the Fort Smith & Western have had their authority extended over the St. Louis, El Reno & Western, recently acquired by the Fort Smith & Western.

### Operating Officers.

*Atlantic Coast Line.*—E. R. Wooten, Superintendent at Norfolk, Va., has been appointed Superintendent at Richmond, Va., succeeding J. P. Russell, transferred.

*Denver & Rio Grande.*—See Rio Grande Western.

*Duluth, South Shore & Atlantic.*—See Mineral Range.

*Gulf, Colorado & Santa Fe.*—W. E. Maxson has been appointed General Superintendent, with office at Galveston, Tex. A. P. Hall, Superintendent of Terminals at Galveston, Tex., has been appointed to the new office of Superintendent at Beaumont, Tex. The authority of Oliver Snyder, Superintendent of the Galveston division, has been extended over the Galveston Terminals.

*International & Great Northern.*—J. B. Allen has been appointed Car Accountant, with office at Palestine, Tex., succeeding M. H. Trice, recently appointed Assistant Superintendent at Mart, Tex.

*Mineral Range.*—T. W. Smith, formerly Assistant Superintendent of the Duluth, South Shore & Atlantic, has been appointed Superintendent of the Mineral Range, succeeding J. C. Shields, resigned to become General Superintendent of the Keweenaw Central, now under construction in Michigan.

*Missouri Pacific.*—C. E. Carson, who was recently appointed Superintendent of Terminals at Kansas City, Mo., was born in 1864 in Ohio, and educated at Carleton College, Syracuse, Ohio. He began railroad work in 1882 as a switchman on the Kansas City, Fort Scott & Gulf. He remained on this road until 1893, serving as yard master, conductor and chief clerk to the Division Superintendent. He was then appointed chief clerk to the Superintendent of the Terminal Railroad of St. Louis, and, in 1897, went to the Missouri Pacific as Superintendent of Terminals at Kansas City, Mo. He was transferred to St. Louis five years later, and, in 1903, went to the Colorado & Southern as Superintendent at Denver, where he remained until last May. He was then out of railroad service until his recent appointment.

*Rio Grande Western.*—W. E. Miller, Assistant Superintendent of the First division of the Denver & Rio Grande at Pueblo, has been appointed Superintendent, with headquarters at Salt Lake City, succeeding F. S. Elliott.

*St. Louis & San Francisco.*—Andrew O'Hara, Superintendent at Springfield, Mo., has been appointed General Superintendent of the First district, with office at that place, succeeding C. F. Resseguie.

*Seaboard Air Line.*—J. H. Witt, Trainmaster at Richmond, Va., has

been appointed Superintendent of the Third division, with headquarters at Atlanta, Ga. E. L. Ryan, Trainmaster at Waldo, Fla., has been appointed Superintendent of the Sixth division, with headquarters at Jacksonville, Fla.

*Southern.*—J. A. Heether, Superintendent at Charleston, S. C., has been appointed Superintendent of the Norfolk division. A. G. Jones, Superintendent at Pinners Point, Va., succeeds Mr. Heether.

### Traffic Officers.

*New Orleans & Northeastern.*—J. B. Bannon has been appointed Assistant General Freight Agent, with office at New Orleans, La.

### Engineering and Rolling Stock Officers.

*Baltimore & Ohio.*—G. B. Swingly, Assistant Division Engineer at Connellsville, Pa., has been appointed Division Engineer at that place, succeeding John Ware, resigned to go into other business.

*Great Northern.*—W. W. Breckenridge, Master Mechanic at Crookston, Minn., has been appointed Master Mechanic of the Montana Central, with office at Great Falls, Mont., succeeding F. M. Fryburg, recently appointed General Master Mechanic of the Central district of the Great Northern.

*Lehigh Valley.*—J. M. McMullin has been appointed Master Mechanic at Sayre, Pa., succeeding Willard Kells, transferred to Buffalo, N. Y.

### Purchasing Agents.

*San Antonio & Aransas Pass.*—James Cowan has been appointed Purchasing Agent, with office at San Antonio, Tex., succeeding T. B. Palfrey, resigned to go into other business.

## LOCOMOTIVE BUILDING.

*The Western Pacific*, it is reported, has ordered 20 locomotives from the Baldwin Works.

*The Elgin, Joliet & Eastern* will place orders for 10 consolidation (2-8-0) locomotives and six six-wheel switching (0-6-0) locomotives.

*The Chicago, Lake Shore & Eastern*, as reported in our issue of August 10, is about to place orders for five consolidation (2-8-0) road locomotives, five six-wheel switching (0-6-0) locomotives, and three eight-wheel (4-4-0) transfer locomotives.

## CAR BUILDING.

*The New Orleans Great Northern*, it is reported, has ordered new passenger equipment.

*The Southern Pacific* is building 32 standard cabooses, with wood underframes, at its Sacramento car shops.

*The Canadian Pacific*, it is reported, will receive a large amount of new equipment in time for the moving of the western wheat crop.

*The Elgin, Joliet & Eastern* will place orders for 300 steel underframe gondola cars and 100 steel side dump cars, all of 100,000 lbs. capacity.

*The St. Louis & San Francisco* is asking bids on 500 box cars and 250 43-ft. steel frame flat cars. The box cars are to be the Frisco Rock Island common standard steel frame car.

*The Chicago, Lake Shore & Eastern* is about to place orders for 500 steel underframe drop end gondola cars, 350 steel side dump cars and 100 steel underframe flat cars, all of 100,000 lbs. capacity.

*The Chicago Great Western* has ordered eight cabooses from the American Car & Foundry Co., for September delivery. These cabooses will be 33 ft. 7⅝ in. long, 8 ft. 11¾ in. wide and 6 ft. 9 in. high.

*The Grand Trunk Pacific*, as reported in our issue of Aug. 3, has made a contract with Rhodes, Curry & Co. for 2,500 cars, delivery to commence this year and to extend over a period of five years.

*The Chicago & North-Western* has ordered 1,500 box cars, 700 gondola cars and 300 flat cars, all of 80,000 lbs. capacity, from the American Car & Foundry Co. These cars are for January, 1907, delivery, and are in addition to the cars ordered from the Pullman Co. and from Haskell & Barker.

## RAILROAD STRUCTURES.

Columbus, Ga.—It is reported that the Central of Georgia will build a terminal station at this place.

Little Rock, Ark.—H. C. Link will open bids on August 20 for a brick station, with steel skeleton, to be built at this place for the St. Louis, Iron Mountain & Southern. The building will be 60 ft. x 290 ft., three stories high, and is to cost approximately $300,000. Work is to be begun on September 1.

San Francisco, Cal.—This company has bought for $800,000 a block of land near its present passenger station at Third and Townsend streets, and it is reported that a new station will be built on this property.

Spokane, Wash.—The Washington Water Power Co. is building a car barn 180 ft. by 580 ft. at this place, to have a capacity of 140 ft. Shops will be connected with the building.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Allentown, Tamaqua & Ashland.—See New York, Pittsburg and Chicago Air Line.

Arkansas Valley.—See Atchison, Topeka & Santa Fe.

Atchison, Topeka & Santa Fe.—This company has bought the Arkansas Valley, which is surveyed from Lamar, Colo., to Rocky Ford, 80 miles. Forty miles of road have been built and work on the remainder will be started at once.

Brush Creek & Crows Run.—See New York, Pittsburg & Chicago Air Line.

Butte & Plumas.—See Western Pacific.

Canadian Northern.—Bids will soon be asked for the building of a 50-mile road from Hawkesbury to Montreal. Work is already under way on a line from Ottawa to Hawkesbury, 50 miles.

Canadian Pacific.—Work is under way on an extension of the Manitoba & Northwestern branch from Sheho, its present terminus, to Prince Albert.

According to a Montreal despatch, the President of this company has announced that a line will be built through the Temiskaming district, in the northern part of the province of Quebec.

Cardenas Railroad Terminal Company.—This company has been incorporated in New Jersey, with $1,000,000 capital. The incorporators are: John S. Fiske, De Witt Bailey, Paul R. E. Steier, John H. Leary and Fred Blasenbrey.

Chambersburg & Western Electric.—Under this name incorporation will be asked on August 28 for a company with $500,000 capital to build a road from Greencastle, Pa., northward to Chambersburg, 10 miles. It is expected to later extend from Chambersburg to Shippensburg, and from that point through Cumberland County to Harrisburg, about 58 miles from Chambersburg. Surveys are under way.

Chihuahua & Pacific.—It is reported that this road will be extended from Chihuahua, Mex., northeast to the Rio Grande border, about 225 miles, and from its southwestern terminus, Minaca, westward to the Pacific coast, about 500 miles. Concessions for these lines have been obtained from the Mexican Government.

Cincinnati, New Orleans & Texas Pacific.—This road is being double-tracked between Cincinnati and Chattanooga. The line is also being straightened so that the distance between these cities will be shortened by about 60 miles, the existing line being 338 miles long.

Coeur d'Alene & Spokane.—It is announced that the Hayden Lake branch from Coeur d'Alene to Hayden Lake, seven miles, will be in operation early in September.

Denver, Enid & Gulf.—Under the name Denver, Kansas & Gulf, this road is being extended from Kiowa, Kan., the northern terminus of the D., E. & G., northeasterly to Medicine Lodge. From the last named point it will run northwesterly to a connection with the Englewood branch of the Atchison, Topeka & Santa Fe to Belvidere. Grading is completed to Medicine Lodge and tracks will soon be laid to this point. The work is being done by the Kansas Construction Co., which has sublet parts of it.

Denver, Kansas & Gulf.—See Denver, Enid & Gulf.

Erie.—This company has bought about 100 acres of land at Little Ferry, N. J., extending from the New York, Susquehanna & Western tracks to the Hackensack river. It is understood that new yards will be built on this land.

Georgia, Southwestern & Gulf.—Chartered in Georgia to build from Dawson via Albany to a point in Washington County, Florida. The new road is to have $300,000 capital. The incorporators are: W. M. Legg, H. J. Brewton, A. H. Russell, M. D. Powers, W. M. Gordon, Jr., of Georgia; W. H. Milton, Miami, Fla.; E. V. Babcock and F. R. Babcock, of Pittsburg; E. S. Peter and J. H. Pope, of Chicago.

Grand Trunk Pacific.—Location surveys have been made for

about 760 miles of the 790 miles comprising the Prairie section. Grading has been extended on this section to a point 165 miles west of Winnipeg.

HALIFAX & SOUTHWESTERN.—It is expected that this line, 236 miles long, under construction between Halifax, N. S., and Yarmouth, will be finished by August 20, and that regular train service will be established in October.

INDIANA, CLEARFIELD & EASTERN.—See New York, Pittsburg & Chicago Air Line.

INDIANAPOLIS, HUNTINGTON, COLUMBIA CITY & NORTHWESTERN (ELECTRIC).—This company, recently incorporated, has made a mortgage to the Central Trust Co., of Indianapolis, securing an issue of $1,500,000 five per cent. bonds of 1936. The company proposes to build a line from Indianapolis, Ind., to Goshen, via Columbia City and Huntington, about 150 miles, and the mortgage covers the division from Huntington to Goshen, 60 miles. Contracts for the grading, track and overhead work on this section have, it is reported, been let to M. B. Ryan, Silver Creek, N. Y. C. E. Merrifield is President, with office at Indianapolis, and I. D. Wiest is Secretary, Treasurer and General Manager.

INDIAN VALLEY.—See Western Pacific.

INLAND EMPIRE.—It is announced that the Spokane & Inland will be extended from either Moscow, Idaho or Palouse, Wash., to the Snake river, and thence to Lewiston, Idaho, 150 miles. The branch line from Spokane to Lake Pend d'Oreille, 56 miles, will, it is expected, be in operation within a year. This branch parallels the projected line of the Spokane-Lake Pend d'Oreille Rapid Transit line.

MCCLOUD RIVER.—This company is about to close contracts for extending its road 13 miles west from McCloud, Cal.

MEXICAN ROADS.—A concession has been obtained from the Government to build a road from Guiterrez, on the Mexican Central, to Chalchihuites, and also a line from Guiterrez to Nieves, with a branch line to Ciudad de Jerez. The Rothchilds are reported to be behind this project, the purpose being to develop mines in which they are interested.

MISSOURI & NORTH ARKANSAS.—This company, recently incorporated as the successor of the St. Louis & North Arkansas, has been authorized by the shareholders to contract with the Allegheny Improvement Co., of Illinois, to extend the line from Seligman, Mo., the northern terminus, to Joplin, Mo., 50 miles, and also from Leslie, Ark., the southern terminus, southwesterly to a point on the Mississippi river, either Helena or Memphis, about 140 miles. (See St. Louis & North Arkansas, July 13, p. 12.)

MISSOURI ROADS.—It is stated that incorporation is to be asked for at once for an interurban road from Jefferson City, Mo., to Sedalia, 83 miles. C. W. Thomas, of Jefferson City; Nelson Leonard, of Bunceton, and J. H. Decker, of Sedalia, are mentioned in this connection.

NATIONAL RAILROAD OF MEXICO.—This company is planning to make standard gage the present narrow gage line from Gonzalez Junction to Mexico City, 231 miles. This division formed a part of the main line until a few years ago, when a cut-off was made between the two points named. The 54 miles of road between Gonzalez and Acambaro will be made standard gage at once at a cost of about 750,000, and the estimated cost of standardizing the entire line is about $2,000,000.

NEW PARK & FAWN GROVE.—This road, running from Stewartstown, Pa., to Fawn Grove, 12 miles, was formally opened on Aug. 9th.

NEW YORK CENTRAL & HUDSON RIVER.—It is reported that the Pennsylvania, Beach Creek & Eastern Co., recently incorporated as a holding company for the New York Central's coal properties in the Beach Creek region, will build a road from a point near Williamsport on the New York Central to connections with other railroads. The Erie, D., L. & W., Lehigh Valley and Pennsylvania all have lines in this region.

This company has bought about 50 acres of land at Little Ferry, N. J., which is directly west of the Weehawken terminals of the West Shore. It is said that the land will be used for additional yards. See Erie Railroad.

NEW YORK, ONTARIO & WESTERN.—The Scranton division of this road running from Cadosia, N. Y., on the main line southwesterly to Scranton, Pa., 54 miles, is being double-tracked. The work is being done by the company's forces.

NEW YORK, PITTSBURG & CHICAGO AIR LINE (ELECTRIC).—It has been announced that there is a project under way to build a low-grade double-track electric railroad from New York to Pittsburg, with Chicago as the ultimate western terminal. The road is to be built under the management of Joseph Ramsey, Jr., formerly President of the Wabash. Mr. Ramsey has made the following statement in regard to the project:

"We expect to make a start this fall and begin work next spring, hoping to complete the line between Pittsburg and New York within three years. The cost of the line between Pittsburg and New York is estimated to be between $75,000,000 and $100,000,000, all of which has been pledged, the bulk of it by foreign capitalists. It would not be wise for me to give details or names now.

"The line is not merely a preliminary survey, but a final location that has been revised three times. Three corps of engineers have been busy for three years. It is the best possible short low-grade line to be secured through Pennsylvania between Pittsburg and New York. The extension of the road west to Chicago from Pittsburg will be taken up when the line east to New York is completed."

The new road is to be operated by electric locomotives. It is to be 65 miles shorter between New York and Pittsburg than the Pennsylvania, and, when extended to Chicago, will be 108 miles shorter than the Pennsylvania, the shortest line at present between those points. The Pennsylvania mileage between New York and Pittsburg is 445 miles, as against 380 miles by the projected line, and 330 miles by a perfect air line. Between New York and Chicago the distance over the Pennsylvania is 913 miles; by the New York Central-Lake Shore route, 980 miles, and by the Erie, 999 miles. The new company expects to secure a line between 805 and 815 miles long. The air line distance between New York and Chicago is 748 miles. The announcement of the project was made in connection with the filing of papers for the consolidation of the Indiana, Clearfield & Eastern, the Allentown, Tamaqua & Ashland, and the Brush Creek & Crow's Run railroads, three projected lines in Pennsylvania. The two former will, it is reported, form the main part of the new road in Pennsylvania. The route of the new road as given in the despatches is from Pittsburg east along the Allegheny river to its junction with the Kiskiminetas opposite Freeport, along that stream for several miles to a point near Leechburg, where it is to cross Crooked creek and run up that stream through South Bend, Shelocta and Creekside; thence across Black Lick creek and the Divide to the west branch of the Susquehanna river, which is to be crossed at Cherry Tree, on the New York Central's Pennsylvania division in the Clearfield region. From Cherry Tree the route is via Westover, near Irvona, on the Bells Gap line of the Pennsylvania at Beccaria, across the height of land in the Allegheny mountains near Sandy Ridge, at an elevation 400 ft. lower than the elevation reached by the Pennsylvania's main line at Gallitzin, where it crosses the summit. This low elevation is to be obtained by a tunnel nearly a mile long, after passing through which the road is to descend the eastern slope of the mountains, crossing the Bald Eagle Valley near Dix station, a short distance from Tyrone; thence running through Loveville, Gatesburg, Pine Grove Mills, Shingleton, Tusseyville, and along Penn Creek to New Berlin. Here branches may be built to Sunbury, on the Philadelphia & Reading, and Northumberland, on the Delaware, Lackawanna & Western. The main line is to continue eastward, crossing the valley of the Susquehanna at Selins Grove; thence following Mahanoy Creek, through Ashland and Mahanoy to Buck mountain, where a 3,000-ft. tunnel is to be built. By way of Tamaqua the road then is to reach Lizard Creek, and the second 5,000-ft. tunnel is to be built here to Jordan's Valley; thence the route is to Allentown on the Lehigh river, Easton on the Delaware, and from Easton into Jersey City.

NITANNY.—Incorporated in Pennsylvania with $40,000 capital to build a line four miles long in Clinton County from Cedar Springs north to Millhall, where connection is to be made with the Pennsylvania division of the New York Central. W. C. Lingle, of Patton, is President.

PENNSYLVANIA, BEACH CREEK & EASTERN.—See New York Central & Hudson River.

PENNSYLVANIA LINES WEST.—There has been appropriated $10,000,000 with which to bore the Pittsburg tunnel of the P., C., C. & St. L. through to Daylight, and build a new union station at Fifth avenue and Grant street, opposite the old St. Paul Cathedral site. The tunnel will be widened to 150 ft. and aqueducts will be placed in the streets the road crosses, making it possible to maintain a high rate of speed through the tunnel.

PITTSBURG, HARMONY, BUTLER & NEWCASTLE (ELECTRIC).—Contracts have been let for the building of this line connecting the cities included in the above name. The distance is about 70 miles, and an issue of $3,500,000 bonds has been made. Union Trust Company, Trustee.

ST. LOUIS & NORTH ARKANSAS.—See Missouri & North Arkansas.

ST. LOUIS & SAN FRANCISCO.—President A. J. Davidson recently made an overland trip over the route of a proposed new branch line, 150 miles long, which is to run from Dublin, Tex., on the Fort Worth & Rio Grande division, north to Thurber, on the Texas & Pacific, 50 miles, and from Dublin south to Lampasas, 100 miles. There are extensive coal mines at Thurber.

According to a report from Austin, Tex., it has been announced

by President Davidson that work on an extension of the Fort Worth & Rio Grande division from its present terminus at Brady south to San Antonio, 150 miles, will soon be begun.

Spokane & Big Bend Electric.—The President of this road, which is projected between Spokane, Wash., and Davenport, 120 miles, is quoted as saying that the road will be in operation before June, 1907. Surveys have been completed and 90 miles of the right of way has been bought. It is stated that work will begin this month.

Texas Northern.—This company has been incorporated in Texas to build from Fort Worth, Tex., south to Egan, and from that place northeasterly to Dallas, 60 miles in all. The general offices are at Fort Worth and the incorporators are: Oscar Wells, G. H. Colvin and J. B. Daniel, of Fort Worth; Rhoades S. Baker, Sidney Reinhard, Royal A. Ferris and Henry E. Jackson, of Dallas; W. A. McDonald, of Cleburne, Tex.; B. P. McDonald, of Fort Scott, and David Bedell, of Iola, Kan.

Valdez, Marshall Pass & Northern.—Work is begun on this line from Valdez on the bay of that name in Alaska to Eagle City on the Yukon river, 412 miles. About 10 miles of this line has been graded. The company has $10,000,000 capital stock and $3,000,000 first mortgage, series A, 5 per cent. bonds of 1936 authorized. The bonds are subject to call at 105 and about $400,000 have been issued. The first 100 miles of road is to be built and equipped with the proceeds of the bonds issued and to be issued.

Versailles & Sedalia.—Work is under way on this road running from Versailles, Mo., northeasterly six miles to the property of the Missouri Cannel Coal Mining Co. Grading is completed half way. The maximum grade is 2 per cent. and the maximum curvature 3 per cent. J. Applewhite is President and H. A. Bailey, Chief Engineer. The general offices of the company are at Versailles.

Washington & Gettysburg.—Incorporated in Pennsylvania with $80,000 capital to build a line from Gettysburg, Pa., at the intersection of the Western Maryland and the Gettysburg & Harrisburg, to Harpers Hill in Freedom Township, Adams County, eight miles. J. W. Le Gore, of Le Gore, Md., is President, and the Directors are W. H. O'Neill and W. T. Ziegler, Gettysburg; J. R. Birkholder, of Lancaster; R. S. Potter, of Philadelphia; C. A. Welker and W. B. Stanbaugh, of Woodsboro.

West Coast Traction.—This company has been incorporated in Washington, with $450,000 capital, to build a line from Olympia, Wash., to Tacoma, 320 miles, including branches. The incorporators are: C. H. Weeks and Cyrus Bradley, Spokane; B. J. Weeks, Tacoma; A. D. Leverson, London, England; J. W. Reynolds, Chehalis, and F. B. Hubbard and W. W. Cannon, of Centralia.

Western Pacific.—This company has bought rights of way through the Feather river canyon, northeast of Oroville, and up the Indian Creek Valley, about 80 miles in all, from the Butte & Plumas and the Indian Valley Railroads. An application has been made to the County Clerk of Butte County, California, for the voluntary dissolution of these two companies.

Yakima Valley Traction.—This company has been incorporated in Washington, with $500,000 capital, to build 120 miles of road in the Spokane and Yakima valleys. W. A. Bell, of North Yakima, is interested.

## RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—This company is reported to have bought the Gulf & Interstate, which runs from Beaumont, Tex., to Fort Bolivar on Galveston Harbor, 70 miles. It owns terminals in Beaumont and about 500 acres of land on Galveston Harbor. The capital stock is $71,000, and it has $829,000 authorized first mortgage 5 per cent. bonds of 1915.

Baltimore & Ohio.—The gross earnings of this company for July, 1906, were $6,544,846, an increase of $776,017; net earnings, $2,196,859, an increase of $178,934.

Boston, Revere Beach & Lynn.—This company is offering at 108½ and interest $289,000 first mortgage 4½ per cent. bonds of 1927. The authorized issue is $1,000,000, and the recent sale of this makes the total amount outstanding $850,000. The bonds now being sold are for the purpose of refunding a like amount of 5 per cent. bonds of the Boston, Winthrop & Shore, which has eight miles of narrow gage road near Boston and is owned by the Boston, Revere Beach & Lynn.

Camden Interstate (Electric).—The control of this company has passed to W. C. Sproul, of Chester, Pa., and associates. The company owns the street railroads and lighting plants of Huntington and Kenova, W. Va.; Catlettsburg and Ashland, Ky., and Ironton, Ohio, and lines connecting these places, operating altogether about 50 miles of road. W. C. Sproul is President of the Kanawha Valley Traction Co., and also controls it. The last named road owns street railroads in Charleston, W. Va., and the Camden Interstate is extending its line to that point from Huntington, 50 miles.

Canadian Northern.—The $3,809,140 first mortgage, 6 per cent. bonds of the Qu'Appelle, Long Lake & Saskatchewan are to be retired by being exchanged for 30-year 4 per cent. mortgage debenture stock of the company, guaranteed by the Canadian Northern, which recently purchased it. Every $100 in bonds is to be exchanged for $107 in debenture stock, while the scrip certificates outstanding issued in payment of interest on the old bonds will be exchanged for 30 per cent. of their face value.

Canadian Pacific.—This company has sold 300,000 acres of timber land on Vancouver Island, formerly the property of the recently acquired Esquimalt & Nanaimo, to the MacLaren Lumber Company for a price said to be $10 an acre.

Central of Georgia.—The earnings of this company during the fiscal year ended June 30, 1906, were sufficient to continue the payment of interest on all three classes of income bonds, begun in 1905, and to leave a surplus of $500,671 after charges, an increase of $396,154. The gross earnings were $11,396,123, an increase of $1,261,068; net earnings, $3,160,910, an increase of $443,821. Fixed charges, including interest on equipment trust obligations and on funded debt and rentals, increased from $2,110,936 to $2,184,860, leaving a balance of $1,250,671, out of which was paid the $750,000 5 per cent. interest on the $4,000,000 first preference income bonds, $7,000,000 second preference, and $4,000,000 third preference. There was no change in mileage during the year.

Chicago, Indiana & Eastern.—This company, which owns 43 miles of road between Converse, Ind., and Muncie, and has been in the hands of a receiver since September, 1904, earned during the three months ended May 31, 1906, $105,459. The net earnings were $16,973, this rate being about 70 per cent. more than in the year before the road went into the hands of the receiver.

Chicago Union Traction.—A protective committee of stockholders of the Chicago West Division Railway has been formed for the purpose of fighting the proposed reorganization plan of the Chicago Union Traction lines. The committee consists of Byron L. Smith, Cyrus H. McCormick, Chauncey Keep and John F. Bass.

Cincinnati, Hamilton & Dayton.—Testimony given on August 13 at the hearing before a referee in the interests of President Bradford, of the Chicago, Indianapolis & Louisville, showed that J. P. Morgan & Co. bought C., H. & D. stock at $165 a share, instead of $160, as has been supposed heretofore. If, as is understood, the firm bought 75,000 shares, the purchase price was $12,375,000, instead of $12,000,000.

Grand Trunk Pacific.—The Grand Trunk Pacific Town & Development Co. has been incorporated in Canada with $5,000,000 capital.

Gulf & Interstate.—See Atchison, Topeka & Santa Fe.

Intercolonial.—The Minister of Railways and Canals announces that it is the intention of the Canadian Government to purchase within a short time several branch railroads in this province which connect with the Intercolonial.

Missouri & North Arkansas.—This is the new name of the St. Louis & North Arkansas, recently reorganized.

New York, Ontario & Western.—The statement of earnings for the year ended June 30, 1906, shows that the troubles in the Pennsylvania coal region during the last few months of the fiscal year were enough to more than offset the increases in the earnings of this road made during the first nine months. The gross earnings were $7,265,057, an increase of $174,169, but the operating ratio increased from 71 per cent. to 72 per cent., so that the net earnings fell off to $2,031,770, a decrease of $8,369. The charges increased $85,407, leaving as surplus $1,187,500, a decrease of $93,776.

Norfolk & Western.—With an average of 1,839 miles operated, an increase of 40 miles, the gross earnings of this company for the year ended June 30, 1906, increased from $24,089,260 to $28,487,766, about 18 per cent. The operating expenses increased only 17 per cent., leaving net earnings of $11,423,142, an increase of $1,948,316, 21 per cent., the operating ratio being 60 per cent. as compared with 61 per cent. last year. The surplus after charges was $7,302,353, an increase of $1,588,128.

Qu'Appelle, Long Lake & Saskatchewan.—See Canadian Northern.

St. Louis & North Arkansas.—See Missouri & North Arkansas.

Southern Pacific.—It is definitely understood that at the meeting of the board of directors to be held this week, a dividend will be declared on the $128,307,960 outstanding stock on which no dividend has heretofore been paid.

# GENERAL NEWS SECTION

## NOTES.

The Pacific Mail steamship "Manchuria," early this week, went aground on a reef near Honolulu.

The conductors on the Seaboard Air Line are likely to ask an increase of wages from the management.

The Big Four, it is reported, will soon operate a fruit and vegetable farm to supply its dining car service.

The commercial travelers of Missouri and of Arkansas are planning a campaign for a 2-cent a mile passenger rate.

The Union Pacific has issued an estimate of the corn crop of the state of Nebraska as probably 250,000,000 bushels.

The Houston & Texas Central carried over 3,000 people in excursions into Houston and Galveston on a recent week end.

It is reported that fast freight service will be begun over the St. Louis & San Francisco and the Louisiana & Arkansas.

The assessment of the Seaboard Air Line in Georgia has been raised over $440,000 at the instance of the Controller General.

The Southern Pacific has raised the carload demurrage charge on hay and lumber at San Francisco and Oakland from $1 to $5 a day.

Wages of trainmen on railroads entering Pittsburg have been raised in order to overcome the scarcity of that class of labor at that point.

The city of Chicago is seeking to have all the cars owned by the Pullman Company included in the company's assessment in Cook County.

Another meeting, this time of freight and passenger traffic officials, in connection with the new railroad rate law, began in New York on August 22nd.

The Santa Fe plans to divide its betterment and construction work into three zones, with headquarters respectively at Topeka, Albuquerque and San Bernardino.

The Illinois Central announces that it is planning to put into effect a system of distribution of coal cars which will be entirely equitable to all operators on its lines.

It is reported from Chicago that western roads will abolish preferential rates on coal to each other, making charges to another railroad the same as to the general public.

The elevator capacity of Kansas City is reported to be over 10,100,000 bushels, against 6,670,000 in 1903. The total yearly receipts of grain are now over 72,000,000 bushels.

The meeting of the railroad lawyers and traffic men at Atlantic City, which lasted for a week, adjourned without clearing up several disputed points in regard to the rate law.

The Minnesota Railroad Commission has sent notices to the railroads of the state requesting them to show cause why rates on coal and on farm products should not be reduced.

The Consolidated Railway, the New Haven's subsidiary company controlling electric lines, has made a general increase in wages, the rate of increase being governed by length of service.

The Union Railroad at Pittsburg, and the other railroads of the United States Steel Corporation which have hitherto kept outside, will enter the per diem agreement on September 1st.

County conventions in Nebraska, both democratic and republican, are instructing delegates to vote for a plank in the state political platform calling for a 2-cent a mile passenger fare.

A Virginia judge has decided that the Norfolk & Western no longer possesses the right of condemnation, owing to the repeal of state laws under which the company formerly exercised the power.

The Southern Indiana, the principal Walsh road, has complained to the Indiana Railroad Commission that the Big Four refuses to receive at Terre Haute coal originating on the Southern Indiana.

A Santa Fe train which had been detoured at Fort Worth, Tex., on account of floods, accidentally took the Missouri, Kansas & Texas track out of Fort Worth and ran several miles before the mistake was discovered.

The Great Northern, Northern Pacific and Minneapolis, St. Paul & Sault Ste. Marie have made a 10 per cent. reduction in grain rates in Minnesota, to apply in all territory more than 50 miles distant from terminals.

Employees of the Columbus, Ohio, shops of the Pittsburg, Cincinnati, Chicago & St. Louis to the number of 45 carloads went on a picnic recently to Sandusky, the transportation being furnished by the railroad company.

The Adams Express Company has asked the Interstate Commerce Commission to extend the time for filing its schedules from August 28, when the new rate law goes into effect, to January 1st, as it will not be able to file its schedules earlier.

Pending the decision of certain points at present the subject of negotiation between the Bureau of Animal Industry and the railroads, the bureau is holding back the publication of regulations between meat packers and common carriers.

The Pennsylvania is reported to have given a contract for lighting its future New York terminal station to the Nernst Lamp Company, of Pittsburg. This involves about 1,000,000 candle power and the cost to the road is reported to be $250,000.

The Attorney General of Vermont has brought suit against the Central Vermont Railroad alleging that the state has been compelled to pay higher rates for coal used in one of the state institutions than the rate charged to private concerns.

Owing to the carelessness of a Mexican laborer who was transferring dynamite from a Mexican Central car to a narrow gage car on a mining road in the state of Chihuahua, between 30 and 40 men were killed by an explosion of a carload of dynamite.

Three despatchers on the Louisville & Nashville have been arrested and brought before the United States Court on the charge of discriminating against members of the Telegraphers' union. The warrants were issued in order to bring a test case.

On Monday, August 20, the ninety-ninth anniversary of the first trip of Robert Fulton's steamer "Clermont," the new Hudson River Day Line steamer "Hendrick Hudson" made her maiden trip up the river from New York to Albany. About 3,000 persons were aboard.

According to the secretary of the state board of trade of Pennsylvania, which is leading the campaign for a 2-cent passenger fare, all but three of the nominees of all parties for the legislature in Pennsylvania have already signed pledges to vote for a 2-cent fare.

One of the first complaints which will be filed with the Interstate Commerce Commission under the new rate law is one from the National Petroleum Association, made up of independent oil refiners, on rates on oil in the Chicago, Omaha and St. Paul territory.

The Wisconsin Railroad Commission, which last week ordered a considerable reduction in grain rates has ruled that the existing rates on cheese from concentration points to Milwaukee are excessive and should be reduced in accordance with a tariff which is prescribed.

The railroads comprised in the Trunk Line and Central Traffic Associations will sell special round trip tickets at the rate of one first-class fare plus $2 from all points on their lines to New York City at the time of the return to this country of the Hon. William Jennings Bryan.

The Interstate Commerce Commission has been in session at Toledo in order to consider the question, turned over to it by the state authorities, whether the railroads running through Ohio have a right to charge 3 cents a mile on interstate business in face of the Ohio 2-cent a mile law.

The Imperial Grain Commission which was appointed to investigate the growth, grading, transportation and marketing of wheat throughout Canada, plans to visit New York, Chicago and the grain markets of Europe in the course of its inquiry. Its object is to curb speculation in grain.

The damage done to the Southern Pacific near Langtry, Tex., by the recent floods, is greater than originally reported. At least one man was killed and 15 bridges and culverts were carried away. A second flood occurred on August 13th, adding to the losses caused by the one of two days before.

The Northern Pacific has made the low rate of $25 from Duluth, St. Paul, Minneapolis and Missouri river points to all points in Oregon and Washington in order to attract laborers to those states. The rate applies only to parties of 20 or more traveling on one ticket and gives no privileges in sleeping or dining cars.

A republican candidate for the Pennsylvania legislature at York, Pa., has pledged himself, if elected, to introduce a bill requiring all street railway corporations to sell to working men and women 50 tickets for single trips between 6 and 7 a. m., 12 and 1 p. m., and 5 and 7 p. m., for $1, or at the rate of 2 cents a trip.

The superintendent of the company which is building the extension to Birmingham of the Atlanta, Birmingham & Atlantic has been arraigned before the United States Commissioner at Columbus, Ga., on the charge of peonage, the charge growing out of a complaint made by foreign laborers brought to Georgia by the construction company.

The Indiana Railroad Commission, in behalf of the state, has filed suits to oust the Adams, American and United States express companies from Indiana and to forfeit their charters on the ground that the companies habitually violate the law which requires them to deliver express within the corporate limits of all cities with a population of over 2,500.

The Acting Attorney General of the United States has sent an opinion to the Department of Commerce and Labor holding that ordinary hands commonly employed in construction and maintenance of railroad tracks are not skilled labor within the meaning of the Contract Labor law and consequently cannot be imported from Mexico under contract.

At the Columbia, S. C., shops of the Southern Railway about 100 car repairers and car inspectors, members of the Brotherhood of Railroad Carpenters, struck as a result of the introduction of piece slips on which was recorded the length of time a man was engaged on a particular job. The men object to the piecework system, and apparently feared that this was the first step in its introduction.

Complaint has been made to the Indiana Railroad Commission that it is impossible for many shippers to obtain cars without paying conductors or brakeman $1 or $2 each for them. An elevator company on the Lake Erie & Western testified that it was told by members of a train crew that cars consigned to it had been sold to another firm at $2 each but that it could have cars at the same rate.

The Chicago Board of Trade has written to lines east of Chicago inquiring whether they expect to take any action to meet the present rate of 5 cents from St. Louis to Toledo and Detroit made recently by the Toledo, St. Louis & Western, which compares with a rate of 6 cents from Chicago. It is from 230 to 245 miles from Chicago to Toledo and Detroit, as against 450 to 490 from St. Louis.

The Toledo Car Service Association has adopted new rules to go into effect September 1, under which coal dealers are allowed only 24 hours after notice of the arrival of a car to order its switching and only 48 hours after that in which to unload it. After these periods $1 a day is to be the demurrage charge. Until recently 7 days were allowed in which to serve the switching order and 4 days to unload.

Seven were killed and three fatally injured in a wreck on the Pennsylvania, near Johnstown, Pa., on August 19, when a fast freight which had received a caution card warning it of a wrecking train in the block ahead, ran into the wrecking train, which had stopped at a water plug just beyond track tanks. The engineer of the fast freight had increased his speed in order to take water at the tanks.

The Santa Fe in September will open a school for instruction in telegraphy and station agents' duties at the Topeka Business College. The main telegraph line of the road will be connected with the school so that students will have opportunity to hear actual railroad messages. The school will replace the present system of apprenticeship in which an apprentice worked for three years under an agent or operator.

An agreement has been drawn up, to go into effect September 1 and expiring April 1 of next year, by which on all export grain gulf lines will receive a differential of 5 cents from Kansas City and 4 cents from Omaha, exclusive of "fobing" charges. Under the new tariff the rate on corn will be 21¼ cents and on wheat 22¼ cents from Kansas City to Baltimore, against 16¼ and 17¼ cents respectively on the same grains to gulf ports.

Firemen on the Pennsylvania's new low grade freight line near Harrisburg, Pa., have refused to run the freight engines without helpers, claiming that a 15-mile grade on one section of the line necessitates too hard work for one fireman. It is said that a round trip means shoveling at least 65,000 lbs. of coal. The company has offered brakemen an extra 4 cents an hour if they will help the firemen but they have refused.

Arrangements for switching cars of bulk freight from one road to another at New Orleans, either to or from industries not situated on the lines over which they wish to ship, instead of the drayage system now in force, which has been the cause of considerable friction, have now been brought under an agreement, assented to by seven railroads, under which free and satisfactory movement is expected. Each of the roads agrees to switch for any one of the others, beginning August 27.

Some 200 excursionists from Easton, Pa., on the Lehigh Valley, having, on account of a misunderstanding as to the leaving time from the New York side of the river, missed the last train on which their return tickets were good, spent the night recently in the Pennsylvania station in Jersey City. Word was finally received from the Lehigh Valley management that their tickets would be accepted on the train leaving Jersey City at 6:40 a. m. The excursion rate was $1.

The Brooklyn Rapid Transit controversy in regard to the rate of fare to Coney Island, following Judge Gaynor's obiter opinion on the subject, has been settled for the time being by the company's issuing rebate tickets which will be worth 5 cents each in case the Court of Appeals of the state of New York decides that a 10 cent fare to Coney Island is illegal. In order to make a test case the Attorney General of the state will apply for a permanent injunction to restrain the company from charging more than 5 cents.

The strike in the Aguascalientes shops of the Mexican Central has come to an end through the advice of President Diaz of Mexico. According to a despatch signed by the President of the railroad, President Diaz indicated to the strikers' committee which had appealed to him for support, that foreign capital would be protected to the fullest extent and that the interests of any particular class would not be allowed by combination to interfere with the duty which such enterprises as railroads owe to the government and the general public.

President Stickney, of the Chicago Great Western, has sent a letter to the directors of the Minnesota Transfer Company warning them that in offering to give Armour car lines free switching to and from the Armour stock yards as an inducement to Armour to build a new packing plant at St. Paul they violate the new Interstate Commerce law and make themselves and Armour & Company liable to fines of from $1,000 to $20,000. This is on the ground that such action would be a discrimination against the Union Stock Yards at South St. Paul.

### President Tuttle on the New Hampshire Campaign.

President Tuttle is quoted as follows in regard to the charges made against the Boston & Maine of political domination in New Hampshire:

"The campaign fulminations against this railroad are too extravagant to require any answer in detail. The utterances for the most part carry with them their own refutation. The most active disseminator of these criticisms is Winston Churchill. Mr. Churchill, as a novelist, is capital, but as a novelist he has evidently become accustomed to disregarding facts or twisting them to serve his purpose. In this campaign, true to his literary instincts, he has shown himself a master of fiction."

### Portable Creosoting Plant for the Southern Pacific.

The Southern Pacific has given a contract to the Erie Heating Company, of Chicago, San Francisco and Portland, Ore., for a portable wood preserving, creosoting and Burnettizing plant to be used for treating ties, piles and bridge timbers, with a yearly capacity of about 1,250,000 ties. The plant will be erected at Los Angeles at once and then sent to Guaymas, Mex., to be used for ties on the new Harriman extensions in Mexico. In transit it will occupy six cars. This is the fourth portable creosoting plant on the Harriman lines, besides two stationary plants also in use.

### Twentieth Century Limited Derailed.

The eastbound Twentieth Century Limited was wrecked on August 18 on the Lake Shore & Michigan Southern near Elyria, Ohio. The train ran off a derail at a crossing of the Baltimore & Ohio, and it was reported that the derail was open because a B. & O. freight train was blocking the crossing. The engine, combination car, baggage car, buffet car and one dining car left the track. The engineer and fireman jumped and there were no serious injuries.

### Two Cents a Mile on the N. Y., N. H. & H.

The following announcement has been issued by the New York, New Haven & Hartford in regard to the reduction in passenger fares on the Shore Line:

"The through Boston and New York rate will not be changed until November 1, when our last tariff on the two-cent-a-mile basis (i. e., betwen New Haven and New London) will be put into effect. The new rates to New York from Boston and Providence will be $4.65 and $3.75 respectively, made on the combination of locals as follows: Boston and Providence, 90 cents; Providence and New London, $1.25; New London and New Haven, $1; New Haven and New York, $1.50."

### Manufacturing and Business.

The Quincy, Manchester, Sargent Company, Chicago, has opened a Priest snow flanger department. Orders already booked for the season's delivery include 22 flangers for Canada, and others for Japan, Alaska and Europe.

Mrs. Frances A. W. McIntosh, formerly Advertising Manager of the Standard Tool Co., Cleveland, Ohio, and more recently in the advertising department of *Power*, New York, now has charge of the publicity department of the Norton Company, Worcester, Mass.

The Strauss Bascule and Concrete Bridge Company and the Wallace-Coates Engineering Company, both of Chicago, announce that they have entered into an agreement whereby the latter will act as general sales agents and constructors for Strauss bascule and concrete bridges. Under the new arrangement the Strauss Company will confine itself exclusively to the engineering work in connection with its special designs, and also will give its attention to general engineering. The Strauss Company has its bascule bridges under construction at Rahway, N. J., for the New Jersey Short Line R. R.; at Camden, N. J., for the County of Camden; at Staten Island, N. Y., for the Staten Island Rapid Transit Co.; at Lockland, Ohio, for the County of Hamilton; over the Black river for the Missouri Pacific R. R.; and at Copenhagen, Denmark, for the City of Copenhagen. The second largest single-leaf bascule bridge in the world is the Strauss bridge for the Wheeling & Lake Erie R. R. at Cleveland, O., completed in October, 1905. The same company has also just completed one of its ribbed concrete steel bridges (a four span, single-track structure) at Belvidere, Ill., for the Elgin & Belvidere R. R. The Wallace-Coates Engineering Company was organized a short time ago and incorporated in Maine with a capital of $500,000. It was organized by H. U. Wallace, who was formerly Chief Engineer of the Illinois Central, and who during the past year has been Third Vice-President of the J. G. White Company, New York, and by F. R. Coates, formerly Chief Engineer of the Chicago Great Western, and for the past two years Vice-President of the Thos. Phee Company, Chicago. The company was organized to do a general engineering, reporting, and construction business, and under the arrangement with the Strauss Bascule Bridge Company, will give particular attention to the sale and construction of the Strauss bascule bridge and reinforced concrete arch, also to reinforced concrete building construction. This company has opened an office in Portland, Ore., in charge of O. O. Alexander, General Western Agent.

### Iron and Steel.

According to a Consular report, the Japanese government's steel foundry at Wakamatsen is to be again enlarged, for which $1,250,000 has been appropriated. An additional sum of $5,000,000 will be applied for during the next session of the Diet, and it is expected that the output of iron will be increased from 90,000 to 180,000 tons per year.

The Northern Indiana has ordered 2,100 tons of rails for 1907 delivery from the United States Steel Corporation. Orders aggregating 8,000 tons for small steam roads and electric lines have also been let for 1907 delivery, and about 5,000 tons for small companies have been given for delivery this year. The Missouri, Kansas & Texas is negotiating for 5,000 tons, and has given orders for about 14,000 tons of spikes and bolts. The Western Pacific has ordered 15 steel bridges from the American Bridge Co.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Traveling Engineers' Association.

The Traveling Engineers' Association will meet at the Auditorium Hotel, Chicago, August 28 to 31, inclusive.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Astoria & Columbia River.*—G. W. Talbot, General Manager, has been elected also Vice-President and Treasurer.

*Erie.*—H. W. Andrus, Assistant Claim Agent at Cleveland, Ohio, has been appointed General Claim Agent, with office at New York, succeeding W. C. Cannon resigned, to go into other business.

*Parral & Durango.*—A. G. Field, Acting Auditor, has been appointed Auditor, with office at Parral, Mexico.

### Operating Officers.

*Boston & Maine.*—D. W. Sanborn, General Superintendent, is to retire on September 1st. C. E. Lee, Assistant General Manager, will succeed Mr. Sanborn, and the office of Assistant General Manager will be abolished.

*Cincinnati, Hamilton & Dayton.*—G. A. Waldo, formerly Superintendent of Car Service, has been reappointed to that position, succeeding W. C. Andrews, resigned.

*St. Louis & San Francisco.*—E. D. Levey has been appointed to the new office of Assistant Superintendent of Car Service at Springfield, Mo.

*St. Louis, Iron Mountain & Southern.*—H. L. Hungerford, who was recently appointed Superintendent at Wynne, Ark., was born in Michigan in 1867, and began railroad work in 1883 as an operator on the Michigan Central. In 1890 he went to the Richmond & Danville as train despatcher, and two years later was appointed chief despatcher of the Mobile & Birmingham. He was later appointed Trainmaster and Car Accountant and then General Superintendent of that road. When the Mobile & Birmingham was absorbed by the Southern in 1899, Mr. Hungerford went to the Mobile & Ohio as chief clerk to the Superintendent. The next year he was made Trainmaster and in 1905 Superintendent of Terminals. In February, 1906, he was appointed Superintendent of Terminals, at Little Rock, of the St. Louis, Iron Mountain & Southern, where he remained until transferred to his present position.

*Parral & Durango.*—R. J. Long, General Freight and Passenger Agent, has been appointed Assistant Manager, with office at Parral, Mexico.

*Wrightsville & Tennille.*—D. R. Thomas, who was recently appointed Secretary and Superintendent, was born in North Carolina in 1866. He began railroad work in 1884 as a clerk on the Richmond & Danville. After becoming operator on that road, he went to the Norfolk & Western, where he served as operator and agent at various points. In 1889 he went to the Wrightsville & Tennille, where he was train despatcher and later Car Accountant, being appointed in 1894 Secretary, Treasurer and Trainmaster. In 1901 he was made Auditor and Secretary, holding this position until appointed to his present office.

### Traffic Officers.

*Chicago & Eastern Illinois.*—F. C. Reilly, who was recently appointed General Freight Agent, was born in Missouri in 1870, and was educated at Washington University, St. Louis. He entered railroad service in 1887 as a clerk in the general freight office of the St. Louis & San Francisco. He remained with this company as traveling freight agent and later general agent until 1904, when he was appointed Assistant General Freight Agent of the Chicago & Eastern Illinois. From this position he was promoted to General Freight Agent on Aug. 1, 1906.

*Dominion Atlantic.*—F. H. Armstrong, General Passenger Agent, has resigned. R. U. Parker has been appointed Acting General Passenger Agent, with office at Kentville, Nova Scotia.

*Mexican Central.*—J. C. McDonald, who was recently appointed General Passenger Agent, began railroad work in 1895, when he was 17 years old, as agent and operator on the Southern Pacific. In 1897 he was made traveling freight and passenger agent of this company at Los Angeles, Cal. The next year he was appointed agent at Pasadena, Cal., and in 1901 went to the National of Mexico as chief clerk in the traffic department. Four years later he was appointed general agent at San Francisco for the Mexican Central, and in February, 1906, was made Assistant General Passenger Agent, which position he held until his recent promotion.

*New York Central & Hudson River.*—The duties of Industrial Agent will hereafter be performed by F. L. Pomeroy, Freight Traffic Manager, the office of Industrial Agent having been made vacant by the death of Samuel Goodman.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe (Coast Lines).*—H. C. Phillips, heretofore Chief Engineer of the San Francisco & Northwestern, which is controlled by the Santa Fe, has been appointed Chief Engineer of the A., T. & S. F. Coast Lines, with office at Los Angeles, Cal., succeeding R. B. Burns, deceased.

*International & Great Northern.*—A. L. Bowers, Superintendent in charge of Buildings, Bridges and Water Service, has resigned, and the authority of O. H. Crittenden, Resident Engineer at Palestine, Texas, has been extended over the Bridges, Buildings and Water Service departments.

*Lake Shore & Michigan Southern.*—O. M. Foster, general road foreman of engines, has been appointed Assistant Master Mechanic at Elkhart, Ind., succeeding Joseph Chidley, promoted.

*Pennsylvania Lines West.*—F. S. Irvine has been appointed to the new office of Right of Way Engineer in the real estate department.

*San Francisco & Northwestern.*—See Atchison, Topeka & Santa Fe Coast Lines.

## LOCOMOTIVE BUILDING.

*The Morelia & Tacambaro* has ordered three locomotives from the Baldwin Works.

*The Duluth, Missabe & Northern* is reported as in the market for 12 to 14 locomotives.

*The Western Pacific*, it is reported, has ordered 20 locomotives from the Baldwin Works.

*The Kansai Railroad of Japan* is having three locomotives built by the American Locomotive Co. at its Pittsburg works.

*The Mexican Central* has ordered 32 oil burning consolidation locomotives from the American Locomotive Co. for November, December and January delivery. These engines will each weigh 198,700 lbs., with 179,000 lbs. on drivers.

## CAR BUILDING.

*The Pere Marquette* is in the market for 500 gondola cars.

*The Erie* has just completed a new hospital car at its Buffalo shops.

*The Colorado & Southern* is asking prices on several hundred dump cars.

*The Detroit, Toledo & Ironton* is again reported in the market for new equipment.

*The Mexican Southern* has ordered two baggage cars from the Mexican Car & Foundry Co.

*The Union Refrigerator Transit Co.*, Milwaukee, Wis., may build a few cars at its own shops to replace destroyed numbers.

*The Illinois Traction System* has ordered from the St. Louis and the American Car companies 27 cars, which are to be duplicates of those now in operation.

*The Pennsylvania*, it is reported, has notified the Postoffice Department that it will substitute steel mail cars for the wooden ones now in use. Seventy-five of these cars will be provided for immediate use.

*The Missouri, Kansas & Texas* has ordered one private car from the American Car & Foundry Co., and has under consideration the building of one additional motor car, but nothing definite has so far been decided upon.

*The Spokane International* has ordered six passenger coaches and three baggage and express cars from the Wason Manufacturing Co., for September delivery. These cars are first class in all particulars, and the style of cars about the same as are used on the New York, New Haven & Hartford road.

*The Illinois Central*, as reported in our issue of August 10, has ordered 20 coaches, five chair, two mail, 10 baggage and eight combination mail and baggage cars from the Pullman Co., all for January and February, 1907, delivery. The coaches and chair cars will be 67 ft. 11 in. long, 10 ft. 5 in. wide, and 14 ft. $5^{11}/_{16}$ in. high, over all. The mail cars will be 63 ft. 9½ in. long, 10 ft. ¼ in. wide, and 14 ft. 3 in. high, over all. The baggage cars will be 64 ft. 2 in. long, 10 ft. 4¼ in. wide and 14 ft. 2¾ in. high, over all. The combination cars will be 68 ft. 10 in. long, 10 ft. 4¼ in. wide and 14 ft. 2¾ in. high, over all.

*The Canadian Pacific*, as reported in our issue of August 3, has placed orders for 15 first class cars with smoking room, five first class cars without smoking room, five first class suburban cars and 10 baggage and express cars at its Angus shops. The first class and suburban cars will be 65 ft. long, over frame; the baggage and express cars will be 60 ft. long, over frame, and all cars will be 9 ft. 10½ in. wide, over frame. The special equipment for all includes:

| | |
|---|---|
| Brake-beams | Simplex |
| Brakes | Westinghouse |
| Couplers | Tower |
| Curtain fixtures | Forsyth |
| Curtain material | Pantasote |
| Draft rigging | Miner Tandem |
| Heating system | Gold |
| Vestibules | Pullman |

*The El Paso & Southwestern* has ordered two chair, one combination dining and passenger, one combination smoking and observation, one dining, one postal and two 66-ft. baggage cars from the Pullman Co., all for August, October and December delivery. The chair cars will be 78 ft. long, 10 ft. 4¼ in. wide and 14 ft. 2 in. high, over all. The combination dining and passenger car will be 80 ft. 6 in. long, 10 ft. 4¼ in. wide and 14 ft. 3 in. high, over all. The combination smoking and observation car will be 72 ft. 6 in. high and 10 ft. 4¼ in. wide, over all. The dining car will be 78 ft. long, 10 ft. 4¼ in. wide and 14 ft. 2¾ in. high, over all. The postal car will be 63 ft. 11 in. long, 10 ft. 4¼ in. wide and 14 ft. 3¼ in. high, over all. The special equipment for all includes:

| | |
|---|---|
| Axles | Pullman |
| Brake-beams | National Hollow |
| Brake-shoe | Streeter & Christie |
| Brakes | Westinghouse |
| Couplers | Janney |
| Curtain fixtures | Forsyth |
| Curtain material | Pantasote |
| Draft rigging | Waugh |
| Dust guards | Symington |
| Heating system | Safety Car Heating & Lighting Co. |
| Light | Pintsch |
| Roofs | Pullman |
| Springs | Railway Steel Spring Co. |
| Trucks | Pullman |
| Vestibules | Pullman |

## RAILROAD STRUCTURES.

Atlanta, Ga.—The Gate City Terminal Co., which has charge of the terminal facilities in Atlanta for the Atlanta, Birmingham & Atlantic and the Seaboard Air Line, has let a contract for grading and excavating for a new freight house to Lane Brothers & Co., of Lynchburg, Va. The cost of the work will be about $500,000.

Cumberland, Md.—Local reports state that the Western Maryland is securing a large tract of land in Mineral County, W. Va., opposite this city, as a site for large shops.

Harahan, La.—A fire recently destroyed the Illinois Central machine shops and boiler room at a loss of nearly $50,000.

Los Angeles, Cal.—Local reports state that the Atchison, Topeka & Santa Fe has approved designs and let contracts for reinforced concrete roundhouse buildings aggregating in cost $250,000. The plans include a large roundhouse at Bakersfield, to cost $150,000; buildings at San Bernardino, to cost $45,000, Point Richmond $42,000 and a roundhouse at Williams $22,000.

Montgomery, Ala.—The Louisville & Nashville is reported planning to enlarge and rebuild its shops at a cost of $50,000.

Mt. Vernon, Ill.—The Chicago & Eastern Illinois is reported to be planning to build a reservoir to have a capacity of 20,000,000 gallons two miles east of this place.

North Towanda, Pa.—Bids are shortly to be asked for putting up a brick passenger station 36 ft. x 104 ft. for the Lehigh Valley, also for train sheds, to be 475 ft. long.

Omaha, Neb.—Bids were recently asked by the Chicago & North-Western for putting up a large office building 50 ft. x 80 ft., to cost about $100,000.

Pittsburg, Pa.—The Pennsylvania, according to local reports, has bought ground and will spend $10,000,000 for a new union passenger station at this place.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Atlanta, Birmingham & Atlantic.—An officer writes that the contract recently let to C. D. Smith & Co. is for work on its line from Talladega, Ala., through Renfrew Gap, crossing the Coosa river near Grovers Ferry and the Central of Georgia track about one mile south of Vincent, thence via a point just north of Harpersville, Shelby County, Alabama, through Big Narrows, in the same county, down Peavine creek to Pelham. The company is building several hundred miles of road and has let contracts for the line between Brunswick, Ga., and Birmingham, Ala., with the exception of about 20 miles from Pelham into Birmingham. Track has been laid to a point near Warm Springs, Ga., which is 264 miles from Brunswick. The line is being built on a 6 deg. maximum curve, with 1 per cent. maximum grades compensated for curvature. The work includes a large number of steel bridges and one tunnel. The company also has under contract 75 miles of line from Atlanta south through Fairburn, Senoia and Woodbury, to Chalybeate, where connection is to be made with the Brunswick-Birmingham line. The Callahan Construction Co. has this contract. There is also a plan for a line from Atlanta west about 100 miles, connecting with the Brunswick-Birmingham line and forming an air line from Atlanta to Birmingham.

Canadian Northern.—A. B. McRae, Fort Rouge, Man., has the contract for building 30 miles of road from Oak Point.

Canadian Pacific.—Sir Thomas G. Shaughnessy, President of this road, is quoted as saying that the company is to build a line through the mineral district on the Quebec side of Lake Temiskaming, and, probably, a spur to Cobalt, Ont.

Carolina Mineral.—Incorporated in North Carolina with $200,000 capital to build a line 40 miles long from Charlotte, N. C., on the Seaboard Air Line and the Southern Railway south through Mecklenburg and Union counties, North Carolina, to Lancaster, Lancaster County, S. C., on the Lancaster & Chester and the Southern. All but five miles of the road will be in North Carolina. J. Moore, of Waxhaw, N. C., and J. F. Keller, D. H. Kulp, S. N. Root and N. Musser are interested.

Chicago & North-Western.—The Wolf River Railway Company, recently incorporated in Wisconsin by officers of the C. & N.-W., has begun work on its proposed line from Bowler to Crandon.

Chicago, Joliet & Kansas City.—A meeting of the shareholders of this company has been called for October 15 to vote on a proposition to increase the capital stock from $1,000,000 to $12,000,000, of which amount $2,000,000 is to be preferred stock. The meeting is also to authorize an issue of $10,000,000. The company was incor-

porated in Illinois in March, 1905, to build a road from Chicago to Joliet, with branches in Mercer, Bureau, Rock Island, Kendall, Grundy and DeKalb Counties. E. F. Hoagland is Secretary.

CHICAGO, MILWAUKEE & ST. PAUL OF SOUTH DAKOTA.—This company has been incorporated with $4,000,000 capital to build from the Missouri river through South Dakota to the Montana state line.

CHICAGO, ROCK ISLAND & PACIFIC.—Adams & Peters, it is said, have begun work on a line 27 miles long for this company near Alexandria, La.

COLVILLE & COLUMBIA RIVER.—Under this name a company has been incorporated in Washington with $250,000 capital to build a 19-mile road between Colville and Myers Falls, Wash., with steamship connections on the Columbia river. The incorporators are: A. Wilkes, W. B. Aris, Ellen C. Gilluly, G. K. Gilluly and H. C. Rice, all of Spokane.

ELECTRIC TERMINAL OF KANSAS CITY.—Incorporation has been granted this company in Missouri, with $300,000 capital, to build a line five miles long wholly within the limits of Kansas City. The incorporators are: John Mayer, Parsons, Kan.; G. H. Kahmann, B. Steele, W. E. Winner and H. G. Pert, all of Kansas City. This is a revival of the Brush Creek project promoted by Willard E. Winner, who had a franchise, since expired. It is said that the Missouri Pacific is interested.

FOX RIVER (ELECTRIC).—An officer writes that this company, previously reported as the Fox River Valley, of which O. C. Beahnke, Manitowoc, Wis., is Manager, has already completed eight miles of track-laying and all the grading on its projected line from Manitowoc, Wis., south via Newton, Hika, Cleveland and Seven Mile Creek to Sheboygan, 30 miles. The Wisconsin Construction Co. has had the contract for the grading.

GREAT NORTHERN.—The contract for grading the Midland & Manitoba from Portage la Prairie, Man., has been let to John Prout, of that city.

HILLSBORO, KIMMSWICK & NORTHERN.—This company has been granted franchises to build a line from Meramec, Mo., to Hillsboro via Kimmswick.

JOHNSTOWN, EBENSBURG & NORTHERN.—Under this name a company has been incorporated in Pennsylvania with $250,000 capital stock to build 25 miles of road in Cambria County. G. E. Daniels, Johnstown, Pa., is President.

MIDLAND & MANITOBA.—See Great Northern.

MISSOURI, KANSAS & TEXAS.—Surveys are reported for a line from Wichita Falls, Tex., to Lawton.

MOBILE & OHIO.—An officer writes denying the report that this company has appropriated money to double-track the road from Jackson, Tenn., to Corinth, Miss. The company is reducing grades and curves to a maximum of ½ per cent. grades and 4 deg. curves.

MORELIA & TACAMBARO.—This company has begun work on a new railroad in Mexico, to run from Irapuato, state of Guanajuato, on the Mexican Central, south via Peruandiro, State of Michoacan, to Morelia on the Mexican National, Tacambaro, and then west to Ario, in all about 225 miles. The cost of building the line will be about $4,000,000. The company plans ultimately to extend its lines south and east along the Balsas River from Ario to the Pacific coast. The Mexican Government has granted concessions, giving rights of way and terminals, and exemption for five years from import duties on construction material. The State of Michoacan agrees to pay $30,000 Mexican for each 10 kilometers built in the State. The contract for the first section of about 50 miles has been let to Hampson & Smith, of Mexico City, and for 5,000 tons of 60-lb. rails to the Pennsylvania Steel Company. The road is capitalized at $6,000,000. Edson J. Chamberlin, formerly general manager of the Canada Atlantic, is president; Gilbert E. Fauquier, of the Pacific Construction Company, of Ottawa, is vice-president and general manager. Jacob L. Greatsinger, former president of the Brooklyn Rapid Transit Company, and Albert J. Payton, of the banking house of A. J. Peyton & Co., of New York, are also interested. (See Construction Record.)

NEW YORK, AUBURN & LANSING.—An officer writes that track has been laid for 15 miles on this road now under construction from Auburn, N. Y., to Ithaca, 35 miles. The Auburn Construction Co., of Auburn, N. Y., who are the contractors, expect to have the work completed by October of this year. The line is to be operated by both steam and electricity. A. H. Flint, 35 Wall street, New York City, is President.

NEW YORK, NEW HAVEN & HARTFORD.—The contract for elimination of the Dudley street grade crossing in Boston has been awarded to J. K. Ryan, of New York. The estimated cost of the improvement is $400,000.

NORTHERN PACIFIC.—Reports from the state of Washington say that this company has acquired the Port Angeles Peninsula and the Port Angeles & Olympia projects. C. M. Levey, Third Vice-President of the Northern Pacific, is quoted as saying that the Port Angeles Peninsula is to be built from Port Angeles southwest to Lake Crescent, and a number of branch lines are also to be built to timber lands in Clallam County. The ferry now in use on the Columbia river at Kalama may be used to connect Everett and Port Ludlow.

NORTH ST. LOUIS & SUBURBAN (ELECTRIC).—This company has filed a petition in the County Court at Clayton, Mo., asking for permission to build and operate an electric road from the city limits to Jennings Station.

PELHAM & HAVANA.—Incorporated in Georgia with $250,000 capital to build a line from Pelham, Ga., on the Atlantic Coast Line, to Havana, Fla., 40 miles. The incorporators are J. B. Martin, Robert Black, John Lane, W. F. Bamberg, H. C. Griggs, J. F. Lewis, Valdosta; C. J. Stephens, Milltown; C. H. Butler, Calvary; H. A. Sanders, Whigham, and W. L. Perkins, Jennings, Fla.

PENNSYLVANIA.—On the new relief line from Morrisville to Newark track laying is to be started at once. With the completion of this division the six-track system from Trenton to Jersey City will be completed. The work on the Morrisville-Newark section includes the building of the new bridge across the Delaware river from Trenton city to Morrisville. The two new tracks will be independent from the four-track system now in service, and in many places will be some distance apart.

PITTSBURG, CONNELLSVILLE & WHEELING.—This projected road, which was surveyed some years ago, may now be built. A. A. Franzheim, of Wheeling, has taken the project up, and it is reported that work is to be begun in the fall. The line is to be 60 miles long, from Wheeling, W. Va., along Wheeling creek into Pennsylvania, thence through Washington and Greene Counties, down Ten Mile creek, crossing the Monongahela river into the coke regions at Masontown, Pa., about 12 miles from Uniontown. The work will be easy.

PORT ANGELES & OLYMPIA.—See Northern Pacific.

PORT ANGELES PENINSULA.—See Northern Pacific.

SANTA FE, LIBERAL & ENGLEWOOD.—Incorporated in Oklahoma to build a line from Englewood, Kan., west to Des Moines, N. Mex., passing through Beaver County, Oklahoma. The offices of the company are to be at Raton, N. Mex. The incorporators are: F. E. Jennison, of New York; J. G. Northcutt and A. Watson, A. W. McHendrie, of Trinidad, Colo.; John Morrow and Thomas D. Lieb, of Raton, and J. H. Albright, of Hooker.

SHREVEPORT & NORTHEASTERN.—At a recent meeting of the stockholders of this company A. K. Clingman, Keithville, was elected President; A. K. Kinnebrew, of Homer, La., First Vice-President; J. B. Ardis, Shreveport, Second Vice-President; C. S. Fullilove, Shreveport, Secretary; Dr. T. E. Schumpert, Shreveport, Treasurer, and J. T. Hardaman, of Homen, Chief Engineer. It was decided to build from Shreveport, La., to Homer, via Minden, thence to Junction City, Ark., where connection is to be made with the Chicago, Rock Island & Pacific.

SOUTHERN PACIFIC.—The new Victoria division of this company, which forms a second Southern Pacific line between Houston and San Antonio and places San Antonio four or five hours nearer a seaport, was recently opened for traffic. This division has been completed by building a connecting link under the name of the San Antonio & Gulf between Stockdale and Cuero. Port Lavaca, which is several hours nearer San Antonio than Corpus Christi, will be greatly benefited as a result of the opening up of the new highway from San Antonio.

This company is reported to be planning to build a coast line from Portland south to San Francisco. The company has secured control of the Coos Bay, Roseburg & Eastern, and work is now under way on the line to connect Coos Bay with Drain, Ore., which is a short distance south of Eugene on the main line. This is supposed to be the initial work in connection with the proposed coast line.

TENNESSEE RAILWAY.—An officer writes that this company, which operates a road from Oneida, Tenn., on the Cincinnati, New Orleans & Texas Pacific south, traversing the coal and timber fields along the new river 28 miles, has given a contract to Walton, Wilson, Rodes & Co., of Knoxville, to build a 20-mile extension. Work is now under way.

UNITED RAILWAYS OF ST. LOUIS.—The United Railways Co. is planning to rebuild all of its 470 miles of lines in and around St. Louis, covering each year between 25 to 30 miles of line. Track-laying and improvements are now being made. The company will also build its cars in St. Louis.

WASHINGTON ROADS.—David T. Ham and others are planning an electric line to run from Big Falls, Wash., along the Pend d'Oreille river to a point north of Newport, 31 miles. A bill has

passed Congress authorizing the company to build a dam across the river near Fox canyon, where the power plant will be placed. Work is to begin early in 1907.

Western Pacific.—The first 20 miles of track west from Salt Lake City have been completed.

Wilkes & Lincoln.—This company has been incorporated in Georgia to build a road from Washington, Ga., to Lincolnton, 50 miles.

Wolf River.—See Chicago & North-Western.

## RAILROAD CORPORATION NEWS.

Auburn & Syracuse Electric.—N. W. Harris & Co., New York, are offering at 104½ $100,000 first and refunding 5 per cent. bonds of 1942, being part of an authorized issue of $2,000,000, of which $1,150,000 is outstanding, the remainder being reserved for future extensions and additions. The A. & S. operates 13 miles of road in Auburn, N. Y., and 24 miles between that place and Syracuse, which city it enters by trackage rights over the Syracuse Rapid Transit.

Boston & Maine.—It is announced that the shareholders have subscribed to 38,457 shares of the 63,319 shares of common stock recently offered to them at the rate of one share of new stock for every five shares already held. (July 27, p. 26.)

The gross earnings of this company for the year ended June 30, 1906, were $39,214,202, an increase of $3,000,957; net earnings, $9,860,834, an increase of $267,329. The surplus, after charges, dividends of 7 per cent. on the common stock and 6 per cent. on the preferred stock, was $217,274, an increase of $140,347.

Chicago & North-Western.—A meeting has been called for Oct. 18 to authorize an increase of the authorized capital stock from $100,000,000 to $200,000,000. There is now outstanding $99,996,165, of which $77,601,045 is common, so that if the increase is authorized it will allow a total issue of $177,604,880 common stock.

Chicago, Milwaukee & St. Paul.—An issue of $24,802,809 of the $25,000,000 treasury common stock is to be issued at par to the holders of the $107,826,300 common and preferred of record on August 29 at the rate of 23 per cent. of their holdings. This will make the total outstanding common stock $82,986,709. The right to subscribe must be exercised on or before Sept. 25.

Consolidated (N. Y., N. H. & H. Electric Lines).—It is reported that a new holding company has been formed to take over the properties of this company in Massachusetts or perhaps the lines in both Massachusetts and Connecticut. The reason given is the Massachusetts law prohibiting ownership directly or indirectly of street railway lines by steam railroad companies.

Coos Bay, Roseburg & Eastern.—See Southern Pacific.

Delaware & Hudson.—The gross earnings for the year ended June 30, 1906, were $12,261,101, an increase of $670,543; net earnings, $4,673,255, a decrease of $12,460, the operating ratio having increased from 62 per cent. to 70 per cent., evidently because of the anthracite coal strike in Pennsylvania during the last quarter of the year. The surplus after charges was $1,659,670, a decrease of $100,397.

See Rensselaer & Saratoga.

Fort Smith & Western.—The St. Louis, El Reno & Western, recently acquired by the Fort Smith & Western, has filed a certificate of a decrease of capital stock from $1,240,000 to $970,800.

Glens Falls.—See Renssalaer & Saratoga.

Missouri, Kansas & Texas.—The gross earnings of this company for the year ended June 30, 1906, were $21,159,145, an increase of $1,118,050; net earnings, $5,744,600, an increase of $641,225. The surplus was $1,244,052, an increase of $402,042.

New York & Long Island.—This company, which is back of the so-called Belmont tunnel, has paid $240,000 for four lots at Fourth street and Jackson avenue, Long Island City.

Norfolk & Western.—A meeting of the shareholders has been called for Oct. 11 to authorize an issue of not more than $34,000,000 convertible bonds, and an issue of the same amount of common stock, making the total authorized issue of common stock $100,000,000. It is announced that the new bonds are authorized for the purpose of providing money likely to be needed for building many spurs to coal mines and for other improvements.

Northern Central.—Townsend, Scott & Sons, Baltimore, have sent to the minority stockholders of this company, which is controlled by the Pennsylvania, a circular letter announcing an effort to get larger dividends on the $17,193,400 outstanding capital stock.

Northwestern Elevated (Chicago).—It is announced that $3,000,000 first refunding mortgage 4 per cent. bonds of 1911, convertible at par into 5 per cent. non-cumulative preferred stock, are to be issued. A corresponding increase in capital stock has been made to provide for the conversion. There are now outstanding $14,000,000 of these bonds. The additional issue is to provide for betterments and extensions heretofore paid out of surplus earnings.

Pennsylvania.—See Northern Central.

Philadelphia Company.—The stockholders have authorized an increase from $30,000,000 to $36,000,000 in the common stock. The increase is for the purpose of reimbursing the company for the purchase of the capital stock of subsidiary roads and for improvements and extensions of the Pittsburg Railways Co. and the Alleghany County Light Co. (June 15, p. 176.)

Rensselaer & Saratoga.—This company has merged with itself a proprietary line, the Glens Falls Railroad, which runs from Fort Edward, N. Y., to Caldwell, 15 miles, and has no bonded debt. The R. & S. is leased in perpetuity to the Delaware & Hudson.

St. Louis, El Reno & Western.—See Fort Smith & Western.

St. Louis, Iron Mountain & Southern.—This company has applied to the New York Stock Exchange for permission to list $1,630,000 additional River & Gulf division first mortgage 4 per cent. bonds of 1933, making the total amount outstanding $24,384,000 out of the $50,000,000 authorized.

Southern Pacific.—A semi-annual dividend of 2½ per cent. has been declared on the $197,849,258 outstanding common stock. This is the first dividend ever declared on the common. The estimated earnings for the year ended June 30, 1906, are as follows:

| | 1906. | Increase. |
|---|---|---|
| Gross earnings | $105,619,113 | $7,478,531 |
| Net earnings | 35,032,464 | 3,485,502 |
| Surplus after charges | 21,560,713 | 8,977,293 |
| Dividend (7%) on preferred stock | 2,769,879 | 2,769,879 |
| Balance | 18,790,834 | 6,207,416 |

This company has bought, for a price said to be over $1,000,000, the Coos Bay, Roseburg & Eastern, which runs from Marshville, Ore., south to Myrtle Point, 26 miles. It is said that this line will be part of a new trunk line between San Francisco, Cal., and Portland, Ore. The C. B., R. & E. has been in the hands of a receiver for some time. According to the balance sheet of June 30, 1897, which contains the latest figures available, the capital stock was then $2,000,000, and there were outstanding $625,000 of the $2,000,000 authorized first mortgage 6 per cent. bonds of 1921.

Union Pacific.—According to an official statement, at a meeting of the directors of the Union Pacific and Southern Pacific held on Aug. 15 the question of dividends was referred to the executive committees which met the next day at 3 p.m. Announcement of the dividends was made to the New York Stock Exchange just before the opening on Aug. 17. A semi-annual dividend of 5 per cent. was declared on the U. P. common stock, of which $195,200,900 was outstanding on June 1, 1906. It was announced that 3 per cent. of the dividend was charged to surplus earnings and 2 per cent. to other income. As the Union Pacific owns $90,000,000 of the Southern Pacific common stock the 2½ per cent. semi-annual dividend declared upon the last named security makes a large increase in the "other income" of the Union Pacific. The previous annual dividend rates on U. P. common have been as follows: 3½ per cent. in 1900, and 4 per cent. thereafter until October, 1905, when a semi-annual dividend of 2½ per cent. was declared, this rate being increased to 3 per cent. in April, 1906. The estimated earnings for the year ended June 30, 1906, were as follows:

| | 1906. | Increase. |
|---|---|---|
| Gross earnings | $67,281,542 | $7,956,593 |
| Net earnings | 30,317,769 | 2,855,534 |
| Surplus after charges | 29,201,844 | 6,416,337 |
| Dividend (4%) on preferred stock | 3,982,032 | Decrease. 324 |
| Balance | 25,219,812 | 6,416,661 |

Wabash.—A meeting of the stockholders and debenture bondholders has been called for October 22 to authorize an issue of $200,000,000 4 per cent. 50-year refunding mortgage bonds dated July 1, 1906. Part of this amount will be reserved to refund existing mortgage bonds and all promissory notes and equipment obligations, while the balance is to be used for betterments, extensions and equipments. This meeting is also to authorize preferred stock to be increased at $16,500,000 and the common stock $81,500,000, and to authorize the exchange of the A and B debenture bonds for the new bonds and the preferred common stock according to terms authorized by the Board of Directors. (June 15, p. 176.)

The gross earnings of the company during the year ended June 30, 1906, were $25,015,378, an increase of $318,778; net earnings, $6,937,491, an increase of $2,744,335.

# GENERAL NEWS SECTION

## NOTES.

Sir William Van Horne, chairman of the Board of Directors of the Canadian Pacific, is quoted as having said in an interview at New York that two miles of line in the interest of the Canadian Pacific will be built in Great Northern territory to every mile that Mr. Hill builds in the Canadian Pacific's territory.

At Jamestown, N. Y., August 24, the Federal Grand Jury brought in further indictments against the Standard Oil Company for securing unlawful freight rates; and the New York Central & Hudson River Railroad was indicted on similar charges. In the indictment against the Standard Oil Company there were 123 counts.

A press despatch from Pittsburg says that the Pennsylvania Lines will revise interstate passenger fares to and from points in the state of Ohio, so as to make them conform to the 2-cents-a-mile basis which governs rates for journeys wholly within that state. For example, the fare from Pittsburg to Cleveland will be calculated at 2 cents a mile for the portion of the distance that is in Ohio, and at the present (higher) rate in Pennsylvania.

According to the *Journal of Commerce*, New York, the Union Pacific, acting on the assumption that the revised Interstate Commerce law will require the road to provide itself with refrigerator cars, has invited bids for 6,000 refrigerator car bodies. It is understood that this means the termination, at the earliest practicable date, of the contract between the Union and Southern Pacific lines and the Armour Car Lines.

The New York Central has for the past three or four weeks been using an electric locomotive and a motor car on a short stretch of track between Kingsbridge and Morris Heights to give steam locomotive enginemen experience in running electrical equipment. Instruction is given between 9 a.m. and 5 p.m. on three days of the week by an engineman who spent a year and a half at Schenectady while the plans for the electric equipment were being worked out. It is expected that at least 80 men will be needed at the beginning of electric operation of trains.

The trunk line railroads terminating in New York have asked the Flour Committee of the New York Produce Exchange to meet them with a view to reducing the free time allowed for the storage of flour. At present, domestic shipments are stored free 20 days and export shipments 60 days, and flour held in cars is charged for at the rate of $4 a car for 10 days. The railroads propose to reduce free time in store houses to 10 days and to raise the rate for car storage to $1 a day. The stiffening of the Interstate Commerce law has evidently made the glaring inequality of the present rates apparent even to the hardened traffic men.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of the Farrar Lumber Co. against the Southern Railway Co. and other carriers. The rate on pine lumber from Southern Georgia points to Chattanooga, Tenn., is two cents per 100 lbs. higher than to Dalton, Ga., but on shipments to Cincinnati, Chattanooga takes a rate two cents lower than Dalton. There is also a dressing-in-transit privilege at Dalton, for which two cents per 100 lbs. additional is charged. The lumber shipped out of Chattanooga is mostly hard wood, the Southern pine lumber brought to that point being practically consumed there. The Commission holds upon complaint against the rate from Dalton that under all the circumstances the lumber rate from Dalton to Cincinnati is not so discriminative nor exorbitant as to justify disturbance at this time, and that the reasons existing for the lower lumber rates from the Southern pineries do not apply to the reshipment of dressed lumber from Dalton. Cleveland and Charleston, Tenn., take the Chattanooga rate on lumber to Cincinnati, but the conditions at those points are not the same as at Dalton, and it is held that no wrongful discrimination results from the existing adjustment of rates.

### Kansas City Southern Shops at Pittsburg, Kan.

Work has been begun on the enlargement of the Pittsburg (Kansas) shops of the Kansas City Southern. These are the principal repair shops of the road, and are at a district terminal, which, of course, necessitates facilities for the handling of road engines. The proposed improvements include the following:

A 16-stall machine and erecting shop, 356 x 152 ft., consisting of a steel frame with brick curtain walls. A 15-stall 90-ft. roundhouse, designed for future extension to 33 stalls. This building will have brick walls and wood posts and roof construction, and will be served by a new 80-ft. turntable. A new coaling station. Plans for this have not been adopted, but the lay-out will probably consist of a locomotive crane and the necessary accessories. A sand house made of wood, resting on concrete foundation. A concrete oil house. A 100,000-gallon elevated metal water tank to feed engines through two 10-in. water cranes and to be supplied from a 250,000-gallon concrete reservoir, to which the water will be raised by compressed air from two 8-in. deep wells which were drilled several years ago. A four engine cinder pit. An electrically operated 46-ft. transfer table to serve erecting shop. This will be overlapped by an electric traveling yard crane of 30 tons capacity, giving connection between the new erecting shop and the present machine shop, and extending over a platform to be built at one end of the present storehouse.

The present roundhouse, coal chute, sand house and water tank are out of date and of insufficient capacity, and it will be abandoned as will also a light transfer table which serves a building 288 x 120 ft. used as a machine, boiler and blacksmith shop for locomotive repairs. This building will be rearranged on the inside and used for boiler and tank work and carwheel machinery. The present car shed and planing mill, 203 x 117 ft.; coach and paint shop, 144 x 107 ft., and storehouse, 173 x 55 ft., will be retained for present purposes. The Arnold Company, Chicago, has been awarded the contract for the designing and construction of the above improvements and the installation of modern power and shop equipment, which will practically double the capacity of the present plant.

### Canadian Railroad Subsidies.

An order-in-council adopted by the Canadian government provides that hereafter railroads will only be paid subsidies on the cost of road construction, without including the cost of rolling stock equipment, which has sometimes been done in the past so as materially to increase the subsidy.

### The Interstate Commerce Law.

The Act to Regulate Commerce, as amended by the Hepburn law of June, 1906, and by other (earlier) laws, has now been issued by the Interstate Commerce Commission in revised form and it is printed in a pamphlet of 59 pages. The pamphlet includes also the acts supplementary to the Interstate Commerce law; the safety appliance acts; the railroad accident law, and the arbitration law of June 1, 1898. A press despatch from Washington says that the 50,000 copies of this pamphlet, which were prepared by the Commission, proved insufficient to meet the demand, from railroads and others, and that an outside publisher in Washington has issued copies of the Commission's publication.

### Revised Interstate Commerce Law in Effect.

The Interstate Commerce law, as revised by the Hepburn law of June, 1906, went into effect on Tuesday of this week, with the exception of the section forbidding railroads to be interested, as owners, in property which they transport. At Washington, on Tuesday, about fifty railroad traffic officers gathered at the office of the Interstate Commerce Commission, and the Commission held an informal hearing, though Commissioners Prouty and Harlan were absent. The railroad representatives made numerous requests for interpretations by the Commission of new clauses in the law, particularly that relating to 30 days' notice of changes in rates, and that requiring the posting of tariffs. The railroads hope that a placard saying that the tariffs can be seen by applying to the agent will be deemed sufficient. The roads also ask for an extension of time, perhaps several months, in which to prepare new tariffs. Vice-President Grammer, of the New York Central Lines, said that the railroads ought to be able to comply with the new law as regards export rates—which means it will be practicable to abandon the very frequent changes in export rates which have heretofore been common, especially in the cotton traffic. All the requests were denied, the Commission deciding that it was for the roads to conform to the law according to their own best lights. Complaints of non-compliance will have to be taken before the Commission in the usual manner.

After the railroad men had been heard, F. T. Bentley, of Chicago, a representative of the Illinois Manufacturers' Association and the American Shippers' Association, presented a series of resolutions, an abstract of which follows:

That we favor a continuance of the present practice of having tariffs in the custody of agents, with a placard announcing that they are open to public inspection.

That only one amendment to a tariff shall be in effect at one time, and when a later amendment is necessary it shall include all live changes up to date.

As to the thirty-day requirement of publication of tariffs: That we favor the Commission ruling that a reduction in domestic rates can be made effective on ten days' notice and on export business allow three days' legal notice for any reduction on the same.

That we favor a Commission ruling that a line having no published tariff rate or carrying a higher published tariff rate than

its competitors publication should be permitted to accept and forward business upon telegraphing the Commission the facts and stating that they adopt the competitors' rate as their own; to become effective at once, and to prevent discrimination it must accept the lower competitive rate.

That we favor the railways adopting a switching tariff at each competitive point.

That means be devised to make a railway company quote rates to the public and be responsible therefor, even though they make an error in so quoting.

That we favor a ruling from the Commission that an application sheet showing such territory or such railroad connections as are parties to the rate from a particular terminal should be considered legal and sufficient.

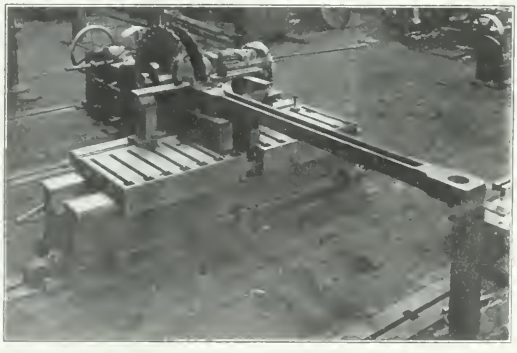
That we should insist that the railway companies recognize the sum of locals as the only legal rate when such sum is lower than a higher published through rate.

That the practice of making import rates on commodities competitive with domestic productions is discriminatory and that the lowest basis from any foreign port to an inland destination should not be lower than the domestic rate from the most favorably located port of entry, and in no case should through import rates be less than the export rates in the opposite direction between the same points.

That we favor the adoption by all shippers of a freight receipt or bill of lading without any conditions as are now embodied in bills of lading in use generally.

### A New Cold Saw Cutting Off Machine.

The accompanying illustration shows a No. 3 crank shaft cold saw cutting off machine made by the Newton Machine Tool Works, Philadelphia, Pa. The machine as illustrated is set up on the testing floor and carries two Taylor-Newbold inserted tooth saw blades, 36 in. in diameter, set at 5½ in. apart. The locomotive connecting rod which is being slotted is 5 in. thick, and was slotted from the end to the two holes shown, which are 12 in. from the end of the rod, in 14 minutes. The spindle of this machine is



driven by spur gearing through a phosphor bronze worm wheel and a hardened steel worm of steep lead. It is also fitted with automatic feed and power quick return to the carriage. The work tables are adjustable independently. The machine is adapted to all classes of cutting off and slotting, including cranks for center crank engines, locomotive connecting rod straps and side rods, guide yokes and similar work. By using a special fixture, rods up to 5 in. wide can be cut to a depth of 22 in. With the machine as illustrated spacing collars are furnished to give a maximum distance between the saw blades of 10 in.

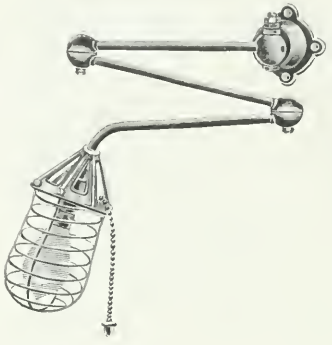
### Quick Work in the Signal Department.

A Taylor all-electric interlocking machine at Easton, Pa., which was completely "knocked out" recently by a derailment which destroyed the tower, was reconnected and again put in operation within four hours after the tracks were cleared so that they could be used. This information, illustrating one of the advantages of a power plant in such an emergency, is furnished by an officer of the Lehigh Valley, the road to which the machine belongs. The derailment was on the track of another road adjacent, and a mechanical (manual) plant which was damaged by the same accident was out of commission three days. It is proper to say that although the tower containing the electric machine was completely destroyed, the machine itself was not much injured, and the main thing that had to be done besides restoring the electrical connections was to fix up a frame for the machine. Power was temporarily secured from the plant at Phillipsburg, on the opposite side of the Delaware river.

In this connection we are reminded that in two important yards—that of the Boston & Maine, at Boston, and that of the Grand Central Station, New York—new machines were recently connected and put in use within 25 minutes from the discontinuance of operations with the old machine. At Boston the change was made from an old to a new electro-pneumatic machine; and at New York from an all-air to an all-electric. At this cabin, which is at 56th street, about half a mile from the terminus, the new machine has 88 levers, while the old one had only 32.

### Wallwork's Electric Lamp Brackets.

The accompanying illustration shows a Wallwork's electric lamp bracket made by the Wells Light Mfg. Co., New York. This bracket is fitted, as shown, with universal ball and socket and elbow joints and is especially adapted for use where a light is needed in a definite position, such as in offices, work shops, shipping rooms, etc. They are made of black enameled iron and are furnished with Hubbell standard Edison chain pull sockets wired-up and ready to connect to the electric wires. The special feature claimed for these brackets is the ease with which the light can be shifted to and held in any desired position.



The Wallwork Electric Lamp Bracket.

## TRADE CATALOGUES.

*Corrugated Steel Bars.*—A corrugated bar pamphlet is being distributed by the Expanded Metal & Corrugated Bar Co., St. Louis, Mo. The introduction discusses the elastic limit of concrete and the function of the embedded metal, the mechanical bond between the two, and points out the advantages of the corrugated bar for this use. Illustrations of old and new style and universal type corrugated bars are shown, as are also fac-simile letters from the Building Bureaus of New York and Philadelphia, respectively, approving for general use in these cities the fireproof floor construction of this company. Half-tone and line illustrations of floor slab designs follow.

*Preservative Coatings for Iron and Steel.*—The Joseph Dixon Crucible Co., Jersey City, New Jersey, has just issued a pamphlet in which is given illustrations and reports of the conditions of the steel frames of the buildings in San Francisco, after the fire, which were painted with Dixon's silica graphite paint. All of the reports show that this paint had perfectly preserved the maximum strength of the steel work. The first page in the pamphlet contains an interesting diagram which shows the comparative area and the dates of America's great fires.

*Car Heating and Electric Switches.*—Two new pamphlets are being distributed by the Consolidated Car Heating Company, New York. One illustrates and describes electric switches for electric bolsters, car lights, headlights and switchboards, and the other is devoted to describing various electric heaters for cars and for house and office use. Illustrations of the heaters are given as well as diagrams which show the method of wiring.

*Steam Specialties.*—Two catalogues sent by The John Davis Co., Chicago, describe "Eclipse" steam specialties and separators respectively. The former is a 38-page book covering steam traps, water columns, back-pressure valves, blow-off valves, reducing and regulating valves, pump governors, low water indicators, etc. The separator pamphlet illustrates in detail and gives data regarding the various patterns of steam separators.

*Rock and Ore Breakers.*—Bulletin No. 1,416, issued by Allis-Chalmers Co., Milwaukee, Wis., contains illustrations and a detailed description of its latest design of Gates rock and ore breaking machine, which is known as style "K" breaker. This is an entirely new machine and is adapted to reduce all kinds of rock under all conditions.

*Flexible Staybolts.*—Illustrations of a few installations of the Tate flexible staybolt and an extract of a paper on "Locomotive

Water Space Stays," read before the Pittsburg Railway Club by B. E. Stafford, are given in a small pamphlet issued by the Flannery Bolt Co., Pittsburg, Pa.

### Manufacturing and Business.

The Pioneer Cast Steel Truck Co., Postal Telegraph Building, Chicago, has been incorporated to manufacture and market boltless cast steel trucks under patents of W. E. Symons. The officers are: W. E. Symons, president; Frank W. Furry, vice-president; E. M. Hadley, secretary and treasurer. The truck design was described in the *Railroad Gazette* of July 27.

### Iron and Steel.

The American Bridge Co. has a contract for supplying and erecting 600 tons of structural material for a cement plant in Center Furnace, Ohio, also for 780 tons of steel for bridges on the Portland & Seattle, and an additional tract for 500 tons for a cement plant at Homestead, Pa., for the Carnegie Steel Co.

Several orders for standard rails have recently been let by big steam and electric traction roads for delivery this year and throughout the first half of next year. The Ione & Eastern has bought from the Pennsylvania Steel Co. 11,150 tons, and the Northern Pacific has given a suplementary order to the United States Steel Corporation for 10,000 tons for 1907 delivery. The Brooklyn Rapid Transit Co. has bought 1,324 tons of special chemical contact rails for 1906 and 1907 delivery. In addition miscellaneous trolley lines have bought 5,000 tons of standard rails for 1907 delivery.

Many of the railroads are preparing contracts for bridges, terminal stations and elevated track work for next year. The Pennsylvania Steel Co. has the contracts for 11 of the 15 new bridges for the New York Central; the orders for the remaining four bridges have been let to the American Bridge Co. The Pennsylvania Steel Co. also has the contract for a Scherzer bridge to be built over the Bronx river for the New York, New Haven & Hartford. This company has also ordered another Scherzer bridge to be constructed over the Harlem river. The contract for the municipal bridge at Pelham Park has been let by Commissioner Stevenson to the Williams Engineering Co. The Columbus & Erie, a subsidiary of the Erie, is negotiating for two new bridges to be built near Columbus, Ohio.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### International Railroad Master Blacksmiths' Association.

At the annual meeting of this association in Chicago, August 21, the following officers were elected for the next year: President, J. S. Sullivan (Penna.), Columbus, Ohio; first vice president, G. H. Judy (B. & O.), Glenwood, Pa.; second vice-president, J. W. Russell, Renova, Pa.; secretary and treasurer, A. L. Woolworth (C., H. & D.), Lima, Ohio; chemist, G. H. Williams, Boston, Mass. The next convention is to be held in Montreal in 1907.

### The Railway Signal Association.

At the next meeting of this Association to be held at the Great Northern Hotel, Chicago, Sept. 11, "Standard Specifications for Mechanical Interlocking" will be discussed and certain revisions recommended for consideration at the annual meeting, also "Identification Marks for Wires and Cables from a Maintenance Point." The Secretary announces that on account of the presence in Washington, D. C., of two other large conventions on October 9th, 10th and 11th, and a scarcity of room to hold sessions and facilities to display exhibits, the Executive Committee left it to a vote of the active members to select a new date; and the date is now fixed by this vote as October 16, 17 and 18. The New Willard Hotel will be Association headquarters.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Delaware & Hudson.*—See Quebec, Montreal & Southern.

*Grand Trunk Pacific.*—Alfred Brunet, of Montreal, has been appointed by the Provincial Government of Ottawa as its representative on the Board of Directors of the Grand Trunk Pacific.

*Interstate Commerce Commission.*—The President has nominated James S. Harlan, of Chicago, formerly Attorney-General for Porto Rico, as a member of the Interstate Commerce Commission, making the Board complete as provided by the Hepburn bill.

*Quebec, Montreal & Southern.*—The officers of this company, which is the holding company for the Delaware & Hudson's sibsidiaries in Canada, are as follows: David Wilcox, President; A. T. Culver, Vice-President, and Senator Beique, David Wilcox and A. T. Culver, Executive Committee, Senator Beique representing the Canadian interests. These officers, together with R. Leimeux and G. F. Hart, constitute the Board of Directors.

*Wabash.*—S. J. Parks has been appointed Auditor of Passenger Accounts, succeeding G. G. Landers, deceased.

### Operating Officers.

*Alabama Great Southern.*—See Cincinnati, New Orleans & Texas Pacific.

*Atlantic Coast Line.*—E. H. Henneger has been appointed Superintendent at Wilmington, N. C., succeeding J. A. Fountain, assigned to other duries.

*Canadian Pacific.*—F. M. Spaidal, Superintendent of Terminals at Montreal and of the line from that place to Smiths Falls, has resigned to go to the Canadian Northern. J. Vaughan, Assistant Superintendent, succeeds Mr. Spaidal, with office at Montreal, Que. R. W. McCormick, Trainmaster at Ottawa, Ont., succeeds Mr. Vaughan, with office at Smiths Falls, Ont.

*Central of Georgia.*—A new division to be called the Chattanooga division has been formed, and R. J. Armstrong, Trainmaster at Cedartown, Ga., has been appointed Superintendent of it, with office at Cedartown. It consists of the lines from Giffin to Chattanooga, Chickamauga to Durham, and Lyerly to Toles Hollow. Other divisions have been rearranged as follows: Macon division, consisting of lines from Macon to Atlanta, Barnesville to Thomaston, S. M. & A. Junction to Athens, with jurisdiction over Macon terminals; office at Macon, Ga. Southwestern division, consisting of lines from Marion to Montgomery, Forth Valley to Parry, Smithville to Lockhart, Gulbert Junction to Fort Gaines, and Eufaula to Ozark; office at Macon, Ga. Columbus division, consisting of lines from Columbus to Birmingham, Henry Ellen to Margaret, Columbus to Fort Valley, Columbus to Americus, Columbus to Andalusia, Columbus to Greenville, and East Alabama Junction to Roanoke; office at Columbus, Ga.

*Chicago, Indiana & Southern.*—H. A. Zeisel, Superintendent at Hammond, Ind., has been appointed General Superintendent, with office at Chicago, Ill.

*Cincinnati, New Orleans & Texas Pacific.*—W. S. Melton has been appointed Superintendent of Telegraph of this road and of the Alabama Great Southern, with office at Chattanooga, Tenn., succeeding G. L. Lang, resigned.

*Lexington & Eastern.*—W. A. McDowell, Assistant to the General Manager, has been appointed General Manager, with office at Lexington, Ky., succeeding J. R. Barr, deceased.

*Pere Marquette.*—Theodore Ensel, private Secretary to the General Manager, has been appointed Superintendent at Grand Rapids, Mich., succeeding P. N. Place, resigned, to go into other business.

*Rio Grande Western.*—D. A. Campbell, Trainmaster at Salt Lake City, has been appointed to the new office of Assistant Superintendent at that place.

*St. Louis & San Francisco.*—H. H. Brown, Superintendent at Memphis, Tenn., has been appointed Superintendent at Springfield, Mo. A. D. Lightner, General Agent at Birmingham, Ala., succeeds Mr. Brown.

*Southern.*—A. M. Smith, Assistant Superintendent at Columbus, S. C., has been appointed Assistant Superintendent of the Charleston division, with headquarters at Rockhill, S. C., in charge of the road between Marion, Rockhill and Camden, and between Camden and Kingville. R. W. Edwards succeeds Mr. Smith at Columbia.

### Traffic Officers.

*El Paso & Southwestern.*—T. Shumacker has been appointed Traffic Manager, with office in New York City.

*New York Central & Hudson River.*—J. M. Brennan, Assistant to the General Passenger Agent of the West Shore Railroad, has resigned to become General Freight and Passenger Agent of the Tampa Bay & West Coast Navigation Co., with office at Tampa, Fla.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe.*—W. B. Storey, Chief Engineer of the Atchison, Topeka & Santa Fe Railroad, has been appointed Chief Engineer of the Atchison, Topeka & Santa Fe System, which includes also the A., T. & S. F. Coast Lines, with office at Chicago. C. A. Morse, Acting Chief Engineer of the Coast Lines, succeeds Mr. Storey at Topeka, Kan.

*Buffalo & Susquehanna.*—P. F. Dreyfus, General Foreman at Toledo, Ohio, of the Pennsylvania Lines West, has been appointed Superintendent of Motive Power of the B. & S., with office at Gale-

ton, Pa., effective Sept. 1, succeeding to the duties heretofore performed by C. R. Williams, Master Mechanic, who has resigned and whose office has been abolished.

*Chicago, Burlington & Quincy.*—J. Dietrich, Master Mechanic at Lincoln, Neb., has been appointed to the new office of Assistant Superintendent of Motive Power, with office at Lincoln, Neb. G. C. Johnson, Master Mechanic at Sheridan, Wyo., succeeds Mr. Dietrich. F. E. Kennedy, Master Mechanic at McCook, Neb., succeeds Mr. Johnson.

*Chicago, Rock Island & Pacific.*—W. J. Tollerton, Master Mechanic of the Oregon Short Line at Pocatello, Idaho, has been appointed Superintendent of Motive Power, at Topeka, Kan., of the C., R. I. & P., succeeding Thomas Roope, resigned, to go to the C., B. & Q.

*Colorado Midland.*—W. J. Schlacks, Superintendent of Machinery, has resigned to go into other business.

*Lehigh & New England.*—R. L. Wyman, general foreman of the Delaware, Lackawanna & Western at Utica, N. Y., has been appointed Master Mechanic of the Lehigh & New England, with office at Pen Argyl, Pa.

*Missouri Pacific.*—M. J. McGaw, Master Mechanic at Fort Scott, Kan., has been appointed Master Mechanic at St. Louis, Mo., succeeding L. Bartlett, resigned. M. C. Walsh succeeds Mr. McGaw.

*Oregon Short Line.*—See Chicago, Rock Island & Pacific.

## LOCOMOTIVE BUILDING.

*The Great Northern* has ordered 75 locomotives from the Baldwin Works.

*The Northern Pacific* has ordered 90 locomotives from the American Locomotive Co.

*The Lehigh Valley* has ordered five Atlantic (4-4-2) locomotives from the American Locomotive Co.

*The Grand Trunk* has ordered some electric locomotives from the Westinghouse Electric & Manufacturing Co. These locomotives are intended for the operation of traffic through St. Clair tunnel.

*The Morelia & Tacambaro*, reported in our issue of Aug. 24, has having ordered three locomotives, will shortly be in the market for seven additional locomotives. Address Edson J. Chamberlin, President, care of A. J. Peyton & Co., Trinity Building, New York.

*The East Broad Top* is having one 3-ft. gage simple locomotive built at the Baldwin Works. The general dimensions are as follows:

| | |
|---|---|
| Weight, total | 80,000 lbs. |
| Weight, on drivers | 60,000 lbs. |
| Diameter of drivers | 48 in. |
| Cylinders | 16 in. x 20 in. |
| Boiler, type | Straight top |
| " working steam pressure | 160 lbs. |
| " number of tubes | 152 |
| " material of tubes | Shelby seamless cold drawn steel |
| " diameter of tubes | 2 in. |
| " length of tubes | 11 ft. 9½ in. |
| Firebox, length | 83 7-16 in. |
| " width | 23⅜ in. |
| " grate area | 12.6 sq. ft. |
| Tank capacity | 2,500 gals. |

Evans Vacuum brakes will be used on driving and tender wheels.

*The Somerset Railway Co.* has ordered two eight-wheel and two ten-wheel simple locomotives from the American Locomotive Company for October, 1906, and March, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | 8 wheel. | 10-wheel. |
|---|---|---|
| Type of locomotive | 8 wheel. | 10-wheel. |
| Weight, total | 98,000 lbs. | 115,000 lbs. |
| Weight on drivers | 61,500 lbs. | 87,500 lbs. |
| Diameter of drivers | 63 in. | 55 in. |
| Cylinders | 17 in. x 24 in. | 18 in. x 24 in. |
| Boiler, type | Wagon top. | |
| " working steam pressure | 180 lbs. | |
| " Number of tubes | 208 | 249 |
| " material of tubes | Charcoal iron. | |
| " diameter of tubes | 2 in. | |
| " length of tubes | 11 ft. 8½ in. | 13 ft. |
| Firebox, length | 102 in. | 102 in. |
| " width | 33½ in. | 33½ in. |
| " grate area | 18 sq. ft. | 23.7 sq. ft. |
| Total heating surface | 1,400 sq. ft. | 1,620 sq. ft. |
| Tank capacity | 3,200 gals. | 3,800 gals. |
| Coal capacity | 5 tons. | 6 tons. |

*Special equipment.*

| | |
|---|---|
| Axles | Hammered steel. |
| Boiler lagging | Asbestos. |
| Brakes | Westinghouse. |
| Brake-beams | Sterlingworth |
| Brake-shoes | Perfecto. |
| Couplers | Tower. |
| Heating equipment | Consolidated. |
| Injectors | Hancock. |
| Lubricators | Nathan Triple Sight feed. |
| Piston rod packing | U. S. Metallic Packing Co. |
| Valve rod packing | U. S. Metallic Packing Co. |
| Sanding devices | Leach. |
| Springs | Standard. |
| Steam gages | American Loco. Co. |
| Tires | Midvale. |

## CAR BUILDING.

*The New York Central* is asking bids on several thousand box cars.

*The Missouri Pacific* has ordered 500 gondola cars from the American Car & Foundry Co.

*The Northern Pacific*, it is reported, is about to close contracts for a large number of freight cars.

*The Union Pacific*, it is reported, is asking bids on 600 refrigerator cars with steel underframes.

*The Huntington & Broad Top Mountain* has ordered 200 hopper coal cars from the Pressed Steel Car Co.

*The New York Central Lines*, it is reported, have just placed an order for 5,000 grain cars with the Pullman Co.

*The Canadian Northern* has ordered 100 box cars of 60,000 lbs. capacity, six coaches and five mail and express cars from the Crossen Co.

*The Atchison, Topeka & Santa Fe*, it is reported, is in the market for 2,000 refrigerator cars, and has ordered 300 passenger coaches.

*The Detroit, Toledo & Ironton*, as reported in our issue of August 24, denies being in the market for any new equipment at this time.

*The Quebec Railway, Light & Power Co.*, Quebec, Que., has ordered 25 flat cars of 40,000 lbs. capacity from the Rathburn Co. These cars will weigh 18,000 lbs. and measure 34 ft. long.

*The Morelia & Tacambaro* will shortly be in the market for 600 freight cars, 15 passenger coaches and three baggage cars. Address Edson J. Chamberlin, care of A. J. Peyton & Co., Trinity Building, New York.

*The Lehigh Valley* has ordered 1,000 coal cars of 100,000 lbs. capacity, 500 gondola cars of 80,000 lbs. capacity, 500 gondolas of 60,000 lbs. capacity, 102 produce cars of 60,000 lbs. capacity, 25 automobile cars, 20 express and baggage cars and one dining car.

*The Atlantic Coast Line* has ordered 60 Hart convertible cars of 80,000 lbs. capacity from the Rodger Ballast Car Co. for November delivery. These cars will weigh 38,000 lbs. and will measure 36 ft. long over end sills; 10 ft. 2⅜ in. wide, 8 ft. 2¼ in. high, and the bodies and underframe will be of wood. The special equipment includes: Simplex truck bolsters, cast steel body bolsters, Monarch solid brake-shoes, Westinghouse brakes, Tower couplers, Thornburgh tandem draft gear, and 33-in. chilled cast-iron wheels.

*The Mexican Central*, it is reported, has ordered 750 steel underframe box cars of 80,000 lbs. capacity, 150 steel underframe stock cars of 60,000 lbs. capacity, 100 steel underframe flat cars of 80,000 lbs. capacity, and 180 steel underframe oil tank cars of 9,800 gallons capacity from the Standard Steel Car Company. Delivery for the above equipment will commence in January, 1907, and 20 cars will be delivered daily. The company has also ordered 11 express cars and four combination mail and express cars from the Barney & Smith Co., delivery to commence in November, 1906.

*The Youngstown & Southern* has ordered two interurban passenger, two interurban passenger and baggage and one interurban freight and express car from the Niles Car & Manufacturing Co., for November delivery. All cars will be 40 ft. 6 in. long, 8 ft. 9 in. wide and 12 ft. 9 in. high, inside measurements. The special equipment for all includes:

| | |
|---|---|
| Bolsters | Baldwin |
| Brake-beams | Baldwin |
| Brakes | Westinghouse |
| Couplers | Van-Dorn |
| Curtain material | Pantasote |
| Paint | Pullman |
| Roofs | Empire |
| Trucks | Baldwin |

## RAILROAD STRUCTURES.

Baton Rouge, La.—The Texas & Pacific has bought land at Baton Rouge Junction as a site for repair shops.

Battle Creek, Mich.—The Grand Trunk, it is said, will shortly begin work on extensive new shops.

Burnside, Ill.—The Illinois Central, it is said, has commenced work on new car shops. The main building is to be 120 ft. wide by 574 ft. long.

Chattanooga, Tenn.—The Chattanooga Railway Co. has given a contract to the West Construction Co. for putting up new car shops at a cost of $50,000. The company is also planning to put up car barns near the shops.

Farmington, Me.—A contract has been given to Coomb & Gibbs, of Lewiston, for putting up a new passenger station for the Sandy River Railroad. The building is to be of granite, 51 ft. by 60 ft.

FT. SCOTT, KAN.—The St. Louis & San Francisco recently opened bids for putting up a large roundhouse here.

HALIFAX, N. S.—The Intercolonial has plans ready for putting up a large roundhouse here this fall.

LEWISTON, IDAHO.—McCreary & Willard, of Spokane, Wash., have been given a contract to construct a 700-ft. steel bridge across the Clearwater river here for the Oregon, Washington & Idaho Railway. Twelve hundred tons of steel will be used. Erickson & Peterson, of San Francisco, will furnish the structural material.

LEXINGTON, KY.—Contracts, it is said, are to be let by the Cincinnati, New Orleans & Texas Pacific for putting up a new office building to cost about $50,000.

LOS ANGELES, CAL.—The Pacific Electric Railway Co. has given a contract for, and work is now under way by the Mercereau Bridge Company on a new steel plate girder bridge 200 ft. long with concrete foundations and reinforced concrete floors 8 in. thick. The work will require about 2,000 cubic yards of concrete and 400,000 lbs. of steel. The bridge is to be built on the line of the new cut-off between Los Angeles and Monrovia Junction, at a point where the Southern Pacific crosses Alhambra avenue.

LYNN, MASS.—The Special Commissioners appointed by the Superior Court to consider the matter of abolishing grade crossings of the Boston & Maine in Lynn recommend alterations in the grade at streets that cross the tracks of the B. & M., as follows: Union, Exchange, Washington, Market, Pleasant, Blossom and Shepard and Central square. Silsbee street is to be discontinued and an elevated passageway built for pedestrians. At Pleasant, State, Alley and Blossom streets the street grades will be depressed. The commissioners make no mention of the estimated expense. Of the total expense for abolishing the crossings the commissioners make the following apportionment: Boston & Maine 65 per cent., city of Lynn 10 per cent., with the remaining 25 per cent. to be paid by the state and Boston & Northern Street Railway, the percentage of the latter being fixed in proportion to expense entailed in abolishing grades over which electric cars now pass.

MONTGOMERY, ALA.—The Western of Alabama has plans about completed for putting up new shops at a cost of $75,000.

MONCTON, N. B.—The Intercolonial is to replace the buildings destroyed by fire with new structures as follows: Tool room, brass shop, bolt shop, etc., under one roof, 355 ft. by 44 ft.; machine shop in two bays, 355 ft. by 135 ft.; smith shop, 300 ft. by 75 ft.; engine shop, 375 ft. by 80 ft.; boiler erecting shop, 300 ft. by 50 ft.; bolt shop, 355 ft. by 50 ft.; car repair shop, 360 ft. by 100 ft.; passenger car paint shop, 360 ft. by 100 ft.; freight car repair shop, 360 ft. by 132 ft.; planing mill and carpenter shop, 300 ft. by 88 ft.; storehouse and office building, 200 ft. by 55 ft., and several accessory buildings.

NASHVILLE, TENN.—The Nashville Railway & Light Co., according to local reports, proposes to use $1,500,000 for immediate improvements, including rebuilding and extending the transfer station, building conduits, buying new cars and installing new machinery, the latter to cost about $500,000.

SACRAMENTO, CAL.—The Southern Pacific is considering plans for a new passenger station here to have a frontage of 500 ft. and to cost about $200,000.

The Southern Pacific is planning to replace the bridge over Sacramento river with a new double-deck steel bridge to carry two tracks and a highway. The new bridge, which is to be about 950 ft. long, is to have a draw span a trifle longer than the present one. The upper deck is to be used for the highway.

SPOKANE, WASH.—A contract has been let to McCreary & Willard, of Spokane, at $250,000, to build steel bridges for the Oregon Railway & Navigation Company. About 3,000 tons of steel will be required. The work includes the following: Steel bridge, 270 ft., across Hood river; 710 ft. across Sandy river, 420 ft. across Umatilla river, 300 ft. at Pendleton, 450 ft. across Des Chutes river, 175 ft. across Walla Walla river, 100 ft. across Burnt river. The structural steel will be delivered by a San Francisco firm. Work is to begin at once.

Estimates made by Commissioner Roy of the new bridges required in this city, to cost between $350,000 and $400,000, are as follows: Mission avenue bridge, $45,000; two bridges over the north and central channels at Howard street, $70,000; bridge over south channel at Howard street, $20,000; Havermale Island bridge, $20,000; bridge over Latah creek, $20,000; Washington street bridge, $35,000. Viaducts at Washington and Division streets are estimated at $328,000, of which the city's share will be $110,000.

Henry M. Richards and residents in the western part of Spokane have petitioned the city council to build a bridge across the Spokane river, to cost $10,000.

SUPERIOR, WIS.—Local reports state that the Great Northern is planning to put up a car building plant here, to give employment to about 1,000 men. The company's shops at St. Paul, St. Cloud and Branesville are overcrowded with work.

WATERTOWN, N. Y.—A contract is reported let by the New York Central to Clinton Hodges & Co. for putting up a new freight house here to cost about $70,000.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ADIRONDACK & ST. LAWRENCE.—The State Board of Railroad Commissioners has granted permission to this company to build a line from De Kalb Junction, southeast, to Hermon, in St. Lawrence County, 3.60 miles. (May 4, p. 136.)

BEAUMONT & GREAT NORTHERN.—Twenty miles of the main line of this road in Texas has been completed and will be ready for operation early next month. Work on the remaining 17 miles from Onalaska is to be pushed to completion as rapidly as possible, so that the line will be opened from Trinity to Livingston early next spring.

CAMPTON RAILROAD.—This company has completed a narrow gage line from a junction with the Lexington & Eastern at Natural Bridge, Ky., to Campton, in Wolf County. The road was built to reach timber lands.

CANADIAN PACIFIC.—A contract for grading a three-mile section near Saskatoon, Sask., has been let to John Davie of that place.

CENTRAL OF GEORGIA.—The last annual report of this company shows that a length of 10½ miles has been aded to the spur at Henry Ellen to reach the company's coal property to Cahaba, St. Clair, Ala.

The Greenville & Newnan, which is to be 23.73 miles long, from Greenville, Ga., to a point on the Chattanooga district between Sharpsburg and Newnan, Ga., called Raynan, for which contract was let in September, 1905, is to be completed by November of this year.

The line from Columbus to Greenville, Ga., 49.51 miles, was widened from 3 ft. to standard gage during the year. About two miles of trestles are being eliminated by fillings, and improvements have been made both in alinement and grades.

Same grade reducing trains have been made on the Chattanooga district during the year. A number of new side and spur-tracks aggregating 13.55 miles were laid and a number of others extended aggregating 5.23, making a total of 18.78 of side and spur tracks constructed during the year.

Extensive terminal improvements are nearly finished at Albany and Savannah. These include enlargement of the yards and the erection of a 2,500 ton coal bin at Albany, and a receiving yard at Savannah. The work at Albany has thus far cost $33,312, and that at Savannah $54,591.

At Athens, Ga., about $15,000 has been spent on the new yard, including additional bulk tracks and a combined passenger and freight station, which is the cost of about one-fifth of the work. The company is also providing new passing and warehouse tracks on all the divisions of the road.

CHICAGO, NEW WASHINGTON & BUCYRUS.—An officer writes that the prospects of building this road are good, and that the motive power will be either electricity or gasolene. The proposed route is from Chicago, Ohio, through New Washington and Sulphur Springs to Bucyrus. E. Z. Williams, Chicago, Ohio, is President.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—An officer writes that the grading is being done by this company for double-track between Flatrock, Ky., and Helenwood, Tenn., 30 miles. This is the only work of this character contemplated at present.

CITY & ELM GROVE.—This company has been incorporated in West Virginia, with capital of $2,000,000 and headquarters at Wheeling. The incorporators are: I. M. Noies, J. J. P. O'Brien, F. A. O'Brien, C. Hartsmann and J. F. Ebling, all of Wheeling.

COOS BAY, ROSEBURG & EASTERN.—The contract for grading the first 20 miles of the Drain-Coos Bay extension has been let to the C. E. Loss Co., of San Francisco, and work is to begin immediately. The work will be rapidly pushed, it being the intention to have the entire road in operation by next summer.

DETROIT, TOLEDO & IRONTON.—Surveys and estimates have been completed for building a line from Ashland, Ky., up Hoods creek, East fork and down Bear creek to the Big Sandy river, thence up that river to the mouth of Shelby creek, 118 miles. From this point a branch is to be built up Long Fork creek, 23 miles, to the coal properties bought by Eugene Zimmerman, President of the D. T. & I., and associates. The Ashland & Ironton Bridge Co., controlled by them, is now building a bridge over the Ohio river at Ashland. An additional branch is to be built up Shelby creek, 20 miles, while a third branch will be built up Beaver creek to the Beaver creek coal fields, an additional 36 miles. For a part of the distance the line will parallel the newly completed extension of the Chesapeake & Ohio up the Big Sandy river. These new lines

will open up some of the best coal fields in Kentucky. J. F. Prindivle Paintsville, Ky., is the Engineer in charge.

Front Royal, Rappahannock & Tidewater.—Incorporated in Virginia with $50,000 capital to build a line from Front Royal, Warren County, via Charlottesville to Richmond, 150 miles, through the counties of Warren, Rappahannock, Madison, Greene, Albemarle, Culpeper, Orange, Louisa, Fluvanna, Goochland, Hanover, Henrico, Spottsylvania and Fauquier. S. R. Miller is the president. It is the purpose of the company to build the road as soon as possible. The incorporators are: E. H. Jackson, Front Royal; S. R. Miller, Front Royal; John I. Miller, Washington, Va.; W. J. Browning, Flint Hill, Va.; William L. Jones, Flint Hill, Va.; Hugh E. Naylor, Front Royal; W. L. Keyser.

Greenville & Newnan.—See Central of Georgia.

Indian Creek & Pound River.—This company, operating 10 miles of road in Virginia, has decided to extend its line from Pound, Va., into Dickenson County, about 20 miles, to a valuable coal and timber section.

Lehigh Valley.—This company, it is reported, is negotiating for the electrification of its branch line from Tunkhannock, Pa., to Montrose, and for building an extension of the line from the latter point to Binghamton.

Lexington & Eastern.—Surveys have been completed for an extension from Jackson, Ky., southeast to Hazard, 25 miles. It is announced that work is to be started at once. From Hazard the line is to be eventually extended into the coal fields of Letcher County, an additional 25 miles.

Liberty-White.—An officer writes that this company, which operates a line from McComb, Miss., west to Liberty, 24.2 miles, has completed the construction of 10 miles from the eastern terminus to Hahnesville, and that surveys are now being made for a continuation of the line east to Columbia, Miss. Surveys have not yet been completed for the extension of the road from the present western terminus at Liberty to Natchez.

Manila Railway.—Announcement is made in London that negotiations are being made with the United States government to take over the Manila Railway in the Philippine Islands with a view to having it transferred by the English owners to an American corporation.

New York, New Haven & Hartford.—A contract is reported let by this company to J. K. Ryan, of New York, at about $400,000 for grading work in connection with the proposed abolishment of the Dudley Street Boston grade crossing on the Midland division.

Norfolk & Washington Air Line.—A. B. Linderman, Philadelphia, Pa., President of this company, says that a contract for the construction and equipment of this proposed line from Washington, D. C., to Esperanza, Md., 64 miles, has been let to D. E. Baxter & Co., Inc., New York. The entire line is to be laid with 70-lb. rails.

Oaxaca & Oriente.—According to reports from the City of Mexico, this road is to be extended to Tlacolula and to the ruins of Mitla. It was also decided to extend the line to the isthmus of Tehauntepec, where connection is to be made with the National Tehauntepec. Such a line in connection with the Mexican Southern will furnish a new direct route from Mexico City to southeastern Mexico.

Pennsylvania.—A contract has been given to the Drake & Stratton Co., of Philadelphia, for work on the last section of the terminal improvements of the Philadelphia, Baltimore & Washington at Washington, D. C. Two tracks of the new elevated line from the Navy Yard tunnel to B street are now in use, and the old main tracks have been taken up.

Philadelphia & Reading.—This company has given a contract to Smith & Campion, of Mahanoy City, for grading and masonry work on a second track on the Catawissa branch between Quakake and Hazle Junction. The double-tracking of this part of the line has become necessary to relieve the congestion of freight traffic between Hawks and Lofty. It is also expected that Ryan's tunnel, which is 500 ft. long, is to be widened for a double-track, and the top of the tunnel may be removed, making an open cut.

Philadelphia, Baltimore & Washington.—See Pennsylvania.

Southern Pacific.—California papers report that this company has decided to abandon its through passenger and freight service to Portland, Oregon, over the steep grades of the Siskiyou Mountains. It has bought the California Northeastern Railway, a 40 mile line extending north of Weed, with a right of way through to Klamath Falls. The Harriman engineers are to rush this lumber line to completion and connect it at Klamath Falls with the Oregon & East ern Railway, now being built from Natron, Ore., south. With the joining of these two lines, all through traffic from San Francisco and points south of Weed will go to Portland and north via Klamath Falls. The present Mount Shasta line will be maintained for local service. The Klamath route will give an easy grade and light curves over the mountains.

Western Pacific.—This company has completed 34 miles of track southeasterly and westerly from Salt Lake City. Towards the west grading is progressing rapidly, on level ground, and track is being laid at the rate of about a mile a day.

## RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—It is reported that this company is negotiating for the purchase of the Coal & Coke Railroad, which owns about 180 miles of road from Elkins, W. Va., to Charleston. It has $10,000,000 capital stock, and $8,950,000 first mortgage 5 per cent. bonds of 1919 outstanding.

Canadian Pacific.—During July, 608,961 acres of land were sold for $2,872,699, the average price being $4.71 per acre; as compared with $5.18 per acre during the corresponding month in 1905, when 59,957 acres were sold for $309,916. The larger part of the land sales were in the Province of Alberta.

Canton-Akron Consolidated Railway.—This company has been incorporated in Ohio with a nominal capital of $10,000, which may be increased to $2,500,000, for the purpose of merging the properties which the Northern Ohio Traction & Light Co. has agreed to buy from Tucker, Anthony & Co., Boston. These include the Canton-Akron Consolidated Railway Co., operating 55 miles of electric lines; the Tuscarawas Traction Co., operating 14 miles, and the Canton-New Philadelphia Railway Co., operating 22.6 miles.

Chicago, Milwaukee & St. Paul.—With the incorporation of the Chicago, Milwaukee & St. Paul of South Dakota, the corporate companies of the St. Paul's Pacific extension are three in number, the other two are the C., M. & St. P. of Montana, and the C., M. & St. P. of Washington, the last named being the new name of the company which was the first of the three to be incorporated.

Coal & Coke.—See Baltimore & Ohio.

Grand Trunk Pacific.—The company has made an agreement with the city of Edmonton, Alberta, under which in consideration of a bonus of $100,000 in cash or debentures, exemption from taxation for five years and a fixed assessment for 20 succeeding years at the present assessed value, the company agrees to make Edmonton the chief divisional point on the main line between Winnipeg and the Pacific coast and to maintain shops there.

Louisville & Nashville.—The gross earnings for the year ended June 30, 1906, were $43,008,996, an increase of $4,491,925; net earnings, $12,075,532, an increase of $48,482. The surplus, after charges, 6 per cent. dividend on the $60,000,000 outstanding capital stock, and the L. & N.'s proportion of the lease of the Georgia Railroad was $2,895,469, a decrease of $435,357.

Missouri, Kansas & Texas.—This company has again applied to the Texas Railroad Commission for permission to issue $25,000,000 mortgage bonds on its lines in Texas. The present application is a modification of the original application which was refused a few months ago.

Missouri Pacific.—The $3,828,000 7 per cent. third mortgage bonds maturing Nov. 1, 1906, are to be extended for 32 years at 4 per cent.

Toledo, Ann Arbor & Detroit (Electric).—Willis Baldwin, Monroe, Mich., and R. H. Burgonn, Fremont, Ohio, have been appointed Receivers for this partially built road between Toledo, Ohio, and Ann Arbor, Mich., on the petition of the contractors who built a power house for the company at Petersburg, Mich.

Troy & New England (Electric).—Action has been brought in the New York State Supreme Court to foreclose the first mortgage securing $160,000 5 per cent. bonds of 1945, on which the interest due Feb. 1, 1906, was defaulted. The road runs from Albia, N. Y., to Averill Park. It has 10 miles of track, including sidings. The company has been in the hands of a Receiver since last January.

Wadley Southern.—This company, which is a consolidation of the Stillmore Air Line and the Wadley & Mt. Vernon, is to mortgage its property to the Guarantee Trust Company, New York, Trustee, securing $1,000,000 first mortgage 5 per cent. 20 year bonds, dated July 4, 1906, and redeemable at 105 and interest on any interest date. Of this amount, $485,000 is issuable at once and, of the remainder, $315,000 is reserved to retire at face value the outstanding bonds of the Wadley & Mt. Vernon, while $200,000 is to be hereafter issued for improvements, betterments and additions.

# GENERAL NEWS SECTION

## NOTES.

The Buffalo & Susquehanna now sells a $20 ticket good for 1,000 miles, and good also on the New York Central, the Reading and the B., R. & P. The B. & S. will also reduce all local ticket rates to 3 cents a mile, and where the Pennsylvania is a competitor the rate, after October 1, will be $2\frac{1}{2}$ cents a mile.

The Atchison, Topeka & Santa Fe has bought several hundred acres of land on the San Diego river, California, and is planning to plant on it a large number of trees to be grown for ties. Among the kinds to be planted are the sugar gum and the lemon-scented gum. The forester in charge of the work is Mr. F. S. Hosp.

L. Levi & Company, 111 Broadway, New York City, who have been leaders in a movement among the minority stockholders of the American Express Company to secure higher dividends on their shares, announce that the directors have acceded to their demands, and that the regular rate of dividend henceforth is to be 12 per cent.

The $20 mileage books announced by the Pennsylvania Railroad some weeks ago, which are good for 1,000 miles and are transferable, were put on sale September 1. These tickets are good on all trains, including limited trains (by payment of the extra fare) except the Pennsylvania Special (the New York-Chicago 18-hour train).

Study of the new Interstate Commerce law has led the railroads in Nashville, Tenn., to the conclusion that although it is lawful to make reductions to charitable institutions in passenger rates, it is not lawful to do anything of the kind with respect to freight rates, and therefore it has been decided that the United Charities of Nashville can no longer have carloads of coal brought from the Kentucky mines free, as has been done in past years. Coal operators in Kentucky have made gifts of coal to the Charities on condition that the railroads carried the coal free. The employees of the railroads also have heretofore been favored in the transportation rates on coal, but it is expected that this favor will now be cut off.

A press despatch from Buffalo says that the railroads of that city have agreed to increase from $1.50 to $2 the rate per car for switching bulk freight for connecting roads. From Chicago it is reported that the Chicago & North-Western and the Chicago, Milwaukee & St. Paul have given notice that they will no longer participate in the inter-line switching arrangement which has been long in vogue in that city. The several roads have regularly sent their switching engines with cars onto the lines of other roads with great freedom and to places many miles from home, and have thus delivered great numbers of cars to industries at considerable expense, without charge, the switching charge being absorbed in the freight bill. When it came to publishing the tariffs for this service, as required by the new law, the two roads decided that it would be a good time to put a stop to such a loose arrangement.

A press despatch from Montreal says that the Canadian Pacific is going to so arrange the trips of its steamships on the Pacific and on the Atlantic, with a special train to connect across the continent, that passengers and mails can be carried between Liverpool and Hong Kong in 30 days, which is claimed to be five days better than the best time between England and China by way of the Suez Canal and the Peninsular & Oriental steamers. The distance between Liverpool and Hong Kong across Canada is given as 12,004 miles. The estimated time is, in days:

| | |
|---|---|
| Liverpool to Quebec | 7 |
| Quebec to Vancouver | 4 |
| Vancouver to Hong Kong | 19 |

And the mileage is:

| | |
|---|---|
| Liverpool to Quebec | 2,661 |
| Quebec to Vancouver | 3,072 |
| Vancouver to Yokohama | 4,283 |
| Yokohama to Shanghai | 1,178 |
| Shanghai to Hong Kong | 810 |
| Total | 12,004 |

The first special train started from Quebec August 31, on the arrival of the Empress of Ireland from Liverpool, and the first eastbound special will start from Vancouver September 17, on the arrival there of the Empress of India.

### Storage to Be Charged on Freight at Kansas City.

The Missouri Valley Car Service Association, with headquarters at Kansas City, Mo., has been reorganized and its name is changed to the Missouri Car Service & Storage Bureau; and storage is to be charged on less than carload freight, if the regulations are to be enforced as bravely as they are written, "as regularly and promptly" as demurrage on cars, or as transportation charges. Individual roads may refund demurrage or storage charges, after investigation by the manager of the bureau and a written recommendation from him, for (*a*) clerical overcharge or error; (*b*) failure of the railroad in movement of the freight; (*c*) unavoidable breakdown of consignee's appliances; (*d*) inclement weather in the free time, making it impossible to move the freight without injury thereto on account of the nature of such freight. This last provision, it will be seen, makes no provision for canceling a demurrage charge simply because a man does not wish to take his horses out in a stormy day. The free time appears to be 48 hours for all commodities. Heretofore grain and hay were allowed to be held 48 hours for inspection and reconsignment, and a period of three days was allowed for unloading coal, coke, lime and ore. The charge for storage of L. C. L. freight is 5 cents a ton for each day. The new rules of the association deal minutely with all conditions, and evidently have been prepared with much care, and as the result of intelligent study of the experience of the past.

### New Ferryboats at 'Frisco.

Plans are being prepared by the Union Iron Works, San Francisco, for two new passenger boats for the Southern Pacific ferry between San Francisco and Oakland. The new boats are to be modeled after the "Berkeley," but will be constructed of steel, and with greater draught and more powerful engines than the "Berkeley."

### New Ferryboats for New York.

Construction is to begin soon on three ferryboats for the city of New York to run from the Battery, Manhattan, to Thirty-ninth street, Brooklyn, the Department of Docks and Ferries having awarded the contract to the Harlan & Hollingsworth Company, of Wilmington, Del. The bid of this company was $635,000 for the three boats. There was only one other bidder, the Burlee Dry-Dock Company, which submitted an estimate of $249,000 for a single boat. The Harlan & Hollingsworth Company's figure for a single boat was $217,000. The Maryland Steel Company, which built the Staten Island boats for the city, did not bid owing to the labor clause in the contract. This clause provides that not more than eight hours a day shall be required of the workmen engaged, and that the prevailing rate of wages in the trade shall be paid. This stipulation was inserted in accordance with a recent decision of the Supreme Court.

The new boats are to be of steel, and will resemble the new boats of the Central Railroad of New Jersey. Their length will be 209 feet, and breadth 45 feet. They will have two two-cylinder compound engines, driving a shaft running from end to end with a screw propeller at each extremity.

### Stolen Ties.

J. C. Betancue, the Southern Pacific detective, has been tie hunting for the company for several weeks, and has located some 5,000 Southern Pacific ties on ranches and at mines, some of them forty miles from the Southern Pacific right of way. He also found many Santa Fe ties west of Deming, where they had been carried by floods. An untreated tie costs the Southern Pacific on its New Mexico division, when put off the car, one dollar, and a treated tie costs a dollar and a quarter.—*Albuquerque Citizen.*

### To Exhibit Safety Devices.

The American Institute of Social Service will hold an exhibition of devices for safeguarding lives and preventing accidents, at the American Museum of Natural History, New York City, commencing Jan. 28, 1907. This will be the first exhibit of its kind held in this country. Requests for information regarding space, etc., should be made to Dr. William H. Tolman, Director, 287 Fourth avenue, New York.

### The Value of the Railroad Y. M. C. A.

Men should be cared for at terminals to improve their mental as well as social standing. We believe that good, clean rest rooms should be provided at terminals and encourage cleanliness with our men. We also believe that they should have access to reading rooms or libraries where they can keep themselves posted on the leading topics of the day, mechanical and otherwise. Your chairman is fortunate enough to be employed on a road that has a Railroad Y. M. C. A. at each terminal. At one of the associations there is a large library, and members of any of the other associations can draw books from this library, the books being handled back and forth by the railroad free of cost. At all of the associations there are good, clean rest rooms, and at several of the away-from-home terminals there are lunch rooms. We would heartily recommend the Railroad Y. M. C. A. to any railroad, as we know of nothing that will improve the standard of the men, from a moral or

cial standpoint, more than these institutions. *From a committee report to the Traveling Engineers' Association.*

### The Traveling Engineers' Convention.

The Traveling Engineers' Association held its 14th annual convention at the Auditorium Hotel, Chicago, August 28 to 31, inclusive. Mayor Dunne, of Chicago, delivered the address of welcome, and A. E. Manchester, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul, also gave a short address. President A. L. Beardsley (A., T. & S. F.) was in the chair. In his address he touched on such important matters as superheating of steam, water treatment, Walschaert valve gear, mechanical stoking, and electricity for motive power, all of which were recommended to the attention of the members.

The subjects discussed by the convention were:

"Oil Burning Locomotives," by J. B. Galivan (Santa Fe Coast Lines).
"Care of Locomotive Boilers," By F. P. Roesch.
"Regularly Assigned vs. Pooled Locomotives," Committee report.
"The Future Engineman," Committee report.
"Committee Work," by C. B. Conger.
"Walschaert Valve Gear," by O. H. Rehmeyer.
"Tonnage Rating," by F. W. Thomas.
"Handling Air Brakes in Passenger Service," by C. C. Farmer.
"Drafting Locomotives," by E. Harlenstein.
"Handling Locomotives at Terminals to Reduce Delays," Committee report.

Extracts from some of the foregoing papers will be found elsewhere in this issue, and others will be published from time to time. In addition to the regular papers and reports, Mr. H. P. Turner, of the Westinghouse Air Brake Company, delivered an illustrated lecture on the new E T brake equipment.

The officers for the ensuing year are: President, W. J. Hurley (N. Y. C. Lines); First Vice-President, A. M. Bickel (L. S. & M. S.); Second Vice-President, J. A. Taity (D., L. & W.); Third Vice-President, C. F. Richardson (Frisco); Secretary, W. O. Thompson (N. Y. C. Lines); Treasurer, C. B. Conger (Int. Corr. Schools). Chicago was selected as the place of meeting for 1907.

### Government Railroad Inspector in the Philippines.

It is announced that the Philippine Commission, the body ruling the Philippine Islands, has created the office of Supervising Railway Expert, at a yearly salary of $24,000, Philippine currency. The function of the expert will be to see that contractors building railroads under the special concessions of 1905 carry out their contracts and conform to the laws; and, in general, to see that all railroad operations are properly carried on. The person to whom this "plum" will fall, says our informant, has not yet been named.

## TRADE CATALOGUES.

*Lackawanna & Wyoming Valley Railroad.*—The Lackawanna & Wyoming Valley, an electric line connecting Scranton and Wilkesbarre, Pa., controlled by the Westinghouse interests, has issued an industrial pamphlet addressed to manufacturers. Under the title, "A Manufacturers' Paradise," the inducements offered by the road in favorable locations for industrial plants are taken up under the heads of power, shipping facilities, fuel, water supplies, and labor. A map is shown with industrial locations available along the road marked in a separate color. The pamphlet is illustrated with pictures of manufacturing plants already located, a coal breaker, the Scranton terminal freight house and power station, and one of the company's electric locomotives at the head of a train of freight cars. For an electric line to pursue the same methods of attracting industries as those which have been used by the industrial departments of the steam roads is an unusual occurrence.

*Mine and Quarry.*—The August number (No. 2) of this magazine of the Sullivan Machinery Co., Chicago, contains some interesting articles, the leading one being a detailed illustrated description of "The Gunnison Tunnel of the Uncompaghre Irrigation Project," especially written for this paper. Another interesting article is that on "Channeling in New York City," describing the work of this character being done in connection with the new terminal work of the New York Central. "Drilling in Coal Prospecting"; "Quarrying Sandstone at Amherst, Ohio," and "Excavation Methods of the New York State Barge Canal," are among the other articles which make up the issue.

*The Oil Problem.*—A two-page folder with this caption is sent by S. F. Bowser Co., Ft. Wayne, Ind., the problem being how to keep the oil in the storehouse, shop or factory clean and pure, prevent waste and evaporation and keep the surroundings clean. A solution by the Bowser system is offered in the folder. A bulletin (No. 51) of the same company describes and illustrates an elaborate installation made for H. Behlen & Bro., 31 Pearl street, New York.

*Ideal Power.*—The August number of the Chicago Pneumatic Tool Co.'s magazine includes articles on "Co-operation"—a reprint of Mr. Henry W. Thornton's address to the Traffic Club of Pittsburg—and the pressed steel passenger car of the Pressed Steel Car Co., exhibited at the Atlantic City conventions, in addition to appropriate articles reprinted from contemporaries, and notes and small items of interest in the field of this magazine.

*Car Roofing.*—A new catalogue of the Hutchins Car Roofing Co., Detroit, Mich., describes and illustrates the different styles of Hutchins metal and plastic car roofs. These include three styles of outside and two inside metal roofs, and two plastic roofs, one being sectional. Drawings showing details and dimensions accompany each style.

*Specifications for Rails, Etc.*—The little pamphlet of The American Bureau of Inspection and Tests, Chicago, contains specifications for new rails, both Bessemer and open-hearth, new splice bars, and first and second class relaying rails; also a blank for relaying-rail contract, and on the back cover tables for amounts of different track material per mile of track.

*The Obermayer Bulletin.*—The current number of this bi-monthly publication of The S. Obermayer Co., Cincinnati, Ohio, has as special articles, "The Right Way to Run a Foundry"; "Pig Iron"; "Ratio of Coke to Iron in Foundry Practice," and "How Mike Took Off His Heat."

### Manufacturing and Business.

The Allis-Chalmers Co., Milwaukee, Wis., reports the sale of two 100-kw. generators to the Panama Railroad.

The Hicks Locomotive & Car Works have removed their general offices to the Fisher Building, Chicago.

A. L. Graburn, formerly Superintendent of the St. Cloud shops of the Great Northern, has been appointed to a position with Geo. M. Kenyon, railway materials, St. Paul, Minn.

Steven Bowling, of the railroad department of the Philip Carey Manufacturing Co., Cincinnati, O., has been appointed Manager of that department, with headquarters at Cincinnati.

The stockholders of the Southern Steel Company have voted to increase the capital $9,000,000, as follows: Preferred stock from six millions to ten; common stock from ten millions to fifteen.

Former Vice-President and Manager Chas. Partington, of the Weir Frog Co., Cincinnati, O., has resigned. W. W. Allen, formerly connected with the Ramapo Iron Works, Hilburn, N. Y., has been appointed manager.

W. J. Schlacks, heretofore Superintendent of Machinery of the Colorado Midland, has resigned to become Western Sales Agent for McCord & Co. at Chicago. Judson A. Lamon, General Sales Agent, McCord & Co., will move his headquarters from Chicago to New York about October 1.

The Kilburne & Clark Co., Seattle, Wash., has recently placed a large order with the Electric Cable Co., New York, for Voltax liquid compound to be used as a waterproof paint for the protection of railroad bridges which this company has in course of construction on the Pacific coast.

The following have been elected Directors of the Locomotive Appliance Company for the ensuing year: Frank W. Furry, J. J. McCarthy, J. B. Allfree, Willis C. Squire, Ira C. Hubbell, all of Chicago, Ill., and Clarence H. Howard, H. M. Pflager, B. F. Hobart, C. A. Thompson, W. J. McBride, all of St. Louis, Mo. and J. H. McConnell, Pittsburg, Pa.

The Carborundum Co., Niagara Falls, has started construction work on a large branch plant in Germany for the manufacture of carborundum. The buildings are to be entirely of concrete, fireproof construction, and the plant when completed will embody all of the latest and most improved machinery for the manufacture of abrasive materials. It is expected the new works will be in operation by January 1, 1907.

### Iron and Steel.

The Southern has let an additional contract for 15,000 tons of rails for 1907.

The Boston & Maine is planning to lay during the present year about 30,000 tons of new rails. From 70 to 80 miles of the new steel will be put in on the Fitchburg line. The rails are all 85-lb.

Rail orders during August were lighter than for several months; during the last week of August the orders aggregated 33,500 tons. The last single contract reported was 15,000 tons additional for the Southern Railway for 1907.

The Chicago & North-Western has given an additional order to the Pennsylvania Steel Co. for 10,000 tons of standard sections for 1907 delivery, and the Missouri, Kansas & Texas for a supple-

mentary lot of 10,000 tons, making its total orders for next year 20,000 tons.

The contracts for structural and fabricated steel placed during August are estimated at 150,000 tons, including the 42,000 for the Manhattan bridge. Of this total approximately 50,000 tons was secured by the American Bridge Company. Orders about to be given include 20,000 tons for Harriman line bridges, and 15,000 tons for the Baltimore & Ohio bridges at Havre de Grace, and 18,000 tons for a rail mill at Gary.

The United States Steel Corporation, through its subsidiary companies, has received an order for 1,100 tons of rails for 1906 delivery, for a lime and cement company, and one for 1,300 tons for the Brooklyn Rapid Transit Co., in addition to the orders of the Lake Shore Electric Co. and the Chicago & Western Indiana, aggregating 5,300 tons. For 1907 delivery the Steel Corporation has orders for 4,500 tons for the Alabama & Vicksburg and allied companies.

The more important of the small contracts let during the last week in August include 750 tons for a highway bridge at Clay street, Passaic, N. J., over the Passaic river, 780 tons additional for the Baltimore & Ohio Washington terminal, 1,250 tons for an open hearth mill building for the Andrews Steel Company at Newport, Ky., and 650 tons for bridges for the Mexican National. The Chicago, St. Paul, Minneapolis & Omaha has let a bridge contract requiring 390 tons of steel.

The Ryan-Parker Construction Co., of New York, which has the contract for the Manhattan bridge, has let the structural work to the Phœnix Iron Co., of Phœnixville, Pa. It is understood that basic open-hearth steel will be used. The contract awarded to the Phœnix Iron Co. calls for about 34,000 tons. It does not include the cables, which will require about 8,000 tons. It is understood, also, that the question of anchorages is still unsettled. The total quantity of steel required will be about 83,970,800 lbs., or 41,985 net tons.

## OBITUARY NOTICES.

Charles Thomas Bayless, Mechanical Engineer of the Mexican Central Railway, died on September 5th at his residence at Aguascalientas, Mexico. Mr. Bayless graduated from Stevens Institute of Technology in 1893, and entered the service of the *Railroad Gazette* at its Chicago office under the late David L. Barnes. He began railroad service as Draftsman in the Mechanical Department, and soon became the Chief Draftsman of the Mexican Central, and since 1901 he has been its Mechanical Engineer.

J. Rogers Barr, General Manager of the Lexington & Eastern, died at Lexington, Ky., Aug. 18. Mr. Barr was born in Louisville, Ky., in 1869, and was a graduate of Princeton University, where he took a scientific course. He left that institution in 1889 and soon afterward entered railroad service with the Baltimore & Ohio Southwestern in the civil engineering department. In 1894 he left that road to go to the Lexington & Eastern. In 1897 he was made General Manager of the latter road, the position which he held at the time of his death.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Delaware, Lackawanna & Western.*—The office of Assistant Auditor has been abolished, W. C. Swift having died recently. C. C. Hubbell has been appointed Auditor of Miscellaneous Receipts, and W. G. Vanderwater has been appointed Auditor of Disbursements, both with office at New York.

*New Orleans, Natchez & Pacific.*—This recently organized company held a meeting at Natchez, Miss., September 3, and elected A. B. Wheeler, New Orleans, President; W. J. Poitevant, New Orleans, First Vice-President; R. F. Larned, Natchez, Treasurer, and G. E. Moritz, Natchez, Secretary.

### Operating Officers.

*Chicago, Burlington & Quincy.*—E. P. Bracken, Superintendent at Sterling, Colo., has been appointed Superintendent at Sheridan, Wyo., succeeding F. D. Weidenhamer, resigned.

### Traffic Officers.

*Southern Pacific.*—H. A. Jones, heretofore on the Texas Lines, has been appointed Freight Traffic Manager, with office at San Francisco, succeeding William Sproule.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe.*—James Dun, who has resigned as Chief Engineer of the Atchison, Topeka & Santa Fe System, has been appointed Consulting Engineer; office at Chicago.

*Chicago, Burlington & Quincy.*—H. E. Culbertson has been appointed Master Mechanic at McCook, Neb., succeeding F. E. Kennedy, transferred.

*Pennsylvania Lines West.*—Guy Scott has been appointed Engineer of Maintenance of Way on the southwest system, at Richmond, Ind., succeeding Robert Ferriday, resigned.

## LOCOMOTIVE BUILDING.

*The Isthmian Canal Commission* has asked bids for 40 mogul locomotives.

*The Salem, Falls City & Western*, it is reported, has ordered one mogul locomotive.

*The New York Central Lines*, it is reported, have reserved space with the American Locomotive Co. for 200 locomotives.

*The Chicago, Burlington & Quincy*, it is reported, has ordered 66 locomotives. Fifty are for freight service and the remainder are for passenger service. The order has been divided between the Baldwin Works and the American Locomotive Co.

*The Western Pacific*, as reported in our issue of Aug. 24, has ordered 20 simple consolidation (2-8-0) locomotives from the Baldwin Works. The specifications are as follows:

*General Dimensions.*

| | | |
|---|---|---|
| Type of locomotive | | Consolidation |
| Weight | on drivers | 185,000 lbs. |
| | total | 207,000 " |
| Diameter of drivers | | 57 in. |
| Diameter of cylinders | | 22 in. and 30 in. |
| Firebox | length | 121 " |
| | width | 40⅛ " |
| | grate area | 33.6 sq. ft. |
| Heating surface, total | | 3,129 sq. ft. |
| Boiler | type | Straight top |
| | working steam pressure | 200 lbs. |
| | number of tubes | 390 |
| | material of tubes | Gould Special Iron |
| | diameter of tubes | 2 in. |
| | length of tubes | 14 ft. 4 " |
| Tank capacity | | 8,000 gals. |
| Coal capacity | | 14 tons |

*Special Equipment.*

| | |
|---|---|
| Axles | Hammered steel |
| Brakes | Westinghouse |
| Couplers | Tower |
| Injector | Monitor |
| Sanding devices | Leach |

## CAR BUILDING.

*The Nashville, Chattanooga & St. Louis*, it is reported, will build 500 coal cars at its own shops.

*The Southern*, it is reported, has ordered a number of freight cars, including gondolas, flat and box cars.

*The Chicago, Rock Island & Pacific*, it is reported, has reserved space with the American Car & Foundry Co. for 5,000 box cars.

*The Salem, Falls City & Western* has ordered 24 flat cars of 70,000 lbs. capacity for October and November delivery. The cars will be 41 ft. long.

*The St. Louis, Rocky Mountain & Pacific*, it is reported, is in the market for upwards of 1,000 cars, including box cars, gondola cars and stock cars.

*The Grand Trunk Pacific* has ordered 1,900 box cars of 60,000 lbs. capacity from the Canada Car Co., and 600 Hart convertible ballast cars of 80,000 lbs. for 1907 delivery.

*The Hartford & Springfield Street Railway* has ordered two closed electric cars from the Wason Manufacturing Co. for October, 1906, delivery. The bodies and underframes will be of wood.

*The Huntingdon & Broad Top Mountain* has ordered 300 steel drop-bottom cars from the American Car & Foundry Co., and 200 steel drop-bottom cars from the Pressed Steel Car Co., all for December, 1906, delivery.

*The Galesburg & Kewanee Electric* has ordered two single-end interurban cars from the Niles Car & Manufacturing Co., for November delivery. These cars will weigh 46,000 lbs., and measure 46 ft. long, 8 ft. 6½ in. wide, and 13 ft. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Brakes | Peacock |
| Couplers | Van Dorn |
| Curtain material | Pantasote |
| Heating system | Peter Smith |
| Journal boxes | Symington |
| Trucks | Baldwin |

*The Tonopah & Goldfield*, as reported in our issue of Aug. 10, has ordered one passenger car, one chair car, one express and mail car, and one baggage car from the Pullman Co., all for November delivery. The passenger car will be 60 ft. long by 9 ft. 8 in. wide over all. The special equipment for all includes:

| | |
|---|---|
| Bolsters | Commonwealth |
| Brake-beams | Diamond Special |
| Brake-shoes | Christie |
| Curtain fixtures | Forsythe |
| Curtain material | Pantasote |
| Heating system | Safety Car Heating & Lighting Co. |
| Vestibules | Pullman |

*The Quebec Central* is building 50 flat cars and 15 stock cars of 60,000 lbs. capacity at its Newington shops, for September and December delivery. The flat cars will be 36 ft. long by 9 ft. 2 in. wide over all. The stock cars will weigh 30,600 lbs. and will measure 35 ft. 6 in. long by 8 ft 7 in. wide, by 7 ft. high, all inside dimensions. The special equipment will include:

| | |
|---|---|
| Bolsters | Simplex |
| Brake beams | Simplex |
| Brakes | Westinghouse |
| Couplers | Tower |
| Draft rigging | Miner |
| Journal boxes | McCord |
| Trucks | Simplex |
| Wheels | Laconia |

*The Pere Marquette*, as reported in a previous issue, has ordered 2,000 box cars of 80,000 lbs. capacity from the Pullman Co., for December delivery. The cars will measure 36 ft. long by 8 ft. 6 in. wide, by 8 ft. 2½ in. high, all inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | American Steel Foundries Co. |
| Brakes | Westinghouse |
| Brasses | Climax |
| Couplers | Janney |
| Door fastenings | Security |
| Doors | Security |
| Draft rigging | Miner |
| Dust guards | Positive |
| Journal boxes | Symington |
| Roofs | Chicago Improved Winslow |
| Trucks | Barber |

*The Mobile Light & Railroad Co.* has ordered six single and six double Brill semi-convertible cars from the American Car & Foundry Co. for October delivery. These cars will have a seating capacity for 28 and 48 persons. The weight of the single cars will be 14,000 lbs., and the double cars will weigh 26,000 lbs. The bodies and underframes will be of wood. The special equipment includes:

| | | | |
|---|---|---|---|
| Axles | Brill | Dust guards | Brill |
| Bolsters | Brill | Heating system | None |
| Brake-beams | Brill | Journal boxes | Brill |
| Brake-shoes | Brill | Light | Electric |
| Brakes | Brill | Paint | Medium chrome yellow |
| Brasses | Brill | Platforms | Vestibuled |
| Couplers | Brill | Roofs | Monitor |
| Curtain fixtures | Keeler | Seats | Am. Car Co.—wood seats |
| Curtain material | Oakette | Springs | Brill |
| Door fastenings | American Car Co. | Trucks | 21E. and 27G., Brill |
| Doors | American Car Co. | Vestibules | Detachable |
| Draft rigging | American Car Co. | | |

## RAILROAD STRUCTURES.

Champaign, Ill.—The Illinois Traction Co. has started preliminary work on its new car barns, to be 200 ft. wide and 300 ft. long, and contain seven tracks. The cost of the work will be about $50,000.

Indianapolis, Ind.—The final plans for the extensive shops, roundhouses, etc., which the C., C., C. & St. L. is to build at Beachwood Grove, have been completed and bids are being asked for the work. It will take three years to build the works. The machine and erecting shop will be 312 ft. by 572 ft. The boiler shop is to have a capacity for 25 boilers. It is intended to have the machine and erecting shop completed this fall.

Macon, Ga.—Residents of this place, in connection with the City Council and the Macon Chamber of Commerce, are negotiating with the railroads to secure the building of a new passenger station.

Moncton, N. B.—General Manager D. Pottinger, of the Intercolonial, is asking bids for the steel superstructure of a bridge at Doaktown; also for one at Boiestown, and one at Boyer River, Quebec.

Montreal, Quebec.—The Canadian Pacific, it is said, is planning to replace about 48 of its present structures with steel bridges on its main line between Montreal and Quebec.

New York, N. Y.—The New York, Ontario & Western and the West Shore roads are to have a new ferry house at West Forty-second street. The contract will be let shortly.

Portage La Prairie, Man.—Plans and specifications are ready for the new union passenger station to be built by the Midland & Manitoba (Great Northern) and the Grand Trunk Pacific Railroads. Mayor E. Brown can give information.

Prince Albert, Sask.—A by-law will be submitted to the ratepayers to grant $25,000 towards the cost of a combined highway and railroad bridge to be built over the Saskatchewan river by the Canadian Northern.

Quebec.—The Canadian Pacific has concluded an arrangement with the management of the Intercolonial for the erection of a Union station at Quebec.

Rice Lake, Wis.—Residents have asked the Chicago, St. Paul, Minneapolis & Omaha to build a passenger station here. Plans have been made for putting up a new structure at a cost of $50,000.

St. Paul, Minn.—The announcement is made that nine of the ten railroads entering the city have agreed to build a railroad bridge across the Mississippi from the mouth of Phalen creek, at the base of Dayton's Bluff, to the West Side yards. Such a bridge will cost $800,000.

Topeka, Kan.—The Chicago, Burlington & Quincy is planning to build a new concrete steel bridge 240 ft. long, to carry two tracks, over Salt creek.

Washington, D. C.—Bids are wanted at the office of the Commissioners September 15 for constructing a plate girder bridge on K street over Rock creek and the canal, between Twenty-eighth and Twenty-ninth streets. Information may be obtained from Henry B. F. Macfarland, Commissioner.

Western Maryland.—Improvements which will cost upwards of $2,000,000 are to be made along the lines of this company. Most of the work, it is expected, will be completed by the end of this year. The work includes a double-tracking of two divisions, the laying of heavier rails, new grading, new bridges and re-ballasting. The double-tracking of the Emory Grove division will be the most important part of the work. Along this division an automatic block signal system will also be installed. Some of the old timber bridges along the line will be replaced by steel structures.

Winnipeg, Man.—Local reports state that the Canadian Northern has decided to build its new shops at Fort Rouge.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Arkansas, Louisiana & Gulf.—This company, which was incorporated some time ago to build a line from Pine Bluff, Ark., via Monticello, Star City, Hamburg and Bastrop, to Monroe, La., about 125 miles, it is said will shortly let contracts for building the line. J. M. Parker, of the Southern Development Company, has secured the rights of way and ground for new stations at Hamburg and at other points. P. B. Stewart, president of the Columbia Title & Trust Company, is interested. (See Construction Record.)

Aurora & De Kalb.—This road has been opened for traffic from Aurora, Ill., to Cortlandt, 26 miles.

Boston, Lowell & Lawrence (Electric).—The directors of this company have petitioned the Massachusetts State Commissioners for authority to build an electric line from Boston northwest to Lowell, about 28 miles. The petition is signed by the following directors: Butler Ames, Paul Butler, Spencer Borden, Jr., Oakes Ames and Charles F. Remington.

Buffalo & Susquehanna.—Preliminary work has been started by this company for the building of a new line from Plumville, Indiana County, Pa., to Sagamore, three miles, where one of the largest coal mines in that district is to be opened. Bids for the work are being received, and it is probable that the contract will shortly be let.

Carolina Mineral.—An officer writes that this company, which was recently incorporated in North Carolina, with $200,000 capital, has been projected by stockholders of the Colosses Gold Mining & Milling Co., of Waxhaw, N. C., and will be owned and operated as a close corporation by that company, not having any connections with other railroads. The road is to be built for the purpose of hauling ore to a central reduction plant already built. The grading work is under way and track-laying was to be started the first of this month. No contracts for this work have been given out. The proposed route is from the Colosses Mine north through Wedington and Providence to Charlotte, N. C., which is on the Seaboard Air Line and the South & Western. There is also to be an extension from the Colosses Mines south to Lancaster, S. C., which is on the Lancaster & Eastern and the Southern. Surveys are now being made for this extension. The work will be easy, being over a comparatively level country. J. F. Keller, Lancaster, Pa., is President, and A. J. Moore, Waxhaw, N. C., Chief Engineer. (Aug. 24, p. 50.)

Central Railway of Oregon.—This company, which was incorporated last June in Oregon with $2,000,000 capital, is offering $2,000,000 of bonds at the rate of $20,000 per mile. The company owns franchises for the operation of railroads in the Grand Ronde valley, Union County, Oregon. The original surveys cover about 100 miles of line. Fifty miles of this work is under way, and it is expected will be completed during the present year. Connections are to be made with the Oregon Short Line and the Oregon Railroad & Navigation Company.

Chicago, Burlington & Quincy.—The line running north from Ashland, Neb., has been extended to Sioux City, Iowa, 108 miles from Ashland, and is now in operation.

Chicago, Milwaukee & St. Paul.—This company has made public a part of the route of its Pacific coast extension. The western terminal is to be at Seattle and on the east the line is to be an ex-

tension of the Aberdeen branch; but from Butte westward the line is still in doubt, although some work is being done at Seattle. The extension leaves the Aberdeen-Evarts line at Glenham, about ten miles east of the Missouri river, and runs northwesterly to the point where a bridge will be built across the river; thence northwest through Boreman and Schnasse counties, South Dakota, into North Dakota at the northeast corner of Butte County, South Dakota. It will traverse Hettinger, Bowman and Billings counties, North Dakota, crossing the line between North Dakota and Montana about ten miles north of the north line of Bowman County. In Montana the line is to run northwest, crossing the Northern Pacific and the Yellowstone river at Erric. It will then run south of the Yellowstone to a point directly opposite Forsythe, Mon. From that place it is to run as directly as possible to Musselshel, on the big bend of the Musselshel river. At Harlowton it connects with the Montana Railroad Company's line from Lewiston to Lombard. This line has been bought by the St. Paul and the track from Harlowton to Lombard, 95 miles, will be used. From Lombard into Butte the new line will closely parallel the Northern Pacific.

The Sioux City and Dakota division of this road has been extended from Corsica, S. Dak., west to Stickney, 12 miles; and the White River Valley Line has been extended from Presho, S. Dak., west to Murdo Mackenzie, S. Dak., 35 miles.

CHICAGO, ROCK ISLAND & PACIFIC.—An officer writes that grading work on the Rock Island, Arkansas & Louisiana is being done by the Dalhoff Construction Co., of Little Rock, Ark. The line is from Alexandria, La., south, paralleling the Texas & Pacific to Lamourie, and thence to Eunice, 56 miles. No track has yet been laid. The work is not difficult, maximum grades being 4/10 per cent. and maximum curves 3 degrees.

CONEMAUGH VALLEY STREET RAILWAY.—The directors of this company have authorized a bond issue of $1,000,000 to build an electric line from Johnstown, Pa., to Ebensburg. The promoters of the road are residents of Johnstown, Pa.

DENVER, ENID & GULF.—An officer writes that the Denver, Kansas & Gulf, a part of the D., E. & G., is being built by the Kansas Construction Company, general offices Medicine Lodge, Kan. The proposed route is from Kiowa, Kan., northwest to a connection with the Englewood branch of the Atchison near Belvidere, 50 miles, following the valley of the Medicine river, passing through Medicine Lodge, Lake City and Sun City. Track has been laid to a mile north of Medicine Lodge; grading is completed to Sun City and under way to the connection, 10 miles; maximum grade, $^{7}/_{10}$ per cent.; maximum curves, 3 deg. J. W. Beatty, Medicine Lodge, Kan., is the engineer in charge.

DENVER, KANSAS & GULF.—See Denver, Enid & Gulf.

DES MOINES, WINTERSET & CRESTON (ELECTRIC).—Plans are being made by this company for building an electric line from Des Moines, Iowa, southwest via Winterset to Creston, about 65 miles. A terminal contract has been made with the Des Moines City Railway Co., which provides for a loop in Des Moines. The company also has a terminal franchise in Creston. The road will be built to carry heavy freight as well as passengers, and will have light grades. The headquarters of the company are at Des Moines. (See Construction Record.)

EASTERN RAILWAYS COMPANY.—The stockholders of this company have voted to build a high-speed electric line between Pottsville, Pa., and Mauch Chunk, and have authorized the expenditure of $1,500,000 for this and other new lines.

ELDORADO, MARION & WESTERN.—See Missouri Pacific.

ELK, BIRCH & GAULEY.—Incorporated in West Virginia, with $100,000 capital, to build a line from the Birch river, in Braxton County, W. Va., southeast to Camden-on-Gauley, in Webster County, about 30 miles. The incorporators include P. T. West, Grafton; G. S. Bennett, Amos; C. A. Shaw, Shinnston, and E. T. Tetrick, Clarksburg, W. Va.

HATTIESBURG & MAMMOTH SPRINGS (ELECTRIC).—Incorporated in Mississippi with $100,000 capital, to build an electric line from Hattiesburg, Miss., on the Gulf & Ship Island, Mississippi Central, Mobile, Jackson & Kansas City, and New Orleans & Northeastern, south to Mammoth Springs, on the Gulf & Ship Island, about twelve miles. E. F. Ballard, J. Fitch and others are interested.

INDIANAPOLIS, HUNTINGTON, COLUMBIA CITY & NORTHWESTERN (ELECTRIC).—An officer writes that this company, which was recently incorporated, will shortly let contracts for building its proposed electric line from Goshen, Ind., south via Columbia City, Huntington, Marion, Elwood and Noblesville to Indianapolis, approximately 150 miles. (Aug. 17, p. 45.)

KINGSPORT SOUTHERN.—Incorporated in Tennessee with $20,000 capital to build a line 20 miles long from Sinking creek, Washington County, Tennessee, north to a point on the Virginia state line. D. V. Mullens, A. P. Moore, A. B. Whitaker, J. A. Dickey and J. C. Anderson, of Bristol, Tenn., are interested.

LOUISVILLE & NASHVILLE.—According to reports this company is planning to ask for bids for double-track work between Corbin and Livingston, Ky., 20 miles. Engineers at work for the past six weeks have about completed their work.

MCCLOUD RIVER.—An officer writes that this company, which operates 37 miles of road in California, from Upton on the Southern Pacific east to Bartle, has completed an extension 14.38 miles beyond Bartle to McGavic. Trains are now running on the extension. The company intends to further extend from McGavic next year. The entire line has been laid with 60-lb. rails.

MAINE ROADS (ELECTRIC).—A contract has been let for building an electric line through Wells, Me., such a line connecting York and Kennebunkport, Me., about 20 miles apart. This will complete a continuous line of electric roads from Boston to Bath and Lewiston, Me. The grading is to be completed by December 1 and the road is expected to be opened by the middle of next summer.

MEXICAN PACIFIC.—The survey for this proposed railroad, the construction of which will open up the resources of the states of Chiapas, Tabasco, Campeche and Yucatan, has been completed under the direction of Pedro A. Gonzalez, Chief Engineer. The line is to be built by American capital, the promoter of the enterprise being J. M. Neeland. It will give a direct railroad connection with Yucatan. It will run from the town of Jalisco, on the main line of the Pan-American, to Tuxtla, the capital of the state of Chiapas. From Tuxtla it will continue to San Juan Bautista, the capital of the state of Tabasco, and thence to Campeche, the capital of the state of the same name. At Campeche it will connect with the United Railways of Yucatan. The route of the proposed road is through a region of far southeastern Mexico now wholly undeveloped.

MEXICAN ROADS.—The Mexican government has granted a concession to A. S. Mackenzie to build a railroad from Carbo, on the Sonora branch of the Southern Pacific, to Copeta, a mining town in the state of Sonora. Under the terms of the concession the road must be completed within five years. It is stated that Mr. Mackenzie represents a strong syndicate of American and Mexican capitalists, and that the building of the road is assured. The headquarters of the company will be at Hermosillo, Mexico.

MISSOURI PACIFIC.—According to reports from Illinois, the St. Louis, Iron Mountain & Southern has secured control of the Eldorado, Marion & Southwestern, promoted by Sam Brush and other Southern Illinois coal operators. It is a coal road, partly built. The route is from Eldorado, Ill., which is on the C., C., C. & St. L., the Illinois Central and the Louisville & Nashville, west to Marion, which is on the Chicago & Eastern Illinois, the Illinois Central, and the St. Louis, Iron Mountain & Southern, distance about 30 miles.

MOBILE & OHIO.—Under the name of the Hiwanee & Tombigbee, application has been made to build a line from Hiwanee, in Wane County, Miss., to the Tombigbee river in Alabama, about 35 miles. Col. E. L. Russell and others of Jackson, Miss., are interested in the project.

NEW YORK, WESTCHESTER & BOSTON.—This company has filed maps, giving its complete route through Mount Vernon, New Rochelle, Larchmont, Mamaroneck, Rye and Port Chester to the Connecticut line; also giving the route from Mount Vernon through the different towns to White Plains. Large numbers of additional men will be put to work within the next few weeks.

PELHAM & FLORIDA.—Incorporated in Georgia with $250,000 capital to build a line from Pelham, Ga., to Havana, Fla., 40 miles, through Grady County. The incorporators are: J. B. Martin, J. F. Lewis, R. Black, J. Lane, W. T. Banburg, H. C. Briggs, of Valdosta; C. H. Butler, of Calvary; H. A. Sanders, of Whigham; C. J. Stevens, of Milltown, and W. L. Perkins, of Jennings, Fla.

PORTLAND & NORTHERN (ELECTRIC).—Application has been made for a charter by a company under this name to build an electric line from Cumberland Mills, Maine, via Naples to Bridgton, 38 miles. S. O. Hancock and R. Cook, of Casco; E. N. Mason, of Raymond; E. B. Jillson, Otisfield, and others are interested.

PORTLAND & RUMFORD FALLS.—Surveys are being made by this company at Gray, New Gloucester and other towns for the proposed extension of the road from Lewiston Junction, Me., to Portland. It is said that the Canadian Pacific, which has long been seeking a means of reaching the Seaboard at Portland, has made arrangements for a connection over this road.

PRINCE ALBERT & NORTHERN SASKATCHEWAN.—This company, which is backed by capitalists of Prince Albert, Sask., recently obtained a charter and has commenced the construction of its proposed line from that place to Hudson's Bay. It is said that additional grading contracts will shortly be let.

ROCK ISLAND, ARKANSAS & LOUISIANA.—See Chicago, Rock Island & Pacific.

ST. LOUIS & SAN FRANCISCO.—This company has completed the

extension of its Winkler branch from Winkler, Mo., to De Camp, Mo., six miles, and trains are now running.

Silverton Northern.—This company has extended its road from Eureka, Colo., north to Animas Forks, Colo.

Sioux City, Pierre & Northwestern.—Incorporated in South Dakota with $1,000,000 by A. S. King, E. M. Thompson and G. N. Borden, of Minnesota, and Philip Lawrence and Marion Hoke, of Huron, S. D., with offices at Huron and in Minneapolis. The proposed line is to occupy practically the same territory as that covered by the Dakota Midland, as far as Sioux City, passing through the counties of Union, Clay, Yankton, Hutchinson, Douglas, Davison, Aurora, Brule, Buffalo, Hyde and Hughes. At Sioux City the Midland project is to extend north to the line between North and South Dakota, but the Sioux City, Pierre & Northwestern project turns to the east through the counties of Hughes, Hyde, Hand, Beadle, Kingsbury and Brookings to the Minnesota state line and to Minneapolis. The promoters also contemplate building a branch northerly from Sioux City to Sioux Falls, through the counties of Union, Lincoln and Minnehaha. The total estimated length of the line is 600 miles, and the estimated cost of the work $50,000,000. This is reported to be a project of the Chicago & North-Western.

Southern.—According to reports this company has given a contract to W. J. Oliver, of Knoxville, Tenn., for excavation work at Charlotte, N. C., for new yards at Spencer and for grading on the new line from Lookout Mountain into Chattanooga.

Southwestern Interurban.—Incorporated in Kansas to build interurban lines between Arkansas City and Parsons and Coffeyville, through the counties of Labette, Montgomery, Chautauqua, Sumner, Sedgwick and Wilson. The names of the incorporators are not given.

Southwestern Missouri (Electric).—Incorporated in Missouri with $5,000,000 capital to build electric lines aggregating 101 miles in Jasper County, Missouri, and Southeastern Kansas. The proposed routes are as follows: From Carthage, via Webb City and Joplin, to Galena, Kan., thence to Baxter Springs, Kan.; from Joplin via Duenwig to Carterville, in Jasper County; from Webb City to Oronogo, Purcell and Alba to Carthage; from Joplin and Webb City via Carl Junction in Jasper County, to Pittsburg and Columbus, Kan. The incorporators are: H. Rogers, of Joplin; E. E. Wallower, E. Bailey, A. Riley, all of Harrisburg, Pa.; I. W. Frey, Joplin; Samuel McReynolds, of Carthage, and W. S. Chinn, of Webb City.

Tampa & Jacksonville.—A contract is reported let by this company (formerly the Gainesville & Gulf) to W. H. Jones, of Mayo, Fla., for grading 53 miles of road, from Crystal river to Brooksville 28 miles, and from that point to the Withlacoochee river, in the direction of Tampa, 25 miles.

Trinity & Brazos Valley (Colorado Southern).—This company has extended its road from Mexia, Tex., south 14 miles to Teague.

Vining & Coleman.—Application has been made to the secretary of state at Austin, Tex., to revive the charter of this company, organized several years ago by Bird S. Coler, of New York, and associates to build a road from Coleman, Tex., to Waldrip. Nothing was done to carry out the project and the charter lapsed. W. L. Vining, who was interested in the original company, has interested St. Louis capitalists in the proposed road, and it is stated that it will now be built from Coleman, Tex., on the Gulf, Colorado & Santa Fe, southeast to Austin, about 150 miles.

Virginia & Truckee.—This company has opened a new branch from Carson City, Nev., to Minden, 15 miles.

Wabash.—A press despatch from Pittsburg says that a contract is soon to be let for building a connecting track between the West Side Belt and the Pittsburg & Lake Erie, at Saw Mill Run.

Whitehall & Granville (Electric).—Announcement is made that work has been started on an extension of this road. A length of nine miles from Whitehall, N. Y., southeast to Granville, was finished about two years ago. The company has been reorganized and F. B. Gridley, of Troy, N. Y., is the Engineer in charge. The line is to be extended from Middle Granville, N. Y., southeast to West Pawlet, Vt.

Wisconsin Central.—The Ladysmith branch of the Third district of the Northern division has been opened for business from Owen, Wis., north to Ladysmith, 45 miles.

Wynne, Newport & Western.—Incorporated in Arkansas with $280,000 capital to build a line from Wynne to Newport, about 40 miles. The directors are as follows: Sigmund Wolff, of St. Louis; Isaac Goldman, M. W. Stuckey, J. S. Welmons, George R. Hays, H. A. Block, J. L. Hare, J. C. Harrell, W. H. Barnes and O. N. Killough. The line as surveyed traverses some of the richest sections of Cross and Jackson counties.

## RAILROAD CORPORATION NEWS.

Chicago, Burlington & Quincy.—The New York Stock Exchange has listed $23,842,000 additional Illinois division 4 per cent. bonds of 1949, making the total amount listed, $34,148,000. Of this additional amount, $19,682,000 was issued to refund the consolidated 7 per cent. bonds originally due July 1, 1903, and extended for two years at 4 per cent.; $1,154,000 for improvements and additional equipment, and $6,000 for other purposes.

The gross earnings of this company for the year ended June 30, 1906, were $73,413,386, an increase of $7,440,341; net earnings, $20,739,731, a decrease of $1,132,981; surplus, after charges, $12,844,023.

Chicago Railways Company.—The directors of this company, which has been formed to take over the Chicago Union Traction and other Chicago street railways, are: M. E. Sampsell, F. H. Rawson, H. A. Blair, W. N. Elsendrath, E. D. Hulbert, J. H. Eckels, John W. Gary, G. W. Wickersham and L. C. Krauthoff. (June 15, p. 176.)

Chicago Union Traction.—See Chicago Railways Co.

Erie.—The gross earnings for the year ended June 30, 1906, were $50,002,634, an increase of $4,277,897; net earnings (taxes deducted), $14,129,797, an increase of $1,547,268; surplus, after fixed charges, expenditures for additions, improvements and dividends, $533,975, an increase of $43,530.

Grand Trunk.—Earnings for June and for the fiscal year were as follows:

| | 1906. | 1905. | Inc. or dec. |
|---|---|---|---|
| Gross | $2,792,400 | $2,578,761 | Inc. $213,639 |
| Operating expenses | 2,243,945 | 1,758,267 | Inc. 485,678 |
| Net | $548,455 | $820,494 | Dec. $272,049 |
| Fiscal year:— | | | |
| Gross earnings | $30,710,534 | $28,511,850 | Inc. 2,198,684 |
| Operating expenses | 22,048,651 | 20,091,345 | Inc. 1,957,306 |
| Net | $8,661,883 | $8,420,505 | Inc. $241,378 |

Interborough Rapid Transit.—The Manhattan Railway Company has applied to the New York State Railroad Commissioners for permission to issue $4,800,000 new capital stock, the proceeds to be used to reimburse the I. R. T. Company for expenditures and to pay land damages.

Kansas City Southern.—The Port Arthur Canal & Dock Company has made to the Equitable Trust Company, Trustee, a mortgage to secure $1,000,000 5 per cent. bonds, replacing the issue of 1904. The new mortgage covers all the property of the Canal & Dock Company, except seven miles of waterway, which is to be transferred free to the United States government.

Missouri & North Arkansas.—This company has filed a mortgage to the St. Louis Union Trust Company, Trustee, to secure an issue of $11,500,000 first mortgage 4 per cent. bonds. (Aug. 17, p. 46.)

New York, Chicago & St. Louis.—The gross earnings for the year ended June 30, 1906, were $9,651,819, an increase of $1,000,762; net earnings, $2,169,960, an increase of $469,026. The surplus, after charges and dividends, was $142,251, as compared with a deficit during 1905, $64,657.

Pennsylvania.—It was announced Sept. 3 that the Pennsylvania had sold 400,000 shares of Baltimore & Ohio stock and 160,000 shares of Norfolk & Western stock to Kuhn, Loeb & Co., thus reducing the aggregate holdings of these securities by the Pennsylvania Railroad system to about 20 per cent. in each company. According to the official statement, this sale was made by the Pennsylvania system, and therefore included shares held by the Pennsylvania Company, the Northern Central and the Philadelphia, Baltimore & Washington. It is estimated that the proceeds of the sale, together with what can be appropriated out of earnings, will just about cover the $40,000,000 which Mr. Cassatt stated would be necessary to complete the New York tunnels.

Philadelphia Company.—Stockholders of record Sept. 5 can subscribe up to Sept. 20 to the extent of 9 per cent. of their holdings for $3,240,000 of the $6,000,000 new common stock recently issued. (Aug. 24, p. 52.)

Seaboard Air Line.—The gross earnings for the year ended June 30, 1906, were $15,116,947, an increase of $1,497,673; net earnings, $4,603,486, an increase of $76,575; surplus, after charges, $992,121, a decrease of $91,971.

Union Pacific.—This company will redeem on November 1 at 102½ and interest all the outstanding (less than $600,000) first lien convertible 4 per cent. bonds.

West Jersey & Seashore.—The Somers Point branch of this road on August 25th was abandoned and passenger service discontinued. On the same date the Atlantic City & Shore Railroad Company commenced its electric service over the line between Pleasantville and Somers Point.

# GENERAL NEWS SECTION

## NOTES.

The Western & Atlantic has put the block system in use between Atlanta and Cartersville, 48 miles, and the Hocking Valley has put it in use on 35 miles.

According to a press despatch the Atchison, Topeka & Santa Fe has received more than $10,000 in cash from persons to whom it gave free rides out of San Francisco after the earthquake and fire of April 18.

The officers of the New York Central and of the New Haven road are now speaking of Oct. 31 as the date when some of the electric locomotives will be put in service on passenger trains to and from New York City.

The National Refining Co., and other independent oil companies of Indiana, have sent to the Railroad Commission of that state a complaint against 41 railroad companies for discriminating in favor of the Standard Oil Co.

According to a western paper the city officials of West Burlington, Iowa, all intend to resign their offices; this because they are railroad employees and, under a new law, are forbidden, as public officers, to ride on passes.

The Armour Car Lines have announced that they are no longer common carriers and will refrain from quoting or publishing rates for refrigeration, leaving the whole matter of dealing with shippers to be attended to by the railroads.

On request of the State Railroad Commission of Ohio the Interstate Commerce Commission has decided that any road desiring to change interstate fares to make them conform to the Ohio two-cents-a-mile law may do so on Oct. 1 by filing notice three days in advance.

A press despatch from Philadelphia says that the Pennsylvania Railroad, after conferences with delegates representing its telegraph operators, has increased the wages of its employees in that department to an extent involving the additional expenditure yearly of $70,000.

The Houston & Texas Central, acting on the advice of its legal department, has decided that whenever the air brakes of a train become defective between terminals, the train may lawfully proceed to the nearest terminal without air-brake power and depending on the hand brakes.

A Texas paper reports that the St. Louis & San Francisco has adopted the standard solid bridge floor of the Southern Pacific and has built four of such floors. These floors are made of plank and covered with ballast, so that the track lies in the ballast the same as on other portions of the roadway.

John O. Backus, of Mattoon, Ill., Assistant Superintendent of the Central Illinois Traction Co., killed himself with a pistol on Friday last, in consequence, it is said, of the verdict of a coroner's jury fixing on him the blame for a collision of cars on his road September 5, when the motorman was killed and several passengers were injured.

J. E. Walker, of Media, Pa., has complained to the Interstate Commerce Commission that the Baltimore & Ohio Railroad Co., acting in the interest of the United States Express Co., is refusing parcel express privileges to citizens of Media who ride on the electric street cars in preference to the trains of the B. & O. In consequence the complainants are compelled to have their express matter from Philadelphia sent over the Pennsylvania Railroad to a station five miles distant.

According to the *Sentinel*, of Knoxville, Tenn., the resignation of two train despatchers, of the Southern Railway, in that city, has disclosed a scarcity of competent men to fill such places. It is said that there is also much difficulty in securing competent telegraph operators, and this not only on the Southern Railway, but on the Baltimore & Ohio, the Pennsylvania and the Cleveland, Cincinnati, Chicago & St. Louis. On some of these roads there is also difficulty in securing enough competent trainmen in the freight service.

According to a Toronto correspondent, the Grand Trunk Pacific in ordering recently 50,000 tons of rails in the United States confidently expected that, owing to the national character of their enterprise, the import duty of seven dollars a ton would be remitted by the government; but this was refused, and on September 6th the company paid the duty on the whole lot, $382,000. The Dominion Iron & Steel Co. made a bid for the rail contract, and its failure to secure it is said to have been due to some disagreement between the road and the steel company over some matter of the past.

The Receivers' & Shippers' Association Co., of Cincinnati, E. E. Williamson, Commissioner, has asked the Interstate Commerce Commission to enforce that part of Section 20 of the amended Interstate Commerce law which requires the initial carrier to accept responsibility for loss of or damage to freight anywhere between the point of shipment and the destination. The complainant holds that this requirement of the law not only prohibits a carrier from contracting to be relieved of responsibility but also forbids exemption of the carrier from any loss and, therefore, forbids the contract, now universal in bills of lading, limiting the liability of the carrier. The Official, the Western and the Southern classifications still contain the stipulation whereby a shipper who will not assume certain liabilities must pay 20 per cent. above the published tariff rate. The existence of the present tariffs, containing this condition, is regarded as sufficient evidence, and the complainant therefore offers no testimony in support of its complaint.

### Reductions in Fares.

The action of the Pennsylvania in reducing fares has led to numerous other reductions. At Cleveland, it is announced that the Baltimore & Ohio is to make interstate rates to and from points in Ohio on the basis of two cents a mile within that state, the present rate beng still used for parts of these journeys which lie in other states. The Erie announces that beginning Nov. 1, two-and-a-half cents a mile will be the maximum rate for local one-way tickets throughout its lines. West of Hornell, N. Y., and also for through passage between New York or Newark, and points west of Olean, 1,000-mile tickets, sold at a flat rate of $20 each, will be accepted. The Erie's interchangeable mileage book now sold at $30, with a rebate of $10, will be sold at $25 with a rebate of $5. The Lackawanna has issued a notice substantially the same as the Erie's. The interchangeable mileage book sold by the Reading, the Central of New Jersey, the New York Central, and the Buffalo, Rochester & Pittsburg, and good on all these roads, is now good for an unlimited time, and the price is $20 flat. This ticket, like the $20 tickets of the Erie and the Pennsylvania, is good for bearer. The Boston & Maine, heretofore selling a 1,000-mile ticket good only in Massachusetts, now sells a 500-mile ticket at $10, valid throughout the company's lines, and good for bearer.

### New Bids for Arthur's Pass Tunnel.

New bids are wanted at the office of the High Commissioner for New Zealand, Westminster Chambers, 13 Victoria street, London, S. W., March 18, 1907, for piercing a tunnel five miles long at Arthur's Pass, through the range between Canterbury and Westland, on the line of the New Zealand Midland Railway, as noted on advertising page 22.

### New Ferry Boat for the Long Island Road.

The new double-deck twin-screw propellor "Babylon" for the Long Island ferry service on the East river, New York, has just come out of the Harlan & Hollingsworth yards, Wilmington. The new steamer has a passenger capacity of 3,000, is 203 feet long and 65 feet wide. She is fitted with two fore and two aft engines, with cylinders 18 inches and 38 inches, with 28-inch stroke. The hull of the steamer, also the center house and outboard side and ceiling, horse gangway and inboard side of ceiling are all of steel. The vessel has 20 water-tight compartments, and is practically unsinkable.

### Some Good Office Rules.

From a placard which is posted in the local offices of the National Express Company—in that part outside of the railing and devoted to the public—we copy the following rules. The whole placard, containing 18 rules, is of interest, as being a good example of intelligent rules, but the rest of them are more commonplace.

A "NOTICE TO THE PUBLIC," at the bottom of the card, says that "any lack of attention or of courtesy on the part of employees should be reported at once in writing to the General Agent."

6. All business of the day must be completed each day, so that one day's work will not encroach upon the next. Before leaving his desk for the day, each clerk will see that his books and papers are properly arranged and put in their places. A place will be provided for everything, and it is expected that everything will be kept in its place.

9. *The most polite and gentlemanly treatment of all customers* —whether men, women or children, rich or poor, white or black, or however insignificant their business—*is insisted upon.* It must not be forgotten that the company is dependent on these same people for its business. These rules must be observed by employees in their communications and dealings with the public *over the telephone.*

10. Should customers call during the temporary absence of a particular clerk or after business hours of the day, whatever

work may be in the office at the time, of whom inquiries or requests may be made, will consider it his business, for the time being, to attend to the same; or if that cannot be done until the absent clerk returns, will explain the matter to customers in such a manner as to avoid any dissatisfaction.

15. Lounging about the office on Sundays will not be permitted. Employees will only be required to labor on that day when the necessities of the business demand. It is intended that the office shall remain closed and quiet as far as practicable on Sundays; and for the credit of the office, *as well as for their own benefit*, it is suggested that all employees attend church during the day.

### Railroad Matters in Pekin.

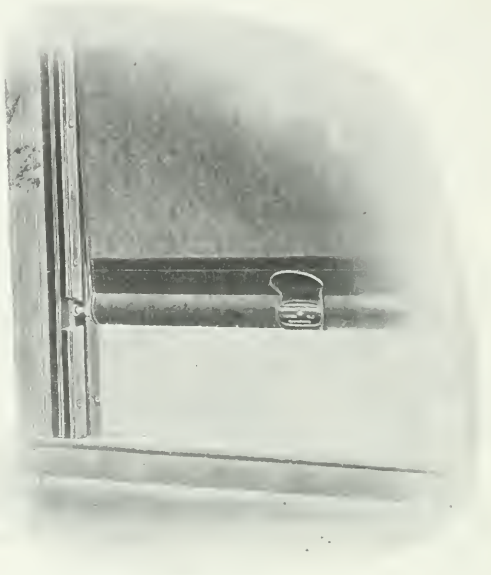
The Chinese government has failed to fulfil its promise to provide funds for the completion of the Shanghai-Nanking Railway. Tang Shao-yi has since informed the British Legation that an edict in reply to his memorial for the provision of funds will probably be issued within three weeks. This policy of constant disregard of promises is difficult to understand. It was also difficult to understand why China should authorize the construction under an imperial guarantee of railway joining the three great centers of population—Shanghai, Su-chau and Nanking—and then permit the officials like the corrupt Sheng or the conservative Viceroy Chau-fu to prevent the railway from coming nearer than five miles to Nanking city wall or nearer than four miles to the business quarter of Su-chau.

The negotiations for the Kau-lung-Canton railways were opened yesterday. The 90-mile railway from the mines to the waterway is not earning running expenses, and the guarantors, the Pekin Syndicate, are compelled to pay 1,500 taels (about $1,100) a month for losses in working, in addition to the £35,000 per annum guarantee. The Pekin Syndicate, however, hopes that if the water difficulties can be overcome prospects will improve. Meanwhile the syndicate has arranged to purchase 15,000 tons of coal from the native coal mines in the vicinity of the syndicate's mines and to transport the coal by junk to Tientsin for sale during the coming winter.—Pekin Letter, Aug. 24, in *London Times*.

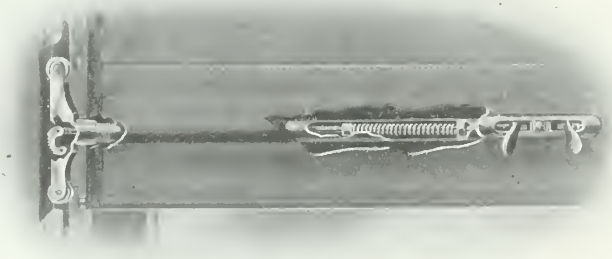
### National Curtain Fixtures.

The accompanying illustrations show some details of the National cam curtain fixtures and the National balance curtain fixtures with protected groove, made by the National Lock Washer Co., Newark, N. J. The National cam curtain fixture automatically locks against the tension of the spring roller by means of spring pursed cams pivoted in the heads of the guides at each end of the fixture and bearing against the bottom of the grooves as shown. The heads are stationary on the bar and thus cannot be drawn out of the grooves when the finger pieces are compressed. Strong tension is put on the spring roller at the top, and as the fixture automatically locks at the bottom against all upward pull the strain all comes on the curtain, causing it to set perfectly smooth. The strong tension also insures quick action when the curtain is raised and holds the curtain firmly when the wind is blowing.

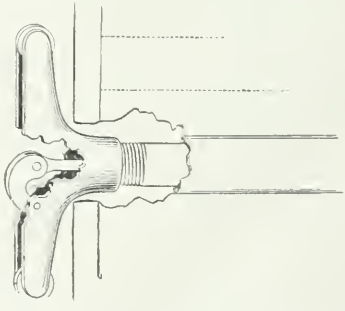
Each head is provided with two non-friction rollers, thus producing a perfectly smooth running curtain. The locking cams, which are pivoted eccentrically, are self-adjusting to variations of woodwork, varnish or paint. The fixtures are adjustable $\frac{1}{2}$ in. by means of the heads which are screwed in. This is ample to allow for any variations in the woodwork in the window frames. Smooth face cams are furnished, instead of the toothed cams, to those desiring a curtain that may be pushed up without compressing the finger pieces. The National balance curtain fixture with protected groove is especially designed for open cars. This curtain requires no cable and the pinch handles are also eliminated. The mechanism is very simple, as shown in the accompanying illustration; all parts are protected, therefore there are no chances for anything to get out of order. The weight of the steel rod at he bottom of the curtain balances just evenly with the tension of the roller. The springs in the rod press the heads against the bottom of the grooves with enough friction to hold the curtain at any point desired up or down the length of the runways. An excellent feature is the storm lock at the bottom of the run to lock the curtain, which can be released by an extra strong pull.



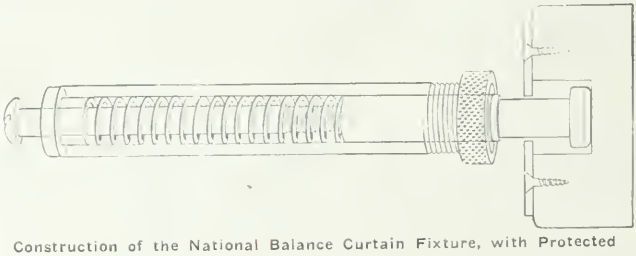
National Balance Curtain Fixture.



The National Cam Curtain Fixture.



Smooth Cam for National Cam Curtain Fixture.



Construction of the National Balance Curtain Fixture, with Protected Groove.

### Manufacturing and Business.

Paul Dickinson, Chicago, head of the railroad supply house bearing his name, died at his home in Winnetka, Ill., August 31, of anæmia. He had been ill for some months but until recently was still able to give attention to his business affairs. Mr. Dickinson was best known in connection with his work on engine house ventilation, and his house made a specialty of smoke jacks.

### Iron and Steel.

The Havana Central of Cuba has bought 5,000 tons of rails from the Carnegie Steel Co.

Exports of 2,000 tons of rails have been made from Baltimore to Mexico, and 1,579 tons to the Argentine Republic.

For supplying 5,000 tons of rails to the Isthmian Canal Commission the U. S. Steel Products Export Co., of New York (United States Steel Corporation) bid $147,250, which is at the rate of $29.45 per ton delivered f.o.b. at Baltimore.

The Pennsylvania has given a contract to the Pennsylvania Steel Co. for 38,000 tons of rails, and the Missouri & Northern Arkansas has ordered 6,000 tons of standard rails from an eastern mill, the latter for 1907 delivery. The more important of the small orders are: Four thousand two hundred tons for the San Antonio & Aransas Pass, 2,000 tons for the Los Angeles Railway, 1,800 tons for the Seattle Electric, 1,500 tons for the Fairmont & Mansfield, 500 tons for the Braddock Heights & Jefferson Electric, and 1,300 tons for another electric line.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Western Railway Club.

The first meeting of the ensuing club year will be held in the Auditorium Hotel, Chicago, Tuesday, September 18, at 8 o'clock p.m. A stereopticon lecture on "Boiler Explosions" will be delivered by Mr. Jas. L. Ford, Chief Inspector, Hartford Steam Boiler Inspection & Insurance Company.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Cincinnati, Hamilton & Dayton.*—C. C. Koerner, Acting Auditor of Disbursements, has been appointed Auditor of Disbursements of this road and of the Pere Marquette.

*Erie.*—E. H. Harriman and W. P. Hamilton have been elected Directors of the New York, Susquehanna & Western, succeeding A. S. Hopkins and W. L. Bull, resigned.

*Gulf & Interstate.*—G. W. Barns, Treasurer, has been appointed Auditor, succeeding G. E. Deyo, resigned. E. M. Barns has been appointed Treasurer.

*New York, Susquehanna & Western.*—See Erie.

*Pere Marquette.*—See Cincinnati, Hamilton & Dayton.

### Operating Officers.

*Atlantic City Railroad.*—O. E. Weidner, trainmaster at Camden, N. J., has been appointed Assistant Superintendent, with office at the same place.

*Canadian Northern.*—Gordon Campbell has been appointed Assistant to the General Superintendent. Charles Carey has been appointed Superintendent at Edmonton, Alb. James Abbott, Acting Superintendent at that point, has been appointed Assistant Superintendent, with office at Battleford, Sask.

*Chicago Great Western.*—Tracy Lyon, Assistant General Manager, has resigned to go to one of the Westinghouse companies.

*Chicago Terminal Transfer.*—C. E. Peterson has been appointed Car Accountant, succeeding J. E. McGary, resigned, to go into other business.

*Cincinnati, Hamilton & Dayton.*—G. H. Waldo has been appointed Superintendent of Car Service, with office at Cincinnati, Ohio, succeeding W. C. Andrews, resigned.

*Columbus & Southern.*—A. F. Brewer has been appointed Superintendent of Car Service.

*Denver & Rio Grande.*—E. W. Spencer has been appointed Superintendent of Car Service, with office at Denver, Colo., succeeding H. F. Parke, resigned.

*Galveston, Harrisburg & San Antonio.*—D. T. Forbes, Superintendent at Victoria, Tex., has resigned to go to the Colorado & Southern.

*International & Great Northern.*—The office of H. S. Carrington, Assistant Superintendent at San Antonio, Tex., has been removed to Taylor, Tex.

*San Antonio & Aransas Pass.*—F. C. Smith has been appointed Assistant General Manager, with office at San Antonio, Texas. R. H. Innes, Superintendent of Transportation, has resigned and this office has been abolished. F. L. Lewis, Assistant Superintendent of Transportation, has been appointed Superintendent, with office at Yoakum, Tex.

*Seaboard Air Line.*—The office of J. H. Witt, Superintendent of the Third division, has been removed from Atlanta, Ga., to Abbeville, S. C.

*Trinity & Brazos Valley.*—J. M. Lee has been appointed Superintendent, in charge of transportation and of the mechanical and maintenance of way departments, with office at Cleburne, Texas.

### Traffic Officers.

*Central of New Jersey.*—W. C. Hope, Assistant General Passenger Agent, has been appointed General Passenger Agent, succeeding C. M. Burt, resigned to go to the Boston & Maine.

*Chicago, St. Paul, Minneapolis & Omaha.*—H. G. Pearce, General Freight Agent, has been appointed Freight Traffic Manager.

*Illinois Central.*—Joseph Haitendorf has been appointed Assistant General Freight Agent at Memphis, Tenn.

*St. Louis, Rocky Mountain & Pacific.*—W. A. Gorman has been appointed General Freight and Passenger Agent, with office at Raton, N. Mex.

*Wisconsin Central.*—C. E. Wilson, Assistant General Freight Agent, has resigned on account of ill health.

### Purchasing Agents.

*St. Louis & San Francisco.*—W. E. Hudson, Acting Purchasing Agent, has been appointed Purchasing Agent.

*Georgia Southern & Florida.*—The office of Acting Purchasing Agent has been abolished and its duties are now performed by S. F. Parrott, Vice-President.

### Engineering and Rolling Stock Officers.

*Alaska Central.*—W. B. Poland, Chief Engineer and Manager, has resigned.

*Boston & Maine.*—C. B. Smith, Master Mechanic at Boston, Mass., has been appointed Mechanical Engineer, with office in that city.

*Buffalo & Susquehanna.*—C. S. Mills has been appointed Master Mechanic at Galeton, Pa.

*Oregon Short Line.*—Henry Carrick has been appointed Master Mechanic at Pocatello, Idaho, succeeding W. J. Tollerton, resigned, to go to the Chicago, Rock Island & Pacific.

*Pennsylvania Lines West.*—F. M. Crowell, Assistant Engineer at Pittsburg, Pa., of the Southwest System, has been appointed Engineer of Maintenance of Way at Cambridge, Ohio, on the Northwest System, succeeding Guy Scott, transferred.

*Quincy, Omaha & Kansas City.*—A. M. Collins, Chief Engineer, has resigned on account of ill health. C. T. Brimson, Assistant Engineer, has been appointed Engineer of Maintenance of Way.

## LOCOMOTIVE BUILDING.

*The Isthmian Canal Commission* opened bids recently for 40 locomotives, and the lowest bid came from the Baldwin Locomotive Works.

*The Canadian Pacific*, it is reported, has ordered 50 consolidation (2-8-0) type locomotives from the Montreal shops of the American Locomotive Co.

*The New York, New Haven & Hartford* has ordered 12 Atlantic (4-4-2) type and 30 Pacific (4-6-2) type locomotives for September, 1907, delivery. The Atlantic type locomotives will have cylinders 21 x 26 in., driving wheels 80 in. in diameter, and will weigh 180,000 lbs. The Pacific type locomotive will have cylinders 22 x 28 in., driving wheels 72 in. in diameter, and will weigh 220,000 lbs.

*The Chicago, Burlington & Quincy*, as reported in our issue of September 7th, has ordered 15 simple Pacific (4-6-2) type locomotives from the Baldwin Locomotive Works, and 50 simple Prairie (2-6-2) type locomotives from the American Locomotive Co. The diameter of the drivers of the Pacific type locomotives is 74 in. and of the Prairie type 69 in. Cylinders of all engines are 22 x 28 in.; working steam pressure, 210 lbs.; tank capacity, 8,000 gallons, and coal capacity, 15 tons.

## CAR BUILDING.

*The Pennsylvania*, it is reported, is about to place an order for 14,000 additional freight cars.

*The New York Central* is asking bids on 9,000 box, 6,000 steel gondola, 2,000 steel hopper and 2,000 steel flat cars.

*The Delaware & Hudson* is reported in the market for 2,000 box, 500 hopper and 2,200 flat, produce and miscellaneous cars.

*The Kanawha & West Virginia* has ordered 60 gondola cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The Nashville, Chattanooga & St. Louis* has ordered four passenger and two combination passenger and baggage cars from the Pullman Co.

*The Northern Pacific* is in the market for 1,500 flat and 1,000 steel dump cars in addition to the 4,000 box cars ordered from the American Car & Foundry Co.

*The Atlantic Coast Line* has ordered from the Standard Steel Car Co., Butler, Pa., 500 steel underframe box cars and 500 steel underframe flat cars. Deliveries to begin in January, 1907.

*The Chinese Government* has ordered from the Wason Car Co., Springfield, Mass., five second class and 10 third class passenger coaches and two baggage cars for the Canton-Hankow Railroad, and is in the market for 25 more cars.

*The Boston Elevated* has ordered four flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works for October 19th delivery. The cars will be 40 ft. long over all, 36 ft. 6 in. inside measurement and 8 ft. 7 in. wide. They will be fitted with Hicks standard trucks and Van Dorn drawbars.

*The Chicago, Indianapolis & Louisville* has ordered two 75-ft. combination cars and two 60-ft. postal cars from the American Car & Foundry Co., for December and January delivery. The special equipment for both includes:

| | |
|---|---|
| Brake beams | National-Hollow |
| Brakes | Westinghouse |
| Brasses | More-Jones |
| Couplers | National |
| Curtain fixtures | Curtain Supply Co. |
| Curtain material | Pantasote |
| Dust guards | Harrison |
| Heating system | Consolidated Car Heating Co. |
| Journal boxes | Symington |
| Light | Pintsch |
| Springs | Pittsburg Spring & Steel Co. |
| Vestibules | American Car & Foundry Co. |
| Wheels | Paige |

*The Harriman Lines*, as reported in our issue of August 10, have ordered 4,050 box cars of 100,000 lbs. capacity for the Union Pacific, Oregon Short Line, Oregon Railroad & Navigation, Pacific System, Morgan's Louisiana & Texas, Louisiana Western and Cananea, Yaqui River & Pacific from the Pressed Steel Car Co., delivery to begin Jan. 15, 1907; 1,450 flat cars of 100,000 lbs. capacity for the Union Pacific, Pacific System, Louisiana Western, Morgan's Louisiana & Texas, and Cananea, Yaqui River & Pacific from the Standard Steel Car Co., for January, 1907, delivery; 625 tank cars of 12,500 gallons capacity for the Southern Pacific from the Pressed Steel Car Co., delivery to begin March, 1907; 600 hopper cars of 100,000 lbs. capacity for the Southern Pacific, Union Pacific and Oregon Short Line from the Cambria Steel Co., delivery to begin October, 1906; 500 gondola cars of 100,000 lbs. capacity from the Cambria Steel Co., delivery to begin October, 1906; 500 stock cars of 80,000 lbs. capacity from the Pressed Steel Car Co., delivery to begin Jan. 15, 1907, and 100 flat car bodies of 80,000 lbs. capacity from the Standard Steel Car Co. for the Oregon Short Line, and 350 convertible dump cars of 100,000 lbs. capacity for the Union Pacific, Oregon R. R. & Navigation, Galveston, Harrisburg & San Antonio, Morgan's Louisiana & Texas, and Cananea, Yaqui River & Pacific from the Rodger Ballast Car Co., for March, 1907, delivery. The box cars will weigh 40,439 lbs. and measure 40 ft. $\frac{1}{8}$ in. long, 8 ft. $6\frac{1}{2}$ in. wide and 8 ft. $\frac{1}{4}$ in. high, inside measurements. The flat cars will weigh 32,570 lbs. and measure 40 ft. 10 in. long, 9 ft. $4\frac{1}{2}$ in. wide. The tank cars will weigh 46,650 lbs. and measure 41 ft. 10 in. long and 12 ft. $11\frac{1}{8}$ in. high, over all. The hopper cars will be 30 ft. $\frac{1}{4}$ in. long, 9 ft. 6 in. wide and 5 ft. $9\frac{1}{4}$ in. high, inside measurements. The gondola cars will weigh 40,170 lbs. and measure 40 ft. 4 in. long, 9 ft. $4\frac{7}{8}$ in. wide and 4 ft. 6 in. high, inside measurements. The stock cars will weigh 35,091 lbs. and measure 36 ft. $6\frac{1}{8}$ in. long, 8 ft. $5\frac{3}{8}$ in. wide and 8 ft. $\frac{1}{4}$ in. high, inside measurements. The dump cars will weigh 43,000 lbs. and measure 41 ft. 6 in. long and 7 ft. 11 in. high, over all. The special equipment for all includes:

| | |
|---|---|
| Bolsters | Simplex |
| Brake beams | Damascus and Chicago Railway Equipment Co. |
| Brake shoes | American Brake Shoe & Foundry Co. |
| Brasses | Hewitt Mfg. Co. |
| Couplers | National Malleable Castings Co. |
| Door fastenings | National Malleable Castings Co. |
| Draft rigging | Miner |
| Dust guards | National Malleable Castings Co. |
| Journal boxes | National Malleable Castings Co. |
| Roofs | Standard Railway Equipment Co. |
| Springs | Railway Steel Spring Co. |

## RAILROAD STRUCTURES.

Baltimore, Md.—The Baltimore & Ohio has moved into its new office building, which is 14 stories high and has accommodation for 3,000 employees. This building was recently completed to replace the structure destroyed by fire.

Brandon, Man.—The Great Northern and Canadian Pacific are planning to jointly put up a union passenger station here.

Brooklyn, N. Y.—Bids were recently opened by the Dock Department for dredging and building the Brooklyn Terminal for the 39th street ferry. The lowest bidders were B. Rolf, who agreed to do the work for $253,333, the work to be finished in about 8 months.

Gadsden, Ala.—The Alabama Great Southern, it is reported, has let contracts for car works in this city to local builders. The ground has been graded and the work will be begun at once.

Lexington, Ky.—A contract has been let by the Queen & Crescent at $60,000 for putting up a union passenger station.

Little Rock, Ark.—A contract for putting up a new passenger station here has been let to Westinghouse, Church, Kerr & Co. The cost of the station will be about $400,000.

Meridian, Miss.—The new union passenger station recently completed has been opened for traffic.

New York, N. Y.—The New York, Westchester & Boston has let a contract for building its main power station at Eastchester, in the Borough of the Bronx. It is to cost $800,000. The company will also build six sub-stations in the Bronx and in Westchester County.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Alaska Central.—This company, which is building a line from Seward, on Resurrection Bay, to the Tanana river, in the interior of Alaska, about 500 miles, has completed about 50 miles of the road. A great deal of heavy construction work, including 2,500 ft. of tunneling, has been done beyond the end of the track. W. B. Poland, who had charge of this work, has resigned. (June 29, p. 188.)

Anniston & Columbus.—Incorporated in Alabama to build a line from Anniston, Ala., southeast via Roanoke to Columbus, Ga., about 110 miles. The incorporators, most of whom are residents of Anniston, include James Sprauwell, T. A. Kilby, N. V. Melbourne and W. P. Acker. W. H. Wetherlee is President, and O. H. Parker, Secretary and Treasurer.

Atchison, Topeka & Santa Fe.—This company has bought the Arkansas Valley, which the American Beet Sugar Company began to construct from Rocky Ford, Colo., on the north shore of the Arkansas river, to Lamar, a distance of 65 miles. The line now is completed to Shelton, 8 miles from Rocky Ford. Grading is completed to Horse Creek, 17 miles farther on, and much work has been done to Lamar. The A., T. & S. F. main line reaches these places on the south side of the Arkansas river.

Atlanta, Griffin & Macon (Electric).—Incorporated in Georgia with $100,000 capital, by N. T. Pratt and E. P. Ainsley, of Atlanta; J. F. Moore, of Macon; N. B. Drury, of Griffin, and others, to build an electric line from Atlanta, Ga., southeast to Macon, about 90 miles.

Augusta & Louisville.—Incorporated in Georgia with $500,000 capital to build a line from Louisville, in Jefferson County, Georgia, east to a point on the Augusta & Florida, about eight miles. The office of the company is to be at Louisville and the incorporators include J. C. Stone, R. M. Murphee, M. D. Jones and A. W. Jones, of Midville, and R. J. Piele, of Vidette.

Baltimore & Ohio.—This company is now laying third and fourth tracks on its main line between Pittsburg, Pa., and McKeesport, 15 miles. Work is also in progress on the double tracking of the Metropolitan branch between Washington and Washington Junction, 12 miles of which is still single. Similar work is also being carried out at several places between Pittsburg and Chicago.

Canadian Northern.—An officer writes that this company is planning to extend its line along the east bank of Lake Manitoba north of Oak Point. The date for receiving bids for the work has not as yet been decided upon. The work will be easy. The line is to have light grades and easy curves.

Canadian Pacific.—A special meeting of the Board of Directors is to be held to authorize the following: A new road from Petersboro to Victoria Harbor, 96 miles, for a new and better route for grain to tide water; leases of the Joliette & Brandon, 13 miles; the Walkerton & Locknow, 37 miles, and the Berlin, Waterloo, Wel-

Jesley & Lake Huron; construction of Moose Jaw branch, 50 miles; Wayburn branch, 36 miles; Stonewall branch extension, 20 miles; West Selkirk branch extension, 10 miles; Lauder branch, 20 miles, and Darlingford branch, six miles.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CARDENAS RAILROAD & TERMINAL CO.—An officer writes that this company, which was recently incorporated in New Jersey, has made application to the Cuban Government for permission to build railroads in the Island of Cuba. John S. Fiske, 27 William street, New York, is secretary. (Aug. 17, p. 38.)

CATAWBA VALLEY.—Contracts are reported let by a company under this name to build 10 miles from Salem, Va., to Catawba Valley. James Smith has a contract for 2 miles, and Hampton Johnson one for the remaining 8 miles.

CENTRAL OF GEORGIA.—Superintendent Pollard is quoted as saying that this road will soon begin the work of extending its lines from Albany, Ga., southwest through Baker County and to the extreme southwestern corner of the state. Five companies have petitioned the Secretary of State for charters for lines through this section, but it is probable that only one of the companies will build. Baker County is the only county in the state which is not touched by a railroad. Newton, the county seat, is 12 miles from Camilla, the nearest railroad station.

CHERRYVALE, OKLAHOMA & TEXAS.—At a recent meeting of the stockholders of this company, S. M. Porter, of Caney, was re-elected President. A proposition to build the road was accepted by W. R. Stubbs, of Lawrence, and it is probable that active work will be started by November 1. (Aug. 10, p. 38.)

CHICAGO & MILWAUKEE (ELECTRIC).—This company on September 1st began running trains on its new line from Evanston, Ill., north to Racine, Wis., 50 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—Contracts are reported let by this company to H. C. Henry, of Seattle, for building its proposed line from Bitter Root Mountains, Idaho, west to the Columbia river. The route follows the Joseph river to a point below Ferrell, Idaho, thence to Tekoa, Wash., to Rosalia, along the south side of Rock Lake to Lind, on the Northern Pacific. From Lind the line will practically follow the survey of the old Northern Pacific cut-off from Lind to Ellensburg. Contracts for a part of the work have been let to Grant Smith & Co. Work is now under way near Rosalia, and it is to be completed by January, 1908.

CHICAGO NORTHWESTERN.—A contract has been let by this company to M. J. Peppard, of Minneapolis, for laying about 70 miles of new track in Wisconsin. The work includes a ten-mile extension east from the end of the Antigo branch. From the end of the new extension a line 30 miles long is to be run in a northerly direction, and one 30 miles to the south. It will take about one year to complete the work.

CITIZENS' RAILWAY & LIGHT CO.—Incorporated in Texas with $1,000,000 capital, by W. Bickwell, J. B. Nutt and E. W. Christy, of Cleveland, Ohio; W. O. Allen, of Fostoria, Ohio, and others, to build interurban lines radiating from Fort Worth, Tex.

DENVER TRANSCONTINENTAL.—Incorporation has been asked for at Denver, Colo., by this company, which proposes to build a line from Denver southwest to San Diego, Cal., on the Pacific coast, near the Mexican line. The company is to be capitalized at $20,000,000, and has filed applications for charters in Utah, Nevada and California. The incorporators are: Wm. A. L. Cooper, of Denver; R. E. Vidler, of Georgetown, and C. A. Baldwin, of Colorado Springs. It is said that the incorporators represent the Guggenheimers, the Chicago, Rock Island & Pacific, and a British syndicate.

GRAND TRUNK PACIFIC.—J. D. McArthur, who has a contract for building the section of this line from Winnipeg to Lake Superior Junction, has sublet 15 miles to W. T. Parsons, of Kenora, Ont. The work will be through solid rock, and will require the removal of approximately 1,000,000 cu. yds. of rock.

GREENWICH & JOHNSONVILLE.—This company is making surveys for an extension of its line from Greenwich, N. Y., northeast via Battenville and Centre Falls, to a connection with the Salem & Washington branch of the Delaware & Hudson at Rexleigh, N. Y., about 10 miles.

IDAHO, MONTANA & CALIFORNIA.—This company, it is said, will shortly begin grading its proposed line. The company has opened offices at Caldwell, Idaho, which place is to grant a bonus of $40,000. Secretary E. E. Springer is quoted as saying that the route has been surveyed and contracts will be let for the grading at once; it is expected to have the line completed to Winnemucca by the end of 1907. This is supposed to be a Hill project, as the Northern Pacific surveyors are reported at work upon the final survey from Snake river to Winnemucca.

INDIANAPOLIS WESTERN TRACTION.—This company began regular service on its new line September 1st from Denville, Ind., east to Indianapolis, 20 miles. The cars run to and from the Traction Terminal station in Indianapolis.

LAS VEGAS & TONOPAH.—An officer writes that this company, which is building from Las Vegas, Nev., on the San Pedro, Los Angeles & Salt Lake northwest to Tonopah, 215 miles, has completed the road from Las Vegas to Rose's Well, 100 miles. The route is via Corn Creek, Indian Springs and Amargosa (formerly Johnnie). Work is under way by Deal Bros. & Mendenhall on the construction of the line as far west as Rhyolite in the Bullfrog District. Maximum grades will be 1.5 per cent., and maximum curves 3 deg. 30 min. Contracts for extending the line from Rhyolite to Tonopah have not as yet been let. (Aug. 10, p. 39.)

LONG ISLAND.—The State Railroad Commissioners recommend that this company abolish six grade crossings along the line of its road. At Old Westbury Road in North Hempstead, and at New York avenue and Old Swamp Road in Huntington the crossings are to be carried over or under the road. The remaining four are to be discontinued; they are at Eastport, at Southampton, and two at Brookhaven. The original application to the Commissioners was for the removal of 13 crossings.

MEXICAN CENTRAL.—Announcement has been made by this company that contracts are about to be let for building the short line to connect Mexico City with Tampico. This will be accomplished by extending the Apulco division north from Apulco. Surveys have been under way for the past three years, and the plans are now in the hands of the Government for approval. The line is to have a maximum grade of less than 2½ per cent. The work will include many bridges and tunnels. Plans have already been completed for the bridge to be built over the Panuco river, which will cost $1,000,000 or more. The company will use a ferry to cross the river pending the building of the bridge. (Aug. 10, p. 39.)

NEW ORLEANS & NORTHERN MIDLAND.—Incorporated in Louisiana with $7,000,000 capital to build north to the Ohio river. H. O. True, of Memphis, is President.

NEW ORLEANS, NATCHEZ & PACIFIC.—This company has been organized at Natchez, Miss., with $6,000,000 capital, to build from Natchez south to New Orleans, 160 miles, and to eventually be extended north to Kansas City. The officers are: A. B. Wheeler, New Orleans, President; W. J. Poitevant, New Orleans, First Vice-President; R. F. Larned, Natchez, Treasurer, and C. E. Moritz, Natchez, Secretary.

NORTHERN PACIFIC.—This company, it is reported, has let a contract to Deeks & Deeks, of St. Paul, to straighten its line from Livingston, Mont., west to the Bozeman Tunnel, eleven miles. The line is to be carried over a new route, shortening the distance by about 1,000 ft., reducing the grade and eliminating curves.

PAUL SMITH'S (ELECTRIC).—This line, recently completed, was put in operation August 21. It is about nine miles long through the Adirondacks from Lake Clear station, in the town of Harrietstown, Franklin County, to Paul Smiths, at Saranac. The company is to build a branch from the main line to Upper St. Regis Landing. The company was incorporated by Paul Smith and others some time ago and has a capital of $100,000. Its title is the Paul Smiths Electric Light & Power & Railroad Company.

PENNSYLVANIA.—An officer of the Philadelphia, Baltimore & Washington writes that the contract recently let in connection with the Washington improvements to the Drake & Stratton Co., of Philadelphia, includes the Maryland avenue subway from Ninth to Water streets and the delivery yards at Sixth, Ninth and Water streets. Excavation work has been started, but no track has yet been laid. There will be considerable shifting of tracks and the building of temporary tracks and roadways for street traffic. A roadbed for the southern trains will also have to be provided. There will be one undergrade and three overhead bridges. (Aug. 31, p. 58.)

PHILADELPHIA, BALTIMORE & WASHINGTON.—See Pennsylvania.

RALEIGH & PAMLICO SOUND.—A contract is reported let by this company to Johnson & Grammet Bros., of Alton, Ill., for building 67 miles of its proposed road from Raleigh, N. C., east to Pamlico Sound. The contract which amounts to about $1,000,000 must be completed by June 15, 1907.

ST. LOUIS, ENID & SAN DIEGO.—Application will be made for a charter by a company under this name, which is being promoted by residents of Guthrie, to build a line through that place in a northeast and southwest direction.

SONORA.—See Southern Pacific.

SOUTHERN PACIFIC.—The new Pacific coast line which E. H. Harriman and associates are building in Mexico is an extension of the Sonora division of the Southern Pacific which has been in operation between Benson, Ariz., and Guaymas, Mexico, for many years. It is authoritatively announced that the 1,500 miles of new

road will be completed and in operation within 18 months. A length of more than 300 miles is already practically completed. The first division of 100 miles is in regular operation, and as soon as the bridge which is now being built across the Yaqui river is finished the second section will be opened. The surveys for the entire line down the coast and to Guadalajara have been completed and the maps and profiles of the proposed route have been submitted to the Secretary of the Interior of the Mexican Government for approval. It is said that the engineers have aimed to get the best line possible regardless of cost of construction. The maximum grade after the line leaves the coast and in crossing the mountains to reach Guadalajara is to be a little more than 2½ per cent. As soon as the official approval has been received a large force of men will be put at work grading from Guadalajara and more than 5,000 laborers will be employed by the first of January. Other grading outfits will be put at work on a central division of the line.

This company is also building a branch north from a point near Torin to a connection with the Cananea, Yaqui River & Pacific, which is also a Harriman property.

Tennessee.—This company, which operates a line from Oneida, Tenn., on the C., N., O. & T. P., through the coal fields and timber land southeast of that place to Walton, 28 miles, is said to have let a contract to Wilson Rodes & Co., of Knoxville, for extending the line 20 miles.

Duluth, Mesaba & Northern.—This company has opened its line to the Western Mesaba range. It extends from the main line at Alborn, Minn., to Bovey, 55 miles. No ore will be moved over the line this year, but it is expected that 1,500,000 tons will be brought out next year.

Western Pacific.—Construction work is progressing well in California, though there is still a great shortage of labor. The contractors are using every possible inducement, except high wages, to secure men, and the company is advertising in the east for 5,000 men, promising to secure very low transportation rates for them. The chief difficulty in keeping men at work on the grading contracts is the high wages to be had in other occupations. In San Francisco men are getting $2.50 a day for cleaning bricks, and skilled workmen receive from $3 to $12 a day at various trades. Tunnel work is going ahead very satisfactorily on the entire length of the line in California. The Spring Garden tunnel, which is to be the longest in the state, 7,300 ft., is in 1,062 ft. on the west end and 460 ft. on the east end. The Niles tunnel, a few miles east of Oakland, is making favorable progress underground, and massive concrete portals have been completed. Although forms for bids for most of the grading of this line through the state of Nevada were sent east some months ago no contracts have yet been let for the work. The projected route through Nevada presents but few serious engineering difficulties except where it passes through the Pequop range and the Gosiute gorge. A tunnel about 12,000 ft. long, piercing this range, has been planned, but the line may be relocated in that section so as to permit of a much shorter tunnel. This would avoid time and delay. The company hopes to have the line opened for business from San Francisco to Salt Lake City in two years. The track in Utah has now reached a point 42 miles west from Salt Lake City, and could be extended at the rate of a mile a day across the desert but for the prevailing floods. The whole country is afloat from the unusual rains in the dry season following an exceptionally severe and long winter. The first track laying of any consequence in California will be done at Oroville. It is the intention to lay 13 miles of track easterly from Oroville to the middle fork of the Feather river so that steel can be delivered for the bridge during the winter. Track will also be laid between Oroville and Marysville on the west. On this section grading has been completed for 13 miles and five miles additional almost completed. The first shipment of ten Western Pacific flat cars has been delivered at Reno, Nevada, for use on the Boca & Loyalton road, which has been acquired by the Western Pacific as a feeder.

## RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Part of the proceeds of the sale of the $27,750,000 new common stock of this company recently listed on the New York Stock Exchange are to be used for the completion of terminals at Baltimore, Philadelphia, Wheeling and Washington; also to reimburse the company for payments made and to be made for second and third track and for the improvement of yards at Chicago Junction, Brunswick and Cleveland.

Buffalo, Bradford & Kane.—According to a press despatch from Pittsburg, the main line of this narrow gage road from Bradford, Pa., to Mount Jewett, 37 miles, will be abandoned and the tracks torn up.

Chicago & Eastern Illinois.—See Evansville & Terre Haute.

Chicago & North-Western.—Gross earnings for the year ended June 30, 1906, the average mileage operated during the year being 7,429, an increase of 21 miles, were $63,481,578, an increase of $7,736,303; net earnings $21,265,302, an increase of $4,169,339. The surplus after paying dividends and appropriating $6,000,000 for improvements and permanent additions ($1,400,000 more than last year) was $2,316,639, an increase of $1,673,741. The annual report shows that during the year the company has acquired 41,000 shares of Union Pacific preferred stock at about $94 per share.

Chicago & Alton.—This company has made a mortgage to the Farmers Loan & Trust Co. of Illinois securing $22,000,000 first lien 50-year 3½ per cent. bonds.

Chicago, St. Paul, Minneapolis & Omaha.—The gross earnings of this company for the year ended June 30, 1906, were $12,943,750, an increase of $1,017,750. The net earnings were $4,632,806, an increase of $383,334. The surplus after charges, dividends and appropriation for improvements is $331,279, an increase of $177,011.

Consolidated (N. Y., N. H. & H. Electric Lines).—See New England Investment & Security Co.

Georgia & Florida Railway Systems.—The Augusta & Florida, Millen & Southwestern, Douglas, Augusta & Gulf and Valdosta Southern Railways are being operated together, under above name. The general office is at Augusta, Ga.

Evansville & Terre Haute.—A dividend of 4 per cent. has been declared on the $3,987,383 outstanding common stock, payable November 1, to shareholders of record September 15th. The last dividend on this stock was for the year of 1901, when 1½ per cent. was paid. The Chicago & Eastern Illinois owns a majority of the stock.

Houston Belt & Terminal Co.—A meeting of the stockholders has been called for September 20 to vote on a proposed issue of $5,000,000 improvement mortgage bonds, the proceeds to be used to pay for new terminals at Houston now under construction. The work includes a union passenger station, freight stations and a belt line entirely around the city laid with 85-lb. rails.

Maine Central.—The gross earnings for the year ended June 30, 1906, were $7,794,745, an increase of $543,209; net earnings were $1,761,659, a decrease of $398,407. The surplus after dividends was $56,218.

New York Central & Hudson River.—The income account for the year ended June 30, 1906, is as follows:

| | 1906. | Increase. |
|---|---|---|
| Gross earnings | $86,622,670 | $7,942,851 |
| Net earnings | 23,042,505 | 1,421,426 |
| Charges | 22,295,712 | 216,758 |
| Surplus | 9,989,200 | 1,885,509 |
| Dividends | 7,036,195 | 423,695 |
| Year's surplus | 2,953,005 | 1,461,812 |

New England Investment & Security Co.—This company, which is to take over all of the electric lines controlled by the New Haven road in Massachusetts, has turned over to the Consolidated Railway Company, in payment for the properties, promissory notes and $1,000,000 common stock and $1,000,000 preferred, being its entire outstanding capital. The Consolidated has guaranteed 4 per cent. dividends on the preferred stock of the new company and $105 per share in case of liquidation.

Nome-Arctic Railway.—The Western Development Company has been organized with $6,250,000 capital to build and operate a railroad and canals in Alaska, and also extensive mining properties. It intends to buy the Nome-Arctic Railway, which has 16 miles of line extending out from Nome.

Southern.—This company has bought the entire capital stock, $2,000,000, of the Virginia & Southwestern for a price said to be $200 per share. The Virginia & Southwestern runs from Mountain City, Tenn., to Big Stone Gap, Va., 134 miles, and has $2,000,000 first mortgage bonds outstanding. It has hitherto been controlled by the Virginia Iron, Coal & Coke Co. Four years ago this stock was given away as a bonus to subscribers to the bonds.

Union Pacific.—See Chicago & North-Western.

Virginia & Southwestern.—See Southern.

Wabash.—A circular has been issued giving the details of the agreement entered into between the company and the debenture bondholders' committee for the retirement of the outstanding debenture bonds. The plan, which is to be submitted at a special meeting on October 22d, is as follows: Each $1,000 debenture A bond is to be exchanged for $775 in the new 4 per cent. mortgage bonds, $560 in preferred stock and $560 in common stock. Each $1,000 debenture B bond is to be exchanged for $700 new bonds, $500 preferred stock and $500 common stock. (Aug. 24, p. 52.)

# GENERAL NEWS SECTION

## NOTES.

The Delaware, Lackawanna & Western has, at Whitehall, N. J., and Alden, N. Y., 50,000 young yellow locust trees which are to be grown for ties.

A press despatch from Chicago says that the Burlington road has ordered that enginemen who wear spectacles be not employed on passenger trains, or on freight trains running to or from busy terminals.

The Pennsylvania Railroad, responding to the circular of the Interstate Commerce Commission, has notified that body that of its 133,000 freight cars owned east of Pittsburg and Erie, 98 per cent. are equipped with air brakes.

Press despatches from San Francisco report that the freight blockade at that city is nearly lifted, lumber and hay being the only commodities on which embargoes are still in force. The rate of demurrage is $5 per car per day.

On the Wheeling & Lake Erie at Toledo last Friday night a hand car, loaded with trackmen, ran off an open draw over the Maumee river bridge, and every one on the car was drowned. The number of men on the car is said to have been 12.

The Long Island Railroad announces that after this month season tickets to and from New York will be sold at a uniform rate monthly, instead of charging a higher rate at the beginning of each year, to be equalized by a reduction in the last half of the year.

The State Railroad Commissioners of Arkansas, on complaint of competitors of the Standard Oil Co., have ordered large reductions—in some cases 50 per cent.—in freight rates on oil, and have ruled that oil shipments must be received on three days in each week.

The Boston & Albany seems to have decided to reduce its passenger fares from the present basis of 2½ cents a mile to two cents a mile; though the only authoritative announcement of the fact is that which comes through a letter written to the Interstate Commerce Commission.

The Interstate Commerce Commission, on application of the Boston & Maine, has authorized the adoption on short notice of a reduced rate on southern lumber from Boston to Rockland, Me., ($1 a ton) provided the same rate is put in force to all intermediate stations where there is water competition.

The Massachusetts Railroad Commission, as announced on advertising page 22, is to give a public hearing in Boston, Oct. 2, on the question of block signals and fire extinguishers, in pursuance of a law passed by the last legislature. Under this law the Commission has power to order the establishment of block signals.

The governor of Oregon has called upon all of the railroads in the state to file detailed reports of the value of their property, market values of stock, etc., in accordance with the law of 1885. This law has remained unenforced because of doubt as to its validity, the claim being made that it was repealed by an act passed in 1887.

According to a press despatch from Omaha, "Strike-Breaker" Farley took to San Francisco, on the occasion of the street car strike in that city, early in this month, 1,200 men. After the strike was settled, 700 of these men remained in California, and on September 13th 500 passed through Omaha on their way back to New York.

Large fans for cooling the air by blowing it over nests of water pipes have been in use at the Brooklyn bridge station of the New York city subway for two or three weeks, and the temperature on hot days has been reduced, it is estimated, about 5 deg., say from 83 F. to 78 F. The improved freshness of the air is as grateful to the passengers as is the lowering of the temperature.

The State Railroad Commission of Washington has been enjoined by the United States Court from enforcing its order, issued some weeks ago, requiring reductions in wheat rates from the eastern part of the state to the coast, over two or more railroads. The injunction is granted on the application of the railroads, who claim that the legislature has no power to delegate the making of rates to any other body.

The Illinois Central, beginning Oct. 2, will run a special farmers' instruction train in Mississippi and Louisiana, following the fashion of the lecture trains which have been run in northern states by this and other roads during the past few years. Lectures are to be delivered at 97 places. Professors from the state agricultural colleges and experts from agricultural and immigration organizations will take part.

Lieut.-Gen. Corbin, in a report to the War Department, describes at length the hardships which have been imposed on officers of the army by the action of Congress in revising the interstate commerce law so as to put an end to the practice of railroads giving to officers and men of the army half rates for themselves and their families. The general says that this will make foreign service very distasteful to the officers.

Judge Hough, in the United States Circuit Court at New York City, has fixed Oct. 10 as the day for the trial of the cases against the New York Central and certain shippers for giving illegal reductions in rates on sugar. In the cases of Messrs. Guilford and Pomeroy, who were indicted along with the road, the charges of conspiracy have been dismissed, so that these two men are now free from liability to punishment by imprisonment, although still liable to be fined.

The Lehigh Valley has taken action similar to that of the Erie and the Lackawanna in the reduction of rates, as follows: "Effective Nov. 1, or as soon thereafter as possible, the maximum rate on the Lehigh Valley system will be on the basis of 2½ cents a mile. This will not change passenger rates now based on a charge of less than 2½ cents a mile. Interchangeable mileage books will be sold at $25, instead of $30, with a rebate of $5 on each 1,000-mile book, instead of $10, as at present."

The Illinois Central is to establish at Chicago a laundry for cleaning linen used on its cars, the amount of which monthly is given as follows: Ninety thousand napkins, 30,000 tablecloths, 10,000 aprons, 6,000 jackets, 50,000 towels and 2,000 caps, table felts, etc. This covers laundering for 32 dining cars, 11 officers' cars, one pay car and the five eating houses at Chicago, Champaign, Decatur, Louisville and Memphis. The Illinois Central uses about $8,000 worth of new linen each year.

A press despatch from San Francisco says that the Southern Pacific and the Western Pacific have agreed to leave to a board of arbitration the amounts to be paid by the W. P. for lands owned by the S. P., between Oakland and Oroville, which are to be taken for the new railroad which is being built by the W. P. It is also said that the engineers of the W. P. are trying to so plan their work that the line, from Salt Lake through to San Francisco, can be open for business on the first of January, 1909. Other press despatches say that the contractors want 5,000 more men and are having much difficulty in finding them.

The New York City Railway and also its controlled line, the Union Railway, operating the surface street cars in New York City and Westchester County, have made important advances in wages. In Manhattan, motor men the first year are advanced from $2.10 to $2.25; conductors from $2.00 to $2.15. Wages are advanced yearly until the fifth year, when motormen will henceforth get $2.60 instead of $2.50 and conductors $2.45 instead of $2.35. On the Union Railway, which operates in the Borough of the Bronx and in Westchester County, the rates are somewhat lower. The increase had not been specifically asked for by the men, and appears to have been due to increasing difficulty in securing good men. The new rates are 10 or 15 per cent. higher than those of other street surface railroads in the vicinity of New York.

Representatives of coastwise steamship lines have notified the Interstate Commerce Commission that they wish to join in through rates made by the railroads for rail and ocean shipments, but that in doing so they must give notice that they do not assent to the jurisdiction of the commission. This is deemed necessary to preserve their rights under former laws in regard to liabilities for losses at sea. At the same time, the vessel men declare their willingness to promote the general purposes of the new rate law.

Representative Hepburn says that the members of the Interstate Commerce Commission will draft a bill, to be presented at the next session of Congress, modifying such features of the new rate law as may prove to be unsatisfactory in administration.

A member of the Interstate Commerce Commission says that since the first of September railroads all over the country have been filing numerous freight tariffs showing reduced rates.

### Detroit Tunnel.

The contract for the Detroit river tunnel for the Michigan Central has been let to the Butler Brothers Hoff Co., of New York. Design "A" modified will be used. This design may be described as a method by which the previous material underlying the river is replaced by an imperfectly water-tight mass of concrete sunk from scows on the surface of the water, through which, without

the use of shields the river tubes or tunnels proper may be constructed to secure water-tightness and continuity of strength the whole work being done without the use of high air pressure or coffer-dams. The contract calls for the completion of the work by June 1, 1909. *See Railroad Gazette*, Feb. 16, p. 149, also Feb. 23 p. 181.)

### British Terminal of the C. P. R.

A press despatch says that the Canadian Pacific Railway is considering making the terminal of its Atlantic fleet in England at Fishguard instead of Liverpool. The change would depend on the Great Western Railway agreeing to build a direct line from Fishguard to London.

### Western Union Bond Issue.

A special meeting of the stockholders of the Western Union Telegraph Company has been called for October 10 to authorize an issue of $25,000,000 4 per cent. bonds. It is expected that $10,000,000 of this amount will be issued soon, the stockholders being given an opportunity to subscribe for them on terms to be announced later. Since 1881, the Western Union has spent $39,074,056 in extending its lines and buying property.

### Disastrous Collision near Sudbury, Ont.

In a butting collision on the Canadian Pacific near Sudbury, Ontario, Sept. 12, between a westbound train carrying harvesters and an eastbound express train, 12 persons were killed and three fatally injured. A statement by an officer of the road says that the engineman of the eastbound train claims that the air-brakes did not hold; and that this assertion is correct. An angle cock in the air-brake pipe of a car in the middle of the train had been shut, cutting off from the control of the engineman the brakes of the heaviest cars in the train.

### Electric Traction to Atlantic City.

The electric equipment (third rail) of the West Jersey & Sea Shore between Camden and Atlantic City, by way of Newfield, has been so far completed that electric trains were put in service on Wednesday of this week. Through express trains are run hourly each day, each way, from 7 a. m. until 11 p. m., and there are three local trains each way between Atlantic City and Newfield. The distance from Camden to Atlantic City by this line is about 61 miles and the time of the express trains is one hour 30 minutes. The one-way fare through is $1, and the round trip is $1.70. These rates are about 20 per cent. lower than those prevailing heretofore.

### Publication of Tariffs on Cotton for Export.

The Interstate Commerce Commission, after hearing the petition of the Southern Railway and other carriers east of the Mississippi River and south of the Ohio and Potomac rivers, for permission to equalize export rates on cotton, cottonseed and its products and lumber, and thereby make changes in their export rates on those commodities without the 30 days' notice required by law, and having heard numerous shippers, and the Commission being of the opinion that carriers may legally issue through bills of lading from the interior point of shipment to a foreign destination which specify the inland rate to the port of export and the ocean rate from the port of export, even though no joint through rate is published, has ordered that no published rates on cotton shall be advanced, except upon 30 days' notice; and that until March 1, 1907, carriers may reduce their published export rates on cotton to the various ports of export upon three days' notice. Until November 1, 1906, carriers may continue to equalize export cotton rates through the various ports by applying the lowest combination through all the ports, thereby making said rates without publication and filing, provided that they post notices of the rates as soon as they are made and mail copies to the Commission, said notices to specify the time during which the rate will continue in effect.

As to cottonseed and its products and lumber the petition is denied.

### Large Contracts for Signals.

The General Railway Signal Company of Buffalo and Rochester had on its books September 1st unfilled orders to the amount of $2,500,000, which includes large orders from the Nankai Railway of Japan, the New York Central, the New York, New Haven & Hartford, the Philadelphia & Western, the Illinois Central and the Great Northern. According to the *Rochester Democrat and Chronicle*, from which we take this statement, some of these orders are as follows:

New York Central, eight mechanical interlocking plants in addition to the all-electric signals at New York, and 17 mechanical plants for the Big Four; New York, New Haven & Hartford, block signals for the electric zone, Woodlawn to Stamford, 19 miles of four-track; Illinois Central, automatic block signals, Pullman to Kankakee; Great Northern, automatic block signals on 50 miles of double track near Superior, Wis. The Japanese contract is for the Young system of automatic signals for electric lines.

The General Railway Signal Co. now employs 1,800 men, and the shops at both Buffalo and Rochester are running day and night. The Taylor all-electric interlocking apparatus thus far made and installed by this company, with apparatus now in course of construction, aggregated, up to the first of August, 12,500 levers, a number which an officer of the company declares is three times as large as the aggregate of all the other power interlocking in the world.

### Disastrous Train Wreck in Oklahoma.

On the morning of Tuesday last northbound passenger train No. 12, of the Chicago, Rock Island & Pacific, broke through the bridge spanning Cimarron river, near Dover, Okla., and, with the exception of two sleeping cars at the rear, was entirely wrecked. The engine was submerged and the smoking car floated some little distance downstream. At this writing, the number of victims is not known, but the estimate is eight passengers dead and 20 injured, with 10 or more missing, all of whom, probably, are drowned. Several men floated downstream on wreckage, one going in safety nine miles. The river had been swelled by a flood and it is said that the bridge had been forced out of position by floating driftwood. The engineman and fireman saw the danger in season to jump off and save themselves, and the engineman had applied the brakes. The river is said to be 1,500 ft. wide at this point. Heavy rains did great damage in Kansas and Oklahoma last week.

### Manufacturing and Business.

The plant of the Morse Chain Co. has been removed from Trumansburg, N. Y., to Ithaca.

G. H. Forsyth, Director and Assistant Manager of the Boston Belting Co., died on Sept. 6th at Brookline, Mass.

The B. F. Sturtevant Co., of Boston, is to install its heating system in the new roundhouse of the Southern Railway at Asheville, N. C.

Th Buffalo Brake Beam Co., New York, maker of the Vanderbilt brake-beams, has opened a western sales office at the Lincoln Trust Building, St. Louis, Mo.

A. D. McAdam, heretofore Local Auditor at Detroit, Mich., of the American Car & Foundry Co., has been appointed Manager of Sales of the Michigan Malleable Iron Co.

The shipments made during the month of August by the Chicago Pneumatic Tool Co. showed an increase of 15 per cent. over all previous monthly records. The company has opened an office at Memphis, Tenn., in charge of J. F. Small.

Thomas B. Arnold, until recently with the Railway Steel Spring Co., has been appointed Southwestern Representative of the Detroit Seamless Steel Tubes Co., Detroit, Mich., maker of the "Detroit" locomotive flue. His headquarters will be in St. Louis.

The McConway & Torley Company, of Pittsburg, has issued a new edition of its Car Interchange Manual, covering all the decisions of the Arbitration Committee of the Master Car Builders' Association from November, 1888, to May, 1906, and will be glad to mail a copy free on request to any car man. The "Ready Reference Tables" for the use of men in the car department, and a new edition of the Catechism on the M. C. B. Rules also will be mailed free.

The United States Civil Service Commission announces examinations October 17 for the following vacancies in the Philippine service: Master builder, $2,750 per annum; bridge engineer, $2,250 per annum; principal assistant chief engineer, Department of Sewer and Waterworks Construction, Manila, $4,000 per annum; assistant engineer, $1,800 per annum; second assistant engineer, $1,800 per annum. Age limit, 18 to 40 years on the date of the examination.

Richard S. Buck, member of the Am. Soc. C. E., has become a member of the firm of Sanderson & Porter, engineers and contractors, with offices in New York. This contracting firm does civil, mechanical and electrical engineering and construction, and has been in existence for more than ten years. It has now in hand work including the general design and construction of two hydro-electric plants on the Pacific coast, comprising about 50,000 horse-power of equipment; the power house equipment and transmission system of the McCall Ferry Power Company, on the Susquehanna river; extensive additions to the New Orleans Street Railway & Lighting systems, and to those of the Mahoning & Shenango Railway & Light Company of Ohio and Pennsylvania. Mr. Buck the new member, should add much to the strength of its civil engineering staff. He was Engineer in charge of the difficult construction of the two arch bridges over the Niagara river, designed by Mr. Lefferts L. Buck, to whom, by the way, Richard S. Buck is not related. He has also been Chief Engineer of the Dominion Bridge Co. of Montreal. He has been for a number of years Consulting Engineer of the New York City Bridge Department, and is at present engaged on the Manhattan and Blackwell's Island bridges. He will for the present retain this position. The Sanderson & Porter firm now consists of Messrs. Edwin N. Sanderson, H. Hobart Porter, Francis Blossom, Richard Talbot and Richard S. Buck.

### Iron and Steel.

The Mexican Central is in the market for about six bridges.

Shipments of rails are now being made of about 300,000 tons a month.

The Atlantic Coast Line is in the market for 25,000 tons of heavy rails, and the South & Western for 27,000 tons.

The Erie has increased its inquiry for rails from 15,000 to 40,000 tons. Inquiries for rails now aggregate nearly 200,000 tons, a large percentage of which will be ordered this month.

The Minneapolis, St. Paul & Sault Ste. Marie Railroad has given an additional order for 16,000 tons of standard rails, and the Milwaukee Electric Company 4,000 tons additional for 1907 delivery.

Orders have been given by the Harriman Lines for structural steel, including 20,000 tons of bridge material. The Pennsylvania Lines West have given orders for track elevation requiring 1,500 tons of steel, and the Central of New Jersey for a girder bridge requiring 1,000 tons.

The Pennsylvania Steel Co. has an order for 4,000 tons of bridge work for the Chicago, Milwaukee & St. Paul, and a contract for another Scherzer bridge for the New York, New Haven & Hartford. The McClintic-Marshall Construction has a contract for 1,800 tons of viaduct work for the Pittsburg, New Castle & Butler Electric Traction Co.

The Milwaukee Northern has let a contract for 2,100 tons of standard rails for 1907 shipment; the Seattle Electric Co. for 1,800 tons; the Fairmont & Mannington for 1,500 tons; the Missouri, Kansas & Texas for an additional lot of 18,000 tons; the Indianapolis, Huntington, Columbia City & Northwestern for 1,500 tons; the Los Angeles Railway for 2,500 tons; the Chicago Terminal Transfer Co. for 5,000 tons, and the Missouri & North Arkansas for 6,000 tons.

Reports from Detroit state that under the direction of Joseph H. Berry plans are being made to organize a new blast furnace company, with initial capitalization of $1,000,000 to $2,000,000, to put up works on the river front at Grosse Pointe, near the eastern terminus of the freight belt railroad, known as the Detroit Terminal Railroad, controlled by Mr. Berry and now under construction. This will be the third big iron furnace enterprise in Detroit. The first is the Detroit Iron & Steel Co., with capital of $1,500,000, and the second will be the Ford blast furnace, to be built by the Michigan Alkali Co. at Wyandotte. These three plants will represent an aggregate investment of $5,000,000.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### The Franklin Institute.

At a stated meeting of the Institute September 19th, the programme included a paper on "Relation of the Government to Our Water Ways," by Prof. Lewis M. Haupt.

### American Society of Civil Engineers.

At the meeting of this society September 19th, the programme included a paper on "Street Traffic in New York, 1885 and 1904," by C. Richardson. This paper was printed in the *Proceedings* for May, 1906. There was also one on "Ventilation of Tunnels" by C. S. Churchill. This paper was printed in the *Proceedings* for August 1906, and is reprinted in another column of this issue.

### Railway Signal Association.

This association held its regular September meeting at Chicago, on the 11th, Vice-President J. A. Peabody (C. & N. W.), in the chair. The attendance was very small. The principal discussion announced for the meeting was the revision of the Standard Specifications for Mechanical Interlocking Plants, but no advance copies of the revised specifications had been printed for distribution among the members, and no discussion was attempted. The revision as made by the committee will be printed and distributed among the members for study and comparison with the old specifications, preparatory to an intelligent discussion at the annual meeting in October.

The other subject given in the notice, identification of insulated wires and cables, was briefly discussed, and the suggestion that manufacturers use distinctive braid covering, such as different designs of colored threads, was approved.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Baltimore & Ohio.*—R. B. Keyser, of Baltimore, has been elected a Director, succeeding Jacob H. Schiff, resigned. J. B. Thayer, Fourth Vice-President of the Pennsylvania, has resigned as a Director of the B. & O.

*Cleveland, Akron & Columbus.*—S. C. Scott, Assistant to the Fourth Vice-President of the Pennsylvania, has been elected also Vice-President of the C., A. & C., with office at Pittsburg, Pa., succeeding J. F. Miller, retired on pension.

*Louisville, Henderson & St. Louis.*—Otto Marx and W. M. Bullitt have been elected Directors, representing the minority interests. The Louisville & Nashville, which controls the road, has elected the other seven directors.

*Pennsylvania.*—See Baltimore & Ohio.

### Operating Officers.

*Central New England.*—G. H. Staehle has been appointed Car Accountant, with office at Hartford, Conn., succeeding D. A. Broughel, resigned to go to another company.

*Chicago, Rock Island & Pacific.*—W. S. Tinsman, General Superintendent of the Choctaw district, has been appointed General Superintendent of the Southwestern district, with office at Topeka, Kan., succeeding F. T. Dolan, who has been granted an indefinite leave of absence on account of ill health. H. M. Hallock, Superintendent at Oklahoma City, Okla., succeeds Mr. Tinsman, with office at Little Rock, Ark. T. H. Beacom, Superintendent at Herrington, Kan., succeeds Mr. Hallock. G. W. Rourke, Superintendent of Terminals at Kansas City, Mo., succeeds Mr. Beacom. H. R. Saunders succeeds Mr. Rourke.

*Detroit, Toledo & Ironton.*—R. K. Smith, General Manager, and W. C. Hurst, Superintendent, have resigned and both offices have been abolished.

*Hocking Valley.*—W. F. Elrod, trainmaster of the Zanesville & Western, has been appointed Superintendent of Terminals of the Hocking Valley and of the Toledo & Ohio Central, at Toledo, Ohio.

*Toledo & Ohio Central.*—T. M. Connors, trainmaster of the Hocking Valley at Columbus, Ohio, has been appointed to the new office of Assistant Superintendent of the Toledo & Ohio Central, with office at Bucyrus, Ohio. See Hocking Valley.

### Traffic Officers.

*Galveston, Harrisburg & San Antonio.*—C. K. Dunlap, General Freight Agent, has been appointed Freight Traffic Manager, succeeding H. A. Jones, promoted.

### Engineering and Rolling Stock Officers.

*Baltimore & Ohio.*—D. Gallaudet has been appointed Master Mechanic at Garrett, Ind., succeeding J. E. Davis, resigned.

*Cincinnati, New Orleans & Texas Pacific.*—Prof. Paul Anderson, formerly occupying a chair at the Kentucky State University, has been appointed Superintendent of Tests of this road, with office at Lexington, Ky.

*Cleveland, Cincinnati, Chicago & St. Louis.*—W. M. Vandersluis has been appointed Signal Engineer, with office at Cincinnati, Ohio, succeeding G. H. Macdonough, resigned.

*Great Northern.*—See Texas & Pacific.

*Northern Pacific.*—David Van Alstyne, Mechanical Superintendent, has resigned to become General Superintendent of the Dunkirk works of the American Locomotive Company. W. Moir, General Master Mechanic at Tacoma, Wash., succeeds Mr. Van Alstyne, with office at St. Paul, Minn. Effective Oct. 1st.

*Pennsylvania Lines West.*—W. C. A. Henry, Assistant Superintendent of Motive Power at Columbus, Ohio, has been appointed Superintendent of Motive Power of the Southwest system, with office at the same place, succeeding M. Dunn, deceased. The office of Assistant Superintendent of Motive Power of this system has been abolished.

M. S. Hodgin, Assistant Engineer of the Northwest System at Chicago, Ill., has been appointed Assistant Engineer at Pittsburg, Pa., of the Southwest system, succeeding F. N. Crowell, promoted. W. A. Hawley Assistant Engineer at Richmond, Ind., succeeds Mr. Hodgin, and J. K. Sherman succeeds Mr. Hawley. H. W. Brown has been appointed Assistant Engineer of the Cleveland & Marietta, which is operated as a division of the Pennsylvania Lines West.

P. T. Dunn, General Foreman at Cincinnati, Ohio, has been appointed Master Mechanic of the Northwest system at Chicago, succeeding N. M. Loney, resigned.

*Texas & Pacific.*—Cassius Banks, heretofore Engineer of Tests on the Great Northern, has been appointed Mechanical Engineer of the Texas & Pacific, with office at Marshall, Texas.

### Purchasing Agents.

*Temiskaming & Northern Ontario.*—V. T. Bartram, chief clerk in the Purchasing Department of the Canadian Pacific, has been appointed Purchasing Agent of the Temiskaming & Northern Ontario, with office at North Bay, Ont.

## LOCOMOTIVE BUILDING.

*The New York Central Lines*, it is reported, are to be in the market soon for 400 locomotives.

*The Yuet-Han Railroad* is in the market for locomotives. The order will be placed through Shewan, Tomes & Co., of New York.

*The Davenport Locomotive Works*, Davenport, Iowa, report recent orders as follows: Cerro Depasco Mining Co., South America, two locomotives; Raymond Valdez, San Juan, Porto Rico, one; Buena Vista Plantation Co., Mexico, two; the Laguna Company, Yucatan, one; Central Soledad, Cuba, one; Manitoba Gypsum Co., Manitoba, one.

*The International & Great Northern* has ordered 10 simple 10-wheel (4-6-0) locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Ten-wheel |
| Weight { Total | 80 tons. |
| Weight { On drivers | 65 " |
| Diameter of drivers | 62 in. |
| Cylinders | 20 in. x 28 in. |
| Boiler { Type | Radial stay, extended wagon-top |
| Boiler { Working steam pressure | 200 lbs. |
| Boiler { Number of tubes | 314 |
| Boiler { Material of tubes | Gould Special Iron |
| Boiler { Diameter of tubes | 2 in. |
| Boiler { Length of tubes | 13 ft. 6 in. |
| Boiler { Length | 120 in. |
| Firebox { Width | 41 in. |
| Firebox { Material | Otis steel |
| Heating surface, total | 2,397 sq. ft. |
| Tank capacity | 6,000 gals. |
| Coal capacity | 15 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Boiler lagging | Franklin |
| Brake beams | National |
| Brake-shoes | Am. Brake-Shoe & Fdry. Co. |
| Couplers | Tower |
| Headlights | Pyle National |
| Injectors | Ohio |
| Piston rod packing | Jerome |
| Valve rod packing | Jerome |
| Safety valves | Ashton |
| Sanding devices | Waters |
| Sight-feed lubricators | Chicago |
| Springs | Railway Steel Spring Co. |
| Steam gages | Crosby |

*The Harriman Lines* have ordered from the Baldwin Locomotive Works 194 (including 58 coal and 36 oil) simple Consolidation (2-8-0) locomotives for the Union Pacific, Oregon Short Line, Oregon Railroad & Navigation and Southern Pacific; 12 (10 oil and two coal) simple Atlantic (4-4-2) locomotives for the Oregon Short Line and Southern Pacific; 12 (coal) simple Pacific (4-6-2) locomotives for the Oregon Railroad & Navigation and Oregon Short Line, and 53 (29 coal and 24 oil) simple switching locomotives for the Union Pacific, Oregon Short Line, Oregon Railroad & Navigation, Southern Pacific, Morgan's Louisiana & Texas, Galveston, Harrisburg & San Antonio, and Houston & Texas Central, all for delivery beginning January, 1907. Two sizes of tenders are specified for these locomotives, some being equipped with the larger and some with the smaller size. The specifications are as follows:

*General Dimensions.*

| | Consolidation. | Atlantic. |
|---|---|---|
| Type of locomotive | Consolidation. | Atlantic. |
| Weight, total | 208,000 lbs. | 196,000 lbs. |
| Weight on drivers | 187,000 lbs. | 105,000 lbs. |
| Diameter of drivers | 57 in. | 81 in. |
| Diameter of cylinders | 22 in. x 30 in. | 20 in. x 28 in. |
| Boiler, type | Straight top. | |
| Boiler, working steam pressure | 200 lbs. | |
| Heating surface, total | 3,403 sq. ft. | 2,649 sq. ft. |
| Boiler, number of tubes | 413 | 297 |
| " diameter of tubes | 2 in. | |
| " length of tubes | 15 ft. | 16 ft. |
| Firebox, length | 108 in. | |
| " width | 66 in. | |
| " grate area | 49.5 sq. ft. | |
| Tank capacity | 7,000 and 9,000 gals. | |
| Coal capacity | 10 and 14 tons. | 14 tons. |
| Oil capacity | 2,487 & 2,940 gals. | 2,487 gals. |

| | Pacific. | Switching. |
|---|---|---|
| Type of locomotive | Pacific. | Switching. |
| Weight, total | 222,000 lbs. | 140,000 lbs. |
| Weight on drivers | 141,000 lbs. | ..... |
| Diameter of cylinders | 77 in. | 51 in. |
| Diameter of drivers | 77 in. | 51 in. |
| Diameter of cylinders | 22 in. x 28 in. | 19 in. x 26 in. |
| Boiler, type | Straight top. | |
| Boiler, working steam pressure | 200 lbs. | 175 lbs. |
| Heating surface, total | 3,048 sq. ft. | 1,557 sq. ft. |
| Boiler, number of tubes | 245 | 257 |
| " diameter of tubes | 2¼ in. | 2 in. |
| " length of tubes | 20 ft. | 11 ft. 6 in. |
| Firebox, length | 108 in. | |
| " width | 66 in. | 40¼ in. |
| " grate area | 49.5 sq. ft. | 30.2 sq. ft. |
| Tank capacity | 7,000 & 9,000 gals. | 4,000 gals. |
| Coal capacity | 10 and 14 tons. | 6 tons. |
| Oil, capacity | ..... | 1,020 gals. |

*Special Equipment.*

| | |
|---|---|
| Bell ringer | U. S. Metallic Packing Co. |
| Brake-beams | Damascus Brake-Beam Co. |
| Brake-shoes | American Brake-Shoe Co. |
| Couplers | National Malleable Castings Co. |
| Headlights | Handlan-Buck Mfg. Co. and Pyle-National |
| Injectors | Nathan Mfg. Co. |
| Journal bearings | Hewitt Mfg. Co. |
| Piston rod packing | U. S. Metallic Packing Co. |
| Valve rod packing | U. S. Metallic Packing Co. |
| Safety valve | Crosby Steam Gage & Valve Co. |
| Sight-feed lubricators | Nathan Mfg. Co. |
| Springs | Railway Steel Spring Co. |
| Steam gages | Ashcroft Mfg. Co. |
| Steam-heat equipment | Consolidated Car Heating Co. |
| Tires, driving wheel | Standard Steel Co. |

## CAR BUILDING.

*The Canadian Pacific* is having 2,000 freight cars built at its Angus shops.

*The Chicago Union Traction* has, through its receivers, ordered 200 passenger cars.

*The Duluth, Missabe & Northern* has ordered 1,900 steel ore cars of 50 tons capacity from the Pressed Steel Car Co.

*The Springfield Traction Co.* has ordered four 18-ft. car bodies from the American Car Co., for November 25 delivery.

*The New York Central Lines*, it is reported, will soon consider the purchase of over 20,000 freight and passenger cars.

*The Chicago, Milwaukee & St. Paul* is building 3,000 box cars of 80,000 lbs. capacity at its West Milwaukee shops. These cars will weigh 40,000 lbs., and measure 40 ft. long, 8 ft. 6 in. wide and 8 ft. 3¾ in. high, inside to car line.

*The Texas & Pacific* is building 15 standard cabooses of 60,000 lbs. capacity at its Marshall shops. These cabooses will be 29 ft. 2 in. long, 8 ft. 2 in. wide and 6 ft. 9½ in. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | American Steel Foundries. |
| Couplers | Tower |

*The Yuet-Han Railway*, Canton, China, has ordered from the Wason Car Co., Springfield, Mass., five second class and 10 third class passenger cars, and two baggage cars for December and January delivery. All cars will be 60 ft. over all, wood bodies, and will have Krupp wheels. This order was reported in the *Railroad Gazette* of last week as coming from the Chinese Government.

*The Harriman Lines* have ordered from the American Car & Foundry Co. 6,000 refrigerator cars of 60,000 lbs. capacity; deliveries to begin next January. The cars will measure 34 ft. 3¼ in. long, inside between tanks; 8 ft. 2¾ in. wide and 7 ft. 6¼ in. high, inside measurements, and 41 ft. 10 in. long over end sills, 9 ft. 1⅜ in. wide over sheathing, and 12 ft. 3⅛ in. high to eaves. The bodies will be of wood and the underframes of steel. Special equipment includes:

| | |
|---|---|
| Bolster | Truck Simplex; Body Commonwealth cast steel |
| Brake-beams | Chicago Railway Equipment |
| Brake shoes | American Brake-Shoe & Fdry. |
| Couplers | Climax |
| Draft rigging | Miner |
| Journal boxes | National Malleable |
| Springs | Railway Steel Spring Co. |

*The Atlantic Coast Line*, as reported in our issue of Sept. 14, has ordered 500 double felt lined ventilated box cars of 60,000 lbs. capacity from the Standard Steel Car Co., Butler, Pa. These cars will weigh 38,000 lbs., will be 38 ft. long, 8 ft. 6 in. wide, 7 ft. 5 in. high, all inside measurements, and will have wood bodies and metal underframe. The special equipment includes:

| | |
|---|---|
| Bolsters | A. C. L. Standard truck |
| Brake-beams | Pennsylvania Deck Beam |
| Brakes | Westinghouse |
| Couplers | Tower |
| Draft rigging | Farlow, Westinghouse |
| Dust guards | Harrison |
| Journal boxes | Symington |
| Paint | A. C. L. Standard |
| Roofs | A. C. L. Standard |
| Springs | A. C. L. Standard |

## RAILROAD STRUCTURES.

Denison, Texas.—The Missouri, Kansas & Texas is planning to at once begin work on the union passenger station here.

Edmonton, Alb.—The City Counsel has ratified the Grand Trunk Pacific agreement, which provides that in consideration of a bonus of $100,000, and a right of way into the city, the railroad company will establish its division terminus at this place.

Grand Crossing, Wis.—The Chicago, Burlington & Quincy, it is said, has appropriated $25,000 for improvements to its roundhouse here.

Livonia, N. Y.—The State Railroad Commission recommends that the West avenue grade crossing of the Rochester division of the Erie be abolished and that a steel bridge be erected north of the present crossing.

Ottawa, Ont.—Contracts for putting up four of the steel bridges on the eastern division of the National transcontinental railroad (Grand Trunk Pacific) have been let to the Dominion Bridge Co. at $100,000. Contracts for four additional bridges have also been let to the Locomotive & Machine Co. at $60,000.

Spokane, Wash.—Announcement is made that the Northern Pacific will spend $500,000 for station and yard improvements here. The company is planning to raise its tracks and depress the streets at crossings within the city limits.

Vancouver, B. C.—The Vancouver, Westminster & Yukon will build a drawbridge over the second narrows in connection with the extension of its lines west from Burrard Inlet.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—See Southern Pacific.

ATLANTA & CAROLINA.—Incorporated in Georgia with $50,000 capital to build a line to be operated either by steam or electric power from Atlanta, northeast via Lathonia, Conyers, Lawrenceville, Hoschton and Jefferson, to Commerce, and from Atlanta southwest via Eastpoint, College Park, Palmetto, Newnan, Moreland, Grantville, Hogansville and La Grange to West Point, approximately 170 miles. The incorporators include M. T. Eggerton and W. E. Woods, of Fulton; L. F. Sell, of Jackson; T. J. Clarke, of De Kalb, and R. W. Tucker, of Rockdale.

BAY POINT & CLAYTON.—Incorporated in California with $150,000 capital, and with office in San Francisco, to build railroads. The directors are H. E. Cowell, E. V. Cowell, S. P. Cowell and W. H. George.

BEAVER CREEK.—It is said that under this name a line is to be built up Beaver Creek in Floyd County, Ky., for a distance of 33 miles. Surveys have been completed and construction work is to be started about the first of October. The office of the company is at Pikeville, Ky.

BOCA & LOYALTON.—See Western Pacific.

CALIFORNIA NORTHWESTERN.—See Southern Pacific.

CANADIAN NORTHERN.—Contract has been given by this company to the Central Contracting Company, of Toronto, to build a line from Nepigon to Lake Nepigon, the work to be completed in one year.

CANADIAN PACIFIC.—The Directors of this road have approved the construction of branch lines as follows: Moose Jaw branch from the main line at Moose Jaw northwesterly, about 50 miles; Weyburn branch, from Weyburn, on the northeastern extension of the Souris branch to Stoughton, on the Arcola-Regina extension of the Souris branch, about 36 miles; an extension of the Stonewall branch from Teulon northerly about 20 miles; West Selkirk branch from Winnipeg Beach to Gimli, about 10 miles; a line from Lauder, on the Souris branch, westerly to Broomhill, about 20 miles, and one from a point near Darlingford, on the Manitoba Southwestern Colonization Railway southerly about six miles.

CENTRAL CALIFORNIA.—See Southern Pacific.

CHICAGO & SOUTHERN TRACTION.—This company has begun operating its line from Sixty-third street, Chicago, via Blue Island and Chicago Heights to Cretè, 25 miles. The company expects to have the line completed through to Kankakee by the middle of October. Arrangements have been made with the Chicago Electric Traction Co. for interchange of traffic.

CLAREMONE RAILROAD (ELECTRIC).—Incorporated in Mississippi to build an electric line from Jackson west to Clinton, and thence to Cooper's Well, 16 miles. The company is planning to eventually extend the line to the Mississippi river, a total distance of 43 miles. The line will cost about $1,200,000 to build and equip. The incorporators are R. K. Jayne and M. Culherson, of Jackson, and M. Walker, of Brandon.

COLCHESTER COAL & RAILWAY CO.—According to report from Parrsboro, Nova Scotia, this company wants bids Sept. 29th for building four miles of railroad from De Bert station to the De Bert coal mine; also for 10,400 sleepers.

CORTLAND & AUBURN.—This company has been incorporated in New York state to build a steam or electric road from Cortland to Auburn, 40 miles. The directors include Chas. B. Wheeler, Brooklyn; N. A. Bundy and Walter L. Webb, Philadelphia; Chas. G. Adams, Auburn. The capital stock is $400,000.

CULLMAN & SOUTHWESTERN.—Incorporated in Alabama, with $500,000 capital, to build a line through the counties of Cullman, Jefferson and Walker, connecting with the Louisville & Nashville at Cullman and the St. Louis & San Francisco at Bryan. The incorporators are William N. Cooke, G. H. Ten Broeck and A. W. Liliendahl.

DELAWARE & HUDSON.—This company is securing land for straightening and double-tracking its line from Schenectady to Delanson, 15 miles. The work includes two large new freight yards.

EAST ST. LOUIS, COLUMBIA & WATERLOO.—Incorporated in Illinois with $10,000 capital to build a line from East St. Louis, Ill., south to Waterloo on the Mobile & Ohio, about 25 miles. The incorporators are J. W. Rickert and J. J. Koenigsmark, of Waterloo; H. Reichenbach, J. Warnok and E. F. Schoening, of Columbia.

FRONT ROYAL, RAPPAHANNOCK & TIDEWATER.—An officer writes that plans are being made for starting a preliminary survey for this proposed road, to be built from Front Royal, Va., on the Southern, south through Chester's Gap, Rappahannock County, and Washington Court House, to Sperryville, 23½ miles. As soon as surveys are completed, contracts are to be let for building the line, which is to be financed by Philadelphia and New York capitalists. The work will not be difficult, and will be mostly side cutting, with 2 to 2½ per cent. grades, some short bridges and a few trestles, but no tunnels. The company on the completion of the above work is planning to continue the line south through Madison County, to Orange and to tidewater. S. R. Millar, of Front Royal, is President. (Aug. 31, p. 58.)

GAINESVILLE & GULF.—An officer writes that under the name of the Tampa & Jacksonville this company will build a line from Jacksonville via Gainesville to Tampa, Fla. Contracts have been let to the American Construction Co., of Gainesville, for the work, and it is now under way. A sub contract has been given to W. H. Jones for grading 53 miles of the line. There will be two steel bridges. (See Tampa & Jacksonville, Sept. 7, p. 64.)

GEORGIA ROADS.—An application will shortly be made for a charter by a company to build a line from Social Circle, which is on the Georgia and the Monroe railroads south about 10 miles to Mansfield on the Central of Georgia. The company, it is said, is planning to use the old Middle Georgia & Atlanta grade between these two points. The project is being promoted by Colonel J. N. Preston and Captain A. W. Roberts, of Atlanta, and T. A. Perry, of Decatur.

GREAT NORTHERN.—It is said that a branch is to be built at once by this company in Washington. It is from a point near the Nighthawk mine to the foot of Palmer Mountain, northeast of Spokane, 5 miles, and is to develop ore properties.

GREENVILLE & ROLLINGFORD (ELECTRIC).—Incorporated in Mississippi to build an electric line from Leland through Greenville and Rollingford. G. B. Vincent and Van B. Boddie are incorporators.

HAMPSHIRE SOUTHERN.—Incorporated in West Virginia with $30,000 capital to build a line from Springrun, in Hampshire County, southwest via Romney, where the head office of the company will be located, through Hardy and Grant counties to Durbin and to a connection with the Chesapeake & Ohio and the Western Maryland in Pocahontas County. It is said that contracts for building the road will be let shortly. The incorporators include: John T. McGraw, of Grafton; J. J. Cornwell, of Romney, and W. B. Cornwell, of Fairmont.

INTERCOLONIAL.—Announcement is made by Hon. H. R. Emerson, Minister of Railways, that the double-tracking of this road from St. Johns, New Brunswick, east, is to be begun next spring.

LEWISTON & SOUTHEASTERN (ELECTRIC).—A contract is reported let by this company to the Scofield Co., of Philadelphia, to build 100 miles of its line between Lewiston, Idaho and Grangeville. (See Construction Record.)

MOBILE & WESTERN.—Incorporated in Alabama with $100,000 capital to build a line from Mann's station, on Mobile Bay, south of Mobile, west to the Mississippi river. R. K. Mann, of Muskegon, Mich., is President; G. Watwood, of Mobile, Vice-President and General Manager, and W. H. Mann, of Elkhart, Ind., Secretary and Treasurer.

MORELIA & TACAMBARO.—This company will have completed by November 1 the first section of its line from Irapuato, state of Guanajuato, Mexico, which is on the Mexican Central, south to Puruandiro, 55 miles. The road is projected further south to Ariro, and it will be 200 miles long. The company has been granted concessions, rights of way and terminals by the Mexican Government. (Aug. 24, p. 51.)

NATIONAL OF MEXICO.—This company, which is owned by the Government, is preparing to make direct connections with all the chief centers in Mexico City in addition to the belt line which it is building around that city. The Government has granted permission to build these lines.

OAK POINT & ELYRIA.—Incorporated in Ohio with $300,000 capital and office at Elyria to build railroads. The incorporators include A. R. Mannering, E. S. Cooke and F. S. McGowan.

OREGON & WASHINGTON.—Surveys are being made and rights of way secured by this company for its proposed line from Portland, Ore., north to Everett, Wash., about 189 miles. It is said that the money for carrying out the work has been secured. (June 22, p. 168.)

OREGON WESTERN.—See Southern Pacific.

OSCEOLA, LITTLE RIVER & WESTERN.—This company, now building a line from Osceola, Ark., on the St. Louis & San Francisco, west to Little River, 15 miles, has completed five and a half miles, which is being used for logging purposes. J. E. Roberts, of Osceola, is Chief Engineer.

ST. LOUIS, LAKEWOOD & GRANT PARK (ELECTRIC).—This company has filed a mortgage securing bonds to the amount of $300,-

000. The money is to be used in completing the line from the terminus of the Southampton line of the United Railways Co. in St. Louis to the Grant Farm.

Salina & Northwestern.—Incorporated in Kansas by residents of Topeka to build a line from Salina, Kan., northwest to Kearney, Neb., about 200 miles. This is thought to be a project of the Union Pacific to connect its Kansas and Nebraska divisions through territory now occupied by the Burlington.

San Francisco & Northwestern.—See Southern Pacific.

San Juan.—According to reports from Oaxaca, Mex., this company is building a line which it expects to open for passenger traffic from Oaxaca to Taviche October 15. This road connects with the Zimitlan Railroad at San Pablo. The company will eventually extend the line to Tlacolula with branches to mines.

Sierra Pacific.—This company has applied for incorporation in California with $1,500,000 capital. The company is planning to build a line from Springville, Tulare County, southwest to Port Harford, San Luis Obispo County, on the Pacific coast, via Globe, Hutton, Coalinga, Paso Robles, Templeton, Santa Margerita and San Luis Obispo. The company is also planning to build a number of short lines as feeders at different points in the valley. The names of the promoters are not given.

Southern Pacific.—An officer writes that this company, under the name of the Oregon Western, is grading its proposed line from a point on its line at Drain, Ore., west via Elkton and Scottsburg, thence southwest to Marshfield on the Coose Bay, Roseburg & Eastern. No track has yet been laid. (Aug. 24, p. 51.)

The Central California, of which Manager E. E. Calvin, of the Southern Pacific, is President, announces its intention to build a line from Niles, Cal., to Dumbarton Point and thence to Redwood City and San Mateo instead of starting from the present Southern Pacific line at Newark as originally intended. The proposed new link, which is to be 30 miles long, is intended as a cut-off to facilitate the transfer of freight across the bay at San Francisco.

Both this company and the Atchison have been making surveys in Humboldt and other counties in California with a view of starting work early next year on a joint line to connect Eureka with San Francisco. The existing road, the California Northwestern, from San Francisco north to Willits, 115 miles, is to be utilized, and the remaining gap of about 150 miles to Eureka will be completed by building a joint line by the shortest practicable route to Camp Five, the southern terminus of the short road now operated by the Atchison under the name of the San Francisco & Northwestern, which runs from Arcata south via Eureka to Camp Five, 42 miles. Construction work on this line was to have been started the past summer, but the plans were all destroyed by the great fire in San Francisco.

This company has petitioned the Board of Supervisors for authority to build spur tracks along the northern city front of San Francisco. This would be an extension of the present Belt line, owned by the state, and under the control of the State Board of Commissioners. The plans cover about one-third of the water frontage of the city.

Tampa & Jacksonville.—See Gainesville & Gulf.

Veblen & Northwestern.—This company has completed grading its line from the northeast corner of South Dakota at Veblen east through Roberts County to Minnesota, 32 miles. The company was organized about two years ago by farmers of this section. M. J. Hawley, of Brandt, S. Dak., was President and principal promoter of the project.

Virginia & Truckee.—See Western Pacific.

Western Pacific.—An officer denies that this company has bought the Boca & Loyalton. San Francisco press despatches state that the Western Pacific has acquired control of the Virginia & Truckee, which runs from Reno, Nev., on the Southern Pacific, to Carson City, 31 miles.

West Penn Railway Co. (Electric).—This company, which operates 94 miles of electric roads in Pennsylvania, has opened a new line from Mount Pleasant, Pa., via Hecla to Greensburg, 14 miles.

White Top.—Incorporated in Virginia with $50,000 capital, and office at Azen, to build a line from Grassy Ridge, Washington County, to Upperford on White Top, Laurel, Smith County; also from Grassy Ridge to Blevins Gap, Grayson County. W. A. Hassenger, of Lamona, is President, and J. L. Hurt, of Abingdon, Secretary. R. M. Page and G. E. Barnes are among the incorporators.

## RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Kuhn, Loeb & Co., of New York, announce that negotiations are pending for the purchase from them by the Union Pacific of the 400,000 shares of Baltimore & Ohio stock, recently bought by Kuhn, Loeb & Co. from the Pennsylvania. See editorial columns.

Canadian Northern.—This company, which recently bought the Qu'Appelle, Long Lake & Saskatchewan, will not begin the operation of it until June, 1907, the Canadian Pacific having a lease on the road until that time.

Canadian Pacific.—See Canadian Northern.

Central New England.—See New York, New Haven & Hartford.

Chesapeake & Ohio.—This company has issued $2,900,000 additional 4 per cent. equipment trust notes secured on 3,000 steel gondola cars bought from Blair & Co. They are payable in 20 semi-annual instalments, beginning Dec. 1, 1906.

Chicago, Rock Island & Pacific.—This company has declared a dividend of 2 per cent. on its $74,842,600 outstanding capital stock. Three months ago 1 per cent. was paid on this stock. The annual rates in previous years have been as follows: 1905, 6¼ per cent.; 1904, 8¼ per cent.; 1903, 7½ per cent., and for the four preceding years, 5 per cent.

Cleveland & Pittsburg.—The New York Stock Exchange has listed $1,218,200 additional special guaranteed betterment stock, making the total amount listed $7,477,800. The new stock represents new equipment, second track, sidings, right of way, station grounds and other improvements.

Cleveland, Cincinnati, Chicago & St. Louis.—At a meeting of the directors held on Sept. 19 it was recommended that the authorized capital stock be increased from $40,000,000 to $50,000,000. The proceeds of the sale of the new stock are to be used for equipment and betterments. The authorized capital stock was increased from $28,700,000 to $40,000,000 thirteen months ago.

Colorado & Southern.—See Rock Island Company.

Consolidated (N. Y., N. H. & H. Electric Lines).—See New England Investment & Security Co.

Iowa Central.—See Rock Island Company.

Lehigh Valley.—Gross earnings of this company for the year ending June 30, 1906, were $32,789,857, an increase of $1,514,014. This showing, which is not particularly favorable when compared with the average increase of other roads, is partly due to the decrease in the earnings from coal traffic, owing to the strike in April and May. The net earnings were $12,637,646, an increase of $219,505. The surplus after charges was $5,451,584, an increase of $58,695. The Lehigh Valley Coal Co. shows a net income of $318,489, a decrease of $317,059.

New England Investment & Security Co.—The capital stock of this new holding company for the Consolidated's lines in Massachusetts is $20,000,000, instead of $2,000,000, as reported in our issue of last week. Half of this capital is preferred stock.

New York Central & Hudson River.—At a meeting of the directors held on Sept. 19, the issue of $29,839,560 additional capital stock, the proceeds to be used for improvements, was authorized. The authorized capital stock is $250,000,000. The new issue will bring up the amount outstanding to $179,282,060. The new stock will be issued to stockholders at par at the rate of 20 per cent. of their present holdings.

New York, New Haven & Hartford.—This company has discontinued the operation of trains between Hopewell, N. Y., and Fishkill Landing, but the line to Fishkill Landing will be kept in operation by the Central New England.

Northern Pacific.—During the two months ending August 31, the gross earnings of this company were $11,370,418, an increase of $1,958,963, or 21 per cent. The greatest increase was in freight earnings, 29 per cent. The proprietary lines of the system earned $201,166, an increase of $47,603, or 31 per cent.

Pennsylvania.—See Baltimore & Ohio.

Qu'Appelle, Long Lake & Saskatchewan.—See Canadian Northern.

Rock Island Company.—It is reported that interests identified with this company have bought from Edwin Hawley his holdings in the Colorado & Southern and the Iowa Central.

Rumford Falls & Rangeley Lakes.—Gross earnings for the year ended June 30, 1906, were $152,449, an increase of $20,023; net earnings, $64,301, an increase of $20,474. Surplus after charges, $8,738, an increase of $781.

Union Pacific.—See Baltimore & Ohio.

Velasco, Brazos & Northern.—This 20-mile road in Texas has been ordered to be sold under foreclosure on October 2d. It was sold to H. C. Alexander on July 3d for $80,000, but the sale has been set aside.

White River Valley.—This road, which runs from Bethel, Vt., to Rochester, 19 miles, has been ordered closed by the Vermont Railroad Commission, being considered unsafe for traffic.

# GENERAL NEWS SECTION

## NOTES.

The Buffalo, Rochester & Pittsburg announces that beginning November 1 local passenger rates will be reduced to 2½ cents a mile.

In the United States District Court at Philadelphia, September 25, the Camden Iron Works was found guilty of receiving rebates from the Mutual Transit Company, a lake line.

A press depatch from Chicago says that the Illinois Central has decided to take radical ground in the matter of freight car scarcity, and will refuse to allow its cars to go on to other roads.

On the Gulf, Colorado & Santa Fe, in Texas, an order has been issued that firemen to be examined for promotion to the position of enginemen must not merely have been in the service three years, but must actually have worked 900 days.

The passenger men of Minneapolis having some time ago secured injunctions which resulted in putting the ticket brokers out of business, now find that "a clerk in every hotel" is supplied with cut rate tickets for sale to traveling men.

St. Paul papers report that the Northern Pacific has made reductions of 10 per cent. and in some cases more, in the rates on coal from Duluth; and that the Great Northern and other roads in the state will have to make similar reductions.

Half a dozen of the principal roads centering in Chicago have secured from the United States Circuit Court a permanent injunction against the unauthorized sale of tickets, which it is believed will close up the scalpers' offices in that city.

Beginning October 10 the Southern Pacific will considerably reduce the rates on freight carried in iced refrigerator cars. Hitherto the rates on commodities in such cars were 25 per cent. higher than for the same in common cars; this will be taken off.

On the Pittsburg, Cincinnati, Chicago & St. Louis two freight cabooses on each division are to be equipped with compressed air whistles, to enable a flagman to signal to the engineman when he has returned to his train, and also to enable a stop signal to be given at any time.

At a hearing in Chicago last week the lumber carrying railroads which had been complained of for charging transportation on the stakes and ties used to secure lumber on flat cars, promised the Interstate Commerce Commission that henceforth they would allow 500 lbs. of such material free on each car.

On September 24 a steamboat arrived in Kansas City from St. Louis with a load of freight, the first to come up the Missouri river for more than ten years. The boat was welcomed by whistles and bells; but how much weight should be given to the accompanying statement that regular traffic is to be resumed does not appear.

The suits filed by the state of Texas against certain railroads and express companies for violation of the law, in making exclusive contracts for conducting the express business, have been compromised. The aggregate possible penalties were $6,000,000. The amount paid is $40,000, of which. it is said, the lawyers will get $8,000.

It is announced in Chicago that the round-trip rate over the Illinois Central to New Orleans for the Knights of Pythias will be 80 per cent. of the one-way fare, which is equal to about one cent a mile. This is said to be the lowest rate that has ever been granted for an occasion of this kind, except for the Grand Army of the Republic.

The Attorney-General of Ohio, at the request of the State Railroad Commission, has rendered an opinion holding that Section 3,227 of the Revised Statutes does not prohibit railroads from charging demurrage on freight cars until a period of 10 days has expired. It appears that the prohibition in question applies only to freight in less than car load lots.

At a hearing given by the Interstate Commerce Commission at Omaha, September 19, a representative of coal mines near Rock Springs, Wyo., testified that he was unable to build a track to the Union Pacific because the officers of the Union Pacific Coal Company blocked his plans. The owner of a mine near Hanna, Wyo., made similar statements.

The President of the Boston & Maine has notified stockholders that in consequence of the stringent provisions of the Interstate Commerce law, as revised, stockholders will no longer be carried free to the annual meetings of the company. The Boston & Albany, a large majority of whose stockholders live in Massachusetts, makes no change in its time-honored policy of carrying stockholders and their proxies—especially feminine proxies—free on its annual September Boston shopping excursion.

In the United States Court at Frankfort, Ky., September 24, Judge Cochran granted a temporary injunction restraining the State Railroad Commission from enforcing an order which it has made reducing freight rates throughout the state 20 per cent. The railroads are required to keep full records of all shipments so that in case the suit goes against them they can promptly refund overcharges to shippers.

The Interstate Commerce Commission having received numerous requests for extension of the time within which annual reports must be filed (now September 30 by statute, with fine of $100 a day for delay, instead of September 15, as formerly required by a rule of the commission) has issued a general notice that, in the opinion of the commission the necessity must be very rare which will justify it in granting an extension of time.

That portion of the New York Central main line between Spuyten Duyvil and Mott Haven Junction, a part of which (between High Bridge and Mott Haven) is being electrified, has already been rearranged so that trains run on the right-hand track, instead of the left-hand as in the past. In consequence of this change, northbound trains and southbound trains will cross each others paths at Mott Haven Junction instead of Spuyten Duyvil. New overhead stations have just been put in use at High Bridge and Morris Heights on this line. The use of electric motors on passenger trains is still a month or more in the future.

The Long Island Railroad Company announces that in making flat rates for season tickets, which is to be done after this month, the company will lose $49,000 yearly, unless there is an increase in traffic. Hitherto the rate between Long Island City and Far Rockaway, for example, has been $11 a month for the first month in a year and $5 for the last month; now the rate will be $7.50 for each and every month in the year. The prospective loss appears to be due to the fact that large numbers of passengers begin their year in the summer, buying tickets at the highest rate, but do not continue through the year, moving back to the city in the winter.

According to the *Altoona Times* the scarcity of telegraph operators on the Pennsylvania Railroad has become so acute that the company proposes to establish on the Pittsburg division an operators' apprentice system; and the question arises whether or not this will precipitate trouble with the Telegraphers' Brotherhood, which has induced or compelled many railroads to forbid the presence of students in their offices. The Pennsylvania proposes to employ young men from 17 to 21 years of age as lever men in interlocking towers. They are to work under the direction of the signalman (who is a telegraph operator) and will be expected in their spare time to learn telegraphy.

Philadelphia papers report that the hourly express trains running between that city and New York over the Reading and the Central of New Jersey are soon to be all two-hour trains. These trains leave each terminus "on the hour" from 7 a.m. to 6 p.m. At present six eastbound and seven westbound run through in two hours. The others make more stops. It is said that additional trains will be put on to accommodate intermediate cities. It is said that all of these fast trains will run over the cut-off, a few miles east of Philadelphia, which shortens the distance 2.1 miles. With the cut-off this line has four tracks all the way, except between Yardley and Bound Brook.

The Erie Railroad employees' magazine reports the following cases of commendation of employees for special merit: Engineman H. W. Smith, who discovered a malicious obstruction on the track; Brakemen H. M. Shock and R. I. Friel, for discovering cracked wheels; Freight Conductor J. H. Troy for specially good work when off duty; Engineman V. B. Tuthill, for stopping a derailed car and thereby preventing damage; Operator Jerry Dee, quick signaling of a train, preventing it from striking an accidental obstruction at a highway crossing; Foreman J. S. Thompson, for discovering a broken switch and promptly safeguarding trains; Operator A. M. Vicker, for discovering a broken flange as it was passing his tower; Engineman D. A. Roschie, for the quick renewal of a defective air hose; Foreman Painter Frank Benberger, for discovering a semaphore bracket which was too near the track, and Brakeman William Ryan, for discovering a spike fastened in a switch.

### Car Head Linings and Roofs.

In the new steel cars built for electric service on the New York Central, as well as in some other fireproof cars, a new material made from wood pulp is being used for head linings and also for roofs. It is called indestructible fibre and it has several advantages: It is a non-conductor, it is flexible so as to be easily bent to the

required curves, it is probably stronger than any available wood, and it is easily made fireproof by mixtures in the pulp. When fine shavings are whittled from it and a hot flame is applied to it, it is converted into charcoal; but it does not blaze and the fire goes out as soon as the flame is taken away from it. This artificial wood also has the advantage over natural wood in that it does not splinter, has no knots and is homogeneous throughout. It is also a good vehicle for holding paint, and when covered with porcelain paint it becomes an inexpensive and efficient substitute for tile for walls or floors. Inventions of this kind also appeal to us as being for the general welfare in that they economize the use of timber and so benefit the world. This material is made by the Indestructible Fibre Co., 45 Broadway, New York City.

### Holding Power of Spikes.

The Government Forest Service has made some tests to determine the holding power of different forms of railroad spikes. The spikes used were common driven spikes, a driven spike which has about the same form as the common spike with a lengthwise channel on the side away from the rail, and screw spikes. The common and the channeled spikes were driven into the ties in the usual manner to a depth of 5 in. A hole of the same diameter as the spike at the base of the thread was bored for the screw spikes, which were then screwed down to the same depth as the driven spikes. The ties were then placed in the testing machine and the force required to pull each spike was recorded.

The average force required to pull common spikes varies from 7,000 lbs. in white oak to 3,600 lbs. in loblolly pine, and 3,000 lbs. in chestnut. The holding power of the channeled spike is somewhat greater, about 11 per cent. with loblolly pine. The screw spikes range from 13,000 lbs. in white oak to 9,400 lbs. in chestnut and 7,700 lbs. in loblolly pine.

There is a marked difference between the behavior of driven and screwed spikes in knots and in clear wood. Knots are brittle and lack elasticity, so driven spikes do not hold as well in them as in clear wood. In the case of common spikes in loblolly pine the decrease of holding power in knots is as great as 25 per cent. On the other hand, screw spikes tend to pull out the whole knot which they penetrate. This increases the resistance so much that in loblolly pine the increase of holding power of screw spikes in knots is about 35 per cent. over that for clear wood.

### Electrical Equipment for the Hudson Company's Tunnels.

The electrification of the completed twin tunnels of the Hudson & Manhattan Railway (Hudson Companies) under the North river connecting Jersey City with New York, will be begun at once. Each tunnel is single track; the north tube for the westbound and the south tube for the east bound or New York traffic. Cars will be operated in trains by the third rail system using the Sprague-General Electric system of multiple unit control—the system used in the New York subway. Each of the 50 cars will be equipped with two 160-h.p. railroad motors. Power will be supplied from a large turbine power station to be located between Jersey City and Newark. The General Electric Company will furnish the complete electrical equipment. It is expected that when the new line is in operation the running time between nearby points in New Jersey and New York City will be reduced one-half.

### Disastrous Train Wreck at Grantham, England.

On the night of September 19 a fast night express of the Great Northern Railway of England, bound from London to Edinburgh, was derailed at Grantham, while running at high speed through a curve, and at least 8 passengers were killed; 16 or more were injured. The engineman and fireman were both killed. It is said that the train should have stopped at Grantham, and also that all trains are required to limit speed to 10 miles an hour through the curve where the derailment occurred. The officers of the road have found no evidence of failure of the brakes, and there is no explanation of why the speed of the train was not slackened.

### Sunday Rest on Railroads in France.

A press despatch from Paris says that the leading six railroad companies of France have informed the Minister of Public Works that, although railroads are specifically exempted from the new Sunday Rest law, all employees of the roads will be granted 52 days off in a year. The number of persons employed by these railroads is 280,000, and the plan is to be put in effect within 18 months. The railroads say that they cannot lay off all of the men on Sunday, but will give the holidays to the different men in rotation.

### Mr. Acworth on the Rate Bill.

Mr. W. M. Acworth, of London, is quoted as follows on the new rate bill:

"You have passed a new law; and now—so I gather from the newspapers—the millennium is at the door. All rates in future are going to be reasonable and just—in everybody's opinion. City A is to get lower rates, and City B, which heretofore was at an advantage, will in future be on an equality with A. And the citizens of B are hymning the millennium. I fear they will sing out of tune once the commission gets to work.

"This is assuming that the commission really does make active use of its new powers and that it is supported in so doing by the courts. For my own part I have too much respect for the commission to expect that it will do anything radical in the rate regulation line, at any rate, for some time to come. We don't know for certain and never shall know what is a just and reasonable rate.

"If we want to get a rough idea of what it ought to be, our best chance is to look at the railroad schedule and see what the actual rate is. For the actual rate has not been made by the arbitrary decision of any single man, but by the free play of complex economic forces acting over a long series of years.

"Our English Parliament started regulating railway rates sixty years ago and has passed rate regulation bills at intervals of about ten years ever since. The last was in 1893, so another is about due. Probably it will come in a year or two, and when it does come, like its predecessors, it will not make much difference to anybody.

"No honest man can do otherwise than sympathize with any attempt to catch, fine and imprison the dishonest people who have extorted rebates, and even the complaisant railway men who grant them. But, so far as I can learn, the days of secret rebates were practically over some time before your new act was passed."

### How to Treat Purchasers of Tickets.

The engravings shown herewith are made from photographs which appeared recently in the *North-Western Bulletin*, the periodical published in the interest of the employees of the Chicago & North-Western, having been sent to the *Bulletin* by Mr. J. R. Hood, agent of the company at Oakdale, Neb. The first picture represents a ticket agent before he has learned to treat passengers with thoughtful consideration. He has thrown the lady's ticket and

change down on the counter, where they have to be laboriously recovered by her; and as she has on a pair of new gloves this takes some little time, and in many cases causes more or less annoyance. How it is that in this particular case the lady wears such an unruffled expression we do not pretend to be able to explain. The second picture represents the same agent after he has been reformed. He puts the ticket and coins into the customer's extended palm. It is safe to say that both lady and ticket agent live happy ever after.

### Dynamite Disaster at Jellico, Tenn.

By an explosion of dynamite in a freight car of the Louisville & Nashville Railroad, standing on a side track at Jellico, Tenn., about 8 o'clock on the morning of September 21, eight or more persons were killed and 50 seriously injured; and a thousand people were rendered homeless. The despatches say that all of the business houses of the town were destroyed, and that the property loss will exceed a million dollars. One report says that the explosion was caused by bullets, which were fired at a target fastened to the car, while another says that in switching, a carload of iron bumped violently against the car containing the explosive.

### Status of Work on New York Canal Enlargement.

The total amount of contract work for which plans and specifications have been prepared by the State Engineers' Department, and passed on and approved by the advisory board of Consulting Engineers up to September 1, 1906, on the Erie, Champlain and Oswego canals, is reported at $22,644,418. Twelve contracts have been let, on which work is now under way, as follows: Erie Canal system, seven contracts, aggregating $5,866,285; Champlain Canal system, three contracts, $2,825,347, and the Oswego Canal system, one contract for $1,126,718. In addition a contract has been let for work common to both the Erie and Champlain canals, amounting to $97,635. No bids were received for contract No. 12, Erie Canal, the engineers' estimate for which was $1,329,635, and it is probable that conditions affecting this contract will have to be modified before it is again advertised.

The Canal Board has plans and specifications for six additional

contracts, which are now ready for advertising, the engineers' estimate under these contracts aggregating $11,245,273, and the State Engineers' Department has almost finished plans and specifications for twelve other contracts on the three canal systems. It is expected that this will be let before the close of 1906.

Should this prove practicable more than one-third of the entire work of construction of the three canals would be let by January 1, 1907. The work actually contracted for and now under way has been let at prices averaging 10 per cent. less than the original estimates and appropriations made under the barge canal act of 1903.

### A Cripples' Labor Union.

The "one armed men's" union was founded last night in a hall at Fifty-fifth street and Wentworth avenue. Its principles essentially are humanitarian, it being devised with special regard for the 1,200 maimed, legless, or armless switchtenders, flagmen and crossing men employed by the railroads in and near Chicago.

One of the first things on the programme of the new union will be to secure a more "comfortable" existence for the disabled members. The list of demands to be filed with the railroad companies embraces "cushioned seats" for members with "stumps," ice-water in summer time, and awning shades to protect the tenders from the heat of the sun and the dampness.—*Chicago Tribune.*

## TRADE CATALOGUES.

*Trussed Concrete Bulletin.*—The September number of this publication of the Trussed Concrete Steel Co., Detroit, Mich., is called an automobile number. The name, however, has reference to automobile factory construction rather than to the machines themselves. The construction of reinforced concrete additions to the plant of the Packard Motor Car Co., Detroit, is described and illustrated, and mention made of other automobile factory buildings of reinforced concrete construction according to the Kahn system, aggregating 25 acres of floor space. A view is also shown of the new reinforced concrete warehouse of the Oliver Chilled Plow Co., South Bend, Ind., in process of construction.

*Lathes.*—The Gisholt Machine Co., Madison, Wis., has just issued page 58 of its loose leaf binder. It illustrates and describes a 34-in. Gisholt turret lathe which was recently furnished to one of the large railroad shops for finishing cross heads, eccentrics, piston centers and piston rims. Illustrations of the work done are also shown.

*Pig Iron Production.*—Pilling & Crane, Pittsburg, Pa., send a "crystaloid" sign, 8 x 10, exhibiting by diagrams the production of pig iron in the United States in long tons by decades from 1830 to 1905, and the per capita production in pounds for a similar period.

### Manufacturing and Business.

G. S. Baxter & Company, of Jacksonville, Fla., have contracted to furnish 100,000 ties for the Panama Railroad.

The Barker Mail Crane Co., Clinton, Iowa, reports good business thus far for 1906, the sales of cranes and orders on hand being most satisfactory. These cranes are now in use on 26 railroads.

William M. Brodie, who for the past six years has been connected with the manufacturing department of the Edison Mfg. Co., Orange, N. J., has been appointed manager of sales of the company.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., has bought the two Holland interurban parlor and sleeping cars "Theodore" and "Francis," formerly operated out of Zanesville, Ohio. They were the first cars of this character built and cost $28,000 each. Each car is equipped with 600 h.p. motors. They were only used about three months. This company also bought all of the equipment for the cars and the Holland patents for the United States and Canada.

### Iron and Steel.

The Erie has ordered 38,000 tons of rails and the Panama Railroad has ordered 5,000 tons.

The American Bridge Co., in addition to the 700 tons of steel for a San Francisco building, has received an order for 4,500 tons.

J. G. White & Co. have so far ordered 104,000 tons of rails and structural steel to be sent to Manila for use on the railroads which this company is building in the Philippine Islands.

The Western Pacific has ordered from the American Bridge Company the steel required for 15 bridges. There is to be a long steel bridge at Sacramento, but most of the other bridges on the line are not of great length.

The Harriman lines, which recently let a contract for 20,000 tons of structural steel, are in the market for 14,000 tons of steel billets to be made into tie plates; but owing to the congested condition of the billet mills it is doubtful if any mill can be found to take the order.

The New York Central Lines have closed negotiations for 80,000 tons of rails for 1907 delivery, to be used as follows: Lake Shore, 32,000; C., C., C. & St. L., 31,000; Michigan Central, 12,000; Cincinnati Northern, 2,000, and Lake Erie & Western, 3,000. The order is for only about one-half the quantity needed by the Central Lines, and other contracts will be let later for another 80,000.

Eastern and central traction lines have given additional orders to rail mills for an aggregate of 15,000 tons of standard steel sections for delivery next year, and numerous steam and trolley lines isued new inquiries for fully 50,000 tons more for shipment during the first half of next year. The total tonnage for 1907 now before the mills in all sections of the country aggregates at least 500,000 tons, and it is expected that all of these contracts and many more will be awarded before the end of this year.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Maintenance of Way Master Painters' Association.

The Secretary announces that the next meeting of this association will be held in New York, November 13 and 14, 1906.

### Western Society of Engineers (Chicago).

The following is a tentative program of the meetings of this society for the balance of this year, with the papers to be presented:

October 3, "Methods for the Testing of Coal," by A. Bement.
October 17, "Smoke Prevention and Suppression," by A. Bement.
November 7, "Notes on Road Resistance," by C. H. Hudson.
November 21, "Waterproofing, Particularly as Applicable to Masonry and Concrete Structures," by Edward W. DeKnight.
December 5, "Concrete Pipe Culverts," by O. P. Chamberlain.
December 19, "Gravity Switching Yards for Freight Traffic," by M. H. North.

The annual meeting and annual dinner will take place Jan. 8, 1907.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Atlantic Coast Line.*—Alexander Hamilton has been elected General Counsel, succeeding W. G. Elliott, deceased.

*Chihuahua & Pacific.*—B. F. Maurer, Auditor, Freight and Passenger Agent, has resigned to become Manager of the Central of Peru.

*Colorado Southern, New Orleans & Pacific.*—A. M. Hood, formerly Auditor of the Tennessee Central, has been appointed Auditor of the Colorado Southern, New Orleans & Pacific, with office at Beaumont, Texas.

*New York, New Haven & Hartford.*—The number of directors has been reduced from 21 to 19, the retiring members being Percy R. Tood, First Vice-President, and Richard McCurdy, of New York.

*Seaboard Air Line.*—A. L. Nutt, Assistant Secretary and Assistant Treasurer, has been appointed Treasurer.

*Texas & Gulf.*—F. T. Rembert has been elected Secretary and Treasurer, succeeding G. A. Rogers, resigned.

*Texas Southern.*—C. L. Taylor has been appointed Receiver of this company, succeeding S. P. Jones, effective October 1st.

### Operating Officers.

*Southern.*—A. H. Westfall, General Superintendent of the Elgin, Joliet & Eastern, has been appointed Superintendent of the Southern, with office at Atlanta, Ga.

*Elgin, Joliet & Eastern.*—See Southern.

### Traffic Officers.

*Chicago, St. Paul, Minnesota & Omaha.*—E. B. Ober, formerly First Assistant General Freight Agent, has been appointed General Freight Agent, with office at St. Paul, Minn., succeeding H. M. Pearce.

*Missouri, Kansas & Texas.*—Thomas Noel, Assistant General Freight Agent at Houston, Tex., has resigned, effective October 1st, to go into other business.

*San Pedro, Los Angeles & Salt Lake.*—E. W. Gillett, General Freight and Passenger Agent, has resigned.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe Coast Lines.*—H. C. Phillips has been appointed Chief Engineer, with office at Los Angeles, Cal., succeeding C. A. Morse.

*Isthmian Canal Commission.*—Joseph Ripley, who was recently appointed Principal Assistant Engineer, was born in Michigan in 1854, and graduated from the Michigan University in 1876. After leaving college, he worked as a land surveyor for a year, and then went into government work, acting as Assistant Engineer of the St. Mary River Improvements from 1879 to 1906. He has also been in charge of other work during this period as follows: In 1897 he was in charge of surveys, plans and estimates of the canal from Birmingham, Ala., to the Warrior river, and from 1898 to date he was General Superintendent of the St. Mary's Falls Canal. For the past year Mr. Ripley has been a member of the Consulting Board of Engineers for the Panama Canal.

Joseph Ripley.

*Wisconsin Central.*—J. Krey, formerly Division Engineer of the Duluth, Missabe & Northern, has been appointed Division Engineer of the Duluth-Superior district of the Wisconsin Central, with office at Duluth, Minn.

## LOCOMOTIVE BUILDING.

*The Toledo Railway & Terminal Co.* would like to lease one or two locomotives for a few months.

*The Louisville & Nashville*, it is reported, has ordered 25 locomotives from the Baldwin Locomotive Works.

*The Canadian Pacific*, it is reported, has ordered 50 consolidation (2-8-0) locomotives from the Locomotive & Machine Co., Longue Pointe, Que.

*The Philippine Railways Company* has ordered four Mogul (2-6-0) locomotives from the Baldwin Locomotive Works. Address, care of J. G. White & Co., New York.

*The Queen & Crescent Route* has ordered four simple 10-wheel (4-6-0) locomotives for the Alabama & Vicksburg, and two simple 10-wheel (4-6-0) locomotives for the New Orleans & Northeastern from the Baldwin Locomotive Works, for January and February, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Ten-wheel |
| Weight, total | 146,000 lbs. |
| Weight, on drivers | 116,900 lbs. |
| Diameter of drivers | 58 in. |
| Cylinders | 19 in. x 26 in. |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 262 |
| " material of tubes | National |
| " diameter of tubes | 2 in. |
| " length of tubes | 14 ft. 9½ in. |
| Firebox, length | 107⅞ in. |
| " width | 41⅞ in. |
| " grate area | 31.5 sq. ft. |
| Heating surface, total | 2,172 sq. ft. |
| Tank capacity | 5,500 gals. |
| Coal capacity | 11 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse-American |
| Axles | Midvale |
| Bell ringer | Golmar |
| Boiler lagging | Magnesia |
| Brake beams | Damascus |
| Brake shoes | Kinser |
| Couplers | Monarch-Janney |
| Headlights | Pyle National |
| Injectors | Monitor |
| Journal bearings | Ajax |
| Piston rod packings | Sullivan |
| Valve rod packings | Richardson |
| Safety valves | Crosby |
| Sanding devices | Leach |
| Sight-feed lubricators | Bull's eye |
| Springs | Pittsburg Spring & Steel Co. |
| Steam gages | Crosby |
| Steam heat equipment | Gold |
| Tires, driving wheel | Midvale |
| " truck wheel | Midvale |
| " tender wheel | Midvale |

*The Colorado Southern, New Orleans & Pacific* has ordered 26 simple consolidation (2-8-0) locomotives from the Baldwin Locomotive Works, for January and February, 1907, delivery; six simple eight-wheel passenger (4-4-0) locomotives, two simple 10-wheel passenger (4-6-0) locomotives, and four simple six-wheel (0-6-0) switching locomotives from the American Locomotive Co., all for January to April, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | | |
|---|---|---|
| Type of locomotive | Consolidation. | Eight wheel |
| Weight, total | 204,000 lbs. | 136,000 lbs. |
| " on drivers | 180,000 lbs. | 88,000 lbs. |
| Diameter of drivers | 57 in. | 69 in. |
| Cylinders | 22 in. x 30 in. | 19 in. x 26 in. |
| Working steam pressure | 200 lbs. | 180 lbs. |
| Type of locomotive | Ten-wheel. | Switching. |
| Weight, total | 182,000 lbs. | 121,000 lbs.* |
| " on drivers | 135,000 lbs. | ..... |
| Diameter of drivers | 69 in. | ..... |
| Cylinders | 21 in. x 26 in. | 19 in. x 26 in.† |
| Working steam pressure | 200 lbs. | 180 lbs. |

*Three locomotives, 124,000 lbs.; one locomotive, 148,000 lbs.
†Three locomotives, 19 in. x 26 in.; one locomotive, 20½ in. x 26 in.

*The Seaboard Air Line* has ordered five simple passenger locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Weight, total, engine and tender | 269,090 lbs. |
| " on drivers | 132,610 lbs. |
| Diameter of drivers | 67 in. |
| Dimensions of cylinders | 20 in. x 28 in. |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 328 |
| " diameter of tubes | 2 in. |
| " length of tubes | 14 ft. 1⅝ in. |
| Firebox, length | 9 ft. |
| " width | 42 in. |
| " grate area | 31 sq. ft. |
| Heating surface, total | 2,644 sq. ft. |
| Tank capacity | 5,000 gals. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Brake-beams | Monarch |
| Couplers | Tower |
| Headlights | Pyle-National |
| Injector | Monitor |
| Piston rod packing | U. S. Metallic |
| Valve rod packing | Garlock |
| Safety valve | Coale and Consolidated |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan |
| Steam gages | Ashcroft or Star. |
| Steam heat equipment | Safety |

## CAR BUILDING.

*The Grand Trunk* has asked prices on several classes of car equipment.

*The Cleveland, Cincinnati, Chicago & St. Louis* has ordered 25 cabooses from the American Car & Foundry Co.

*The Minneapolis, St. Paul & Sault Ste. Marie* has ordered 25 cabooses from the American Car & Foundry Co.

*The Central of New Jersey* has increased its order with the Standard Steel Car Co. from 1,000 to 2,000 box cars.

*The Delaware & Hudson* has ordered from the American Car & Foundry Co. 400 flat cars, 100 produce cars, 20 refrigerator cars and 100 stock cars.

*The Chicago, Milwaukee & St. Paul* has asked for space with the car builders for about 40 passenger equipment cars, including 25 coaches in the lot.

*The Philippine Railways Company* has ordered 50 dump cars from the Continental Car & Equipment Company. Address, care of J. G. White & Co., New York.

*The Chicago, Lake Shore & Eastern* has ordered from the American Car & Foundry Co. for the Elgin, Joliet & Eastern 225 side dump cars, 300 steel underframe gondolas and 150 steel underframe side dump gondolas.

*The Georgia Coast & Piedmont* has ordered from the American Car & Foundry Co. twenty 34-ft. box cars of 60,000 lbs. capacity, and 100 36-ft. flat cars of 60,000 lbs. capacity. The bodies and underframes of all cars will be of wood.

*The St. Louis & San Francisco* has ordered for the Colorado Southern, New Orleans & Texas Pacific 500 steel underframe 40-ft. box cars, 250 steel underframe flat cars and 75 tank cars from the American Car & Foundry Co., for March to May, 1907, delivery.

*The Marquette & Southeastern* has ordered 100 steel ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co., for April, 1907, delivery. These cars will weigh 33,000 lbs. and measure 22 ft. long, 8 ft. 6 in. wide and 9 ft. 9 in. high, over all. The special equipment includes:

| | |
|---|---|
| Brakes | Westinghouse |
| Draft rigging | Westinghouse |

*The New York Central Lines* have ordered 4,000 box cars from the Pullman Co.; 2,000 box cars, 3,000 coal cars and 2,050 flat cars from the American Car & Foundry Co.; 4,350 coal

cars from the Standard Steel Car Co., 1,000 steel coal cars from the Barney & Smith Car Co., and 650 ballast cars from the Rodger Ballast Car Co.

*The Colorado Southern, New Orleans & Pacific* has ordered 200 steel underframe ballast cars of 100,000 lbs. capacity from the Rodger Ballast Car Co., to be built by the American Car & Foundry Co., for March to May, 1907, delivery; and twelve 70-ft. coaches, four 70-ft. baggage and mail cars and four 60-ft. baggage cars from the Pullman Co., for January and February, 1907, delivery. Orders for 20 cabooses are still pending.

*The Northern Electric Company*, Chico, Cal., has ordered two passenger and two combination passenger and express cars from the Niles Car & Manufacturing Co. All cars will be 56 ft. long, 9 ft. ¼ in. wide and 12 ft. 11 in. high, over all. The special equipment for both includes:

| | |
|---|---|
| Brakes | Westinghouse |
| Couplers | Gould |
| Curtain fixtures | Curtain Supply Co. |
| Curtain material | Pantasote |
| Draft rigging | Gould |
| Heating system | Gold |
| Journal box s | Symington |
| Light | Anderson & Smith |
| Trucks | Baldwin |
| Wheels | Schoen steel tired |

*The Delaware, Lackawanna & Western* is building at its Scranton shops 300 box cars of 60,000 lbs. capacity, for February and March delivery. These cars will weigh 35,000 lbs. and will measure 40 ft. 1 in. long, 9 ft. 7 in. wide and 13 ft. 7 in. high, over all, and 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. They will have wooden bodies and steel underframes. The special equipment includes:

| | |
|---|---|
| Bolsters | Body, Commonwealth; truck, Simplex |
| Brake-beams | Pennsylvania |
| Brake-shoes | Lappin |
| Brakes | Westinghouse |
| Brasses | Magnus |
| Couplers | Gould |
| Door fastenings | "Positive" |
| Doors | Climax fixtures |
| Draft rigging | Miner tandem |
| Paint | Sherwin, Williams & Co. |
| Springs | Simplex Railway Appliance Co. |
| Trucks | Arch bar, Barber Roller Bearing |

*The Pennsylvania* has ordered for the Lines East of Pittsburg 4,000 all steel hopper, class GLA, gondolas, and 1,000 steel underframe, class GR, gondolas, with wooden bodies, from the Pressed Steel Car Co.; 2,800 class GLA gondolas from the Cambria Steel Co., and 1,000 all steel class GSD gondolas from the Standard Steel Car Co. For the Lines West of Pittsburg the company has ordered 1,000 class GR gondolas with steel underframes and wooden bodies, 930 class XL box cars with steel underframes and wooden bodies, and 400 class FM flat cars with steel underframes from the Pressed Steel Car Co.; 300 all steel class GSD gondolas with cork racks, and 785 class GSD all steel gondolas without cork racks from the Standard Steel Car Co. This is a total of 12,215 cars, and an order for 200 additional cars will be placed shortly. All cars are of 100,000 lbs. capacity, and deliveries are to be made between March and November, 1907.

*The Duluth & Iron Range*, as reported in our issue of August 3, has ordered 400 hopper bottom steel ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co., for April, 1907, delivery. These cars will weigh 32,000 lbs. and measure 20 ft. 4 in. long, 8 ft. wide and 9 ft. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | Simplex |
| Brake-beams | Pressed Steel Car Co. |
| Brake-shoes | Streeter |
| Brakes | Westinghouse |
| Couplers | (300 cars) Latrobe; (50) Major; (50) Climax |
| Draft rigging | (300 cars) Westinghouse; (50 cars) Sessions; (25 cars) McCord; (25 cars) Waugh |
| Dust guards | Franklin |
| Journal boxes | McCord |
| Paint | Illinois Steel Co. |
| Springs | Pittsburg Spring & Steel Co. |
| Trucks | (300 cars) Pressed Steel Car Co.; (100 cars) Andrews |
| Wheels | (300 cars) Griffin; (50 cars) Schoen; (50 cars) Davis |

## RAILROAD STRUCTURES.

ASHTABULA, OHIO.—The Pennsylvania has given a contract to the Pittsburg Construction Co. for its new No. 10 dock at Ashtabula, Ohio. This dock is to be 800 ft. long, and about 400 ft. wide. Modern ore and coal handling machinery are to be put in on the concrete foundation.

BRANDON, MANITOBA.—The Canadian Northern has bought land on Ninth street, directly north of its present terminal, as a site for its new station.

CHARLOTTETOWN, P. E. I.—The Department of Railways and Canals, Ottawa, will shortly call for bids for railroad shops to be built at this place.

CORNELIA, GA.—The Southern, it is said, will put up a new passenger station here.

KANANASKIS, B. C.—The Canadian Pacific is putting in several new steel bridges here.

LONG BEACH, CAL.—The Southern Pacific has begun the construction of a new passenger station 30 ft. x 66 ft.

LOS ANGELES, CAL.—The Southern Pacific has completed plans for a new shop, two story brick structure, with steel roof trusses, 115 ft. x 88 ft.

MEDINA, N. Y.—Plans, it is said, are under way to build a brick or stone passenger station.

MENOMINEE, MICH.—It is said that the Chicago & North-Western will put up a new passenger station here next year.

MONTREAL, QUE.—Announcement is made by the Canadian Pacific that it will build a large car and locomotive shop here.

PITTSBURG, PA.—Work, it is said, will soon be started by the B. & O. on a new terminal station here.

PORT ARTHUR, ONT.—A steel highway and street railroad bridge is to be built at the foot of Arthur street over the Kaministiquia river, with a substructure of concrete and stone, to cost $141,000. Bids are to be called for at once. H. Sydney Hancock is City Engineer, and Jas. McTeigue, City Clerk.

SALAMANCA, N. Y.—The Erie, it is said, will make extensive improvements, to include a new freight house, transfer platform and change of tracks, at a cost of $75,000.

SAN DIEGO, CAL.—The Santa Fe will double the present size of its wharves and warehouses at this place in preparation, it is said, for the increase of business expected after the opening of Tehuantepec Railway and the calling three times a month of the steamers of the American-Hawaiian line which run to the isthmus of Tehuantepec.

SEDALIA, MO.—The Missouri, Kansas & Texas paint shop, with 11 cars, including the private car of A. A. Allen, Vice-President and General Manager, were destroyed by fire September 18; loss about $100,000.

TOPEKA, KAN.—Announcement is made that the Atchison, Topeka & Santa Fe will make this place the manufacturing center of its system, and in addition to the new shops recently put up will put up some large additional ones, for which 11 acres of ground have recently been bought as a site.

TORONTO, ONT.—A steel and concrete bridge for highway and street railroad is to be built at the foot of Bay street, to cost about $200,000, in connection with the new Union Station. C. Rust is City Engineer.

WEST MILWAUKEE, WIS.—The Chicago, Milwaukee & St. Paul is to expend $300,000 in enlarging and improving its shops.

WATERVILLE, ME.—The Maine Central has given a contract to H. Burinton & Co. for building an extension to its repair shops here. An addition is also to be made to the roundhouse.

WINNIPEG, MAN.—Bids are wanted by J. G. Latimer, Chairman of the Committee on Works, Oct. 16, for the stone and concrete substructure, and on Nov. 20 for the steel superstructure of a combined highway and street railroad bridge to be built over the Red river between this place and St. Boniface, to cost $175,000. Col. Ruttan is the engineer in charge, and C. J. Brown, City Clerk.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ALABAMA CITY, GADSDEN & ATTALLA (ELECTRIC).—A meeting of the stockholders of this street railway in Birmingham has been called for October 15th, to consider the question of issuing $300,000 of first mortgage bonds to buy new equipment and to extend the line. The question of building a line from Gadsden about seven miles long to Noccalula Falls is under consideration.

BROWNSVILLE, HIDALGO & NORTHERN.—This company, it is said, will probably let contracts soon for building its proposed line from Brazos Santiago, Tex., west via Brownsville to Hidalgo, 84 miles. Surveys have been completed and nearly all the right of way secured. Grading work will be heavy. (See Construction Record.)

BUFFALO, ROCHESTER & PITTSBURG.—Estimates have been completed by this company for double-tracking its line from Punxsutawney south to Indiana, Pa., 37 miles. As soon as the bids are received and acted upon work will be started.

CAIRO & THEBES.—Organization has been completed of the Cairo Construction & Dredging Co., of which J. B. Magee is President, and which has a contract for work on this line. The company is to do 30,000 cubic yards of earth filling for the Cairo Terminal, and as the railroad has about 1,000,000 yards to do, the company

expects to secure large additional contracts upon the completion of the first one. The work includes the pumping of sand from the Mississippi river into the City of Cairo. Part of this will have to be done through a pipe a mile long. (July 13, p. 10.)

Canadian Pacific.—This company, as shown by its annual report just issued, has 924 miles of road under construction divided as follows:

ONTARIO DIVISION.

*Toronto-Sudbury line*, Bolton to Romford, 226 miles.

*Guelph & Goderich*, Guelph to Goderich, 80 miles.

CENTRAL DIVISION.

*Pheasant Hills branch*, Strassburg north 40 miles; Saskatoon east 40 miles; Sakatoon west 156 miles.

*Wolsley branch*, Wolsley to Reston, 122.4 miles.

*West Selkirk branch*, Winnipeg Beach to Gimli, 9.3 miles.

*Stonewall branch*, Teulon, north 20 miles.

*Moosejaw branch*, Moosejaw, northwest 50 miles.

*Souris branch*, Lauder, east six miles; Lauder to Jackson Creek, 27 miles.

*Manitoba & North-Western, Yorkton extension*, Sheho, northwest 37 miles.

*Bredenburg branch*, Bredenburg, south one mile.

WESTERN DIVISION.

*Crows Nest Pass line, Yahk branch*, Yahk to boundary, 8.3 miles.

*Calgary & Edmonton*, Wetaskiwin extension, 48.5 miles; Lacombe extension, 50 miles.

PACIFIC DIVISION.

*Columbia & Western*, Midway, west 2.2 miles.

Many of the branch lines are nearing completion. The Guelph & Goderich is about finished. Work on the Toronto & Sudbury is well advanced. The branch from Wolsley to Reston will be finished this autumn. Grading is being done in both directions between Sheho, Strassburg and Wetaskewin to connect with the Manitoba & Northwestern line. The Calgary & Edmonton will build the expensive bridge over the Saskatchewan river according to the terms of the agreement made some time ago. A new line is to be built from Peterboro, on the Ontario & Quebec Division, to Victoria Harbor, 96 miles. By this route the distance from Montreal to Georgian bay will be 358 miles as against 449 miles by the present Owen Sound route, and the grades will be much more favorable. The company will enter into an arrangement with the Georgian Bay & Seaboard Railway to construct this line and to lease it to the Canadian Pacific for 999 years.

The shareholders are to authorize the issue of 4 per cent. bonds to provide funds for building branch lines, and to sanction the lease of the Walkerton & Lucknow Railway, extending from Proton, on the Toronto, Grey & Bruce line, to Walkerton, Ont., about 37 miles.

The company will begin work this fall on a branch from Fleshberton to Southampton, Ont.

Carolina Mineral.—The first section of this line, from the Seaboard Air Line to the property of the Colosses Gold Mining & Milling Co., is reported as likely to be ready for operation next month. Contracts for the remainder of the line, which is to have a total length of about 40 miles, from Lancaster, S. C., to Charlotte, N. C., are to be let next year. Surveys are being made and right of way secured. (Sept. 7, p. 62.)

Chicago & Illinois Western.—This company, which operates 17 miles of line from Chicago southwest, has made surveys and secured right of way for 37 miles additional, and will soon build an extension southwest via Desplaines to Joliet.

Chicago & North-Western.—This company has opened for traffic the extension of the Wyoming & Northwestern from Shoshone to Arapahoe, 45.02 miles. Arapahoe is about 18 miles east of Lander, the proposed western terminus of the road. There are six stations on this extension, Shoshone, Minifield, Wahaba, Walsworth, Arapahoe and Alto.

Chicago, Milwaukee & St. Paul.—In the report of this company for the year ending June 30, 1906, the statement of President A. J. Earling in part is as follows: New lines include an extension from Chamberlin to Rapid City, S. Dak., 219 miles, of which 76 miles were completed at the close of this year. The line from Madison to Renner, S. Dak., now under construction, and which is to be 34 miles long, has been completed for about 19 miles. About 21 miles have been finished on the extension of the Armour branch to Stickney, S. Dak. On the Gleason branch, in Wisconsin, about six miles were completed. The company also bought a line running from Oglesby to Granville, in Illinois, 11 miles. A second main track is now being built on the La Crosse division from Watertown Junction to Portage, Wis., 47 miles; also on the River division from River Junction to Richmond, Minn., 10 miles; and from Lake City to Wabasha, Minn., 12.50 miles. Grades are being reduced, the alinement changed at various points on the Chicago & Council Bluffs divisions in Iowa; also on the Chicago & Milwaukee division and the River division. Work is practically completed elevating the tracks used jointly with the Pittsburg, Cincinnati, Chicago & St. Louis from Western avenue, Chicago, to Elizabeth street, and also the tracks of the company between Western avenue and Grand avenue. At Escanaba an additional ore dock 1,440 ft. long has been completed. Improvements were also made to shops during the year at an aggregate cost of $414,661. No mention was made in the report of the Pacific coast extension.

It is understood that the engineering department has decided to adopt a line through the Bitter Root mountains at Saltese, Mont., to reach the Spokane district. Preliminary surveys show a 2 per cent. grade, but this will be reduced, and the curvatures will be less than 10 deg. The Northern Pacific goes over this summit at an elevation of 4,900 ft., but the Milwaukee makes a tunnel at 4,050 ft. The line is to run in the St. Joe valley, southeast of Spokane.

Chicago, St. Paul, Minneapolis & Omaha.—The report of this company for the year ending June 30, 1906, shows that the company is extending the Hartington branch in a northwest direction from Hartington, Neb., to Crofton, 15.33 miles. This work is to be completed during the present year.

On the line from St. Paul to Duluth the company has laid a second track from Spooner north to Superior Junction (now Trego) about five miles. Second track work is also in progress from the passenger station at Duluth, Minn., to the St. Paul River bridge, 1.83 miles; from Merrillan to Augusta, Wis., 22.10 miles, and between east St. Paul and the new yard at Harvester Works, 3.20 miles, two additional main tracks for freight service are being put in. The company has completed a new yard north of Plymouth avenue, Minneapolis, and work is now in progress on a new freight yard near the Harvester Works, at St. Paul. Of the change of line mentioned in the last report, the company has completed and put in operation that between Roberts and Hammond, Wis.; that through Lake Crystal, Minn.; between Bingham Lake and Windom, Minn.; on a section west of Carnes, Iowa, and expects to complete before the close of this year between Ottawa and St. Peter, Minn., and at Minneopa, Minn. Work has been commenced on a change of line between Minneopa and Lake Crystal, where the change is to be 1.37 miles in length and will reduce the curvature 49 deg., 44 min. New stations were put up at Northline and Menomonie City, Sarona, Arnold, Haywood and Eagle Point, Wis.; Mendota, Minn., and at Lyons, Neb. A pile dock 1,002 ft. long is under construction at Itasca, Wis. The length of wooden bridging has been decreased 1,579 ft. as follows: By filling 483 ft., by putting up steel bridges on masonry 80 ft., and by iron pipe culverts and filling 1,016 ft.

The net increase in the length of side and passing tracks was 10.16 miles, and old rails were replaced with new rails on 59.45 miles of track.

Colorado & Southern.—The report of this company for the year ending June 30, 1906, outlines a plan for reaching tidewater at Galveston, Tex., by buying and building as follows: Trinity & Brazos Valley from Cleburne, Tex., to Mexia, 79 miles. Extension of that road now in progress, which is to be completed in November, to Belt Junction near Houston, Tex., 157 miles; trackage rights for the same road over the Gulf, Colorado & Santa Fe from Fort Worth to Cleburne, 28 miles, and from Honston to Galveston, 53 miles; a total of 317 miles. This will provide the shortest through line between the Rocky Mountain section and tidewater. In addition to the above the Trinity & Brazos Valley is building a line from Teague, 14 miles southeast of Mexia, north to Waxahachie, 67 miles, which is to be finished by the first of next year. By a trackage contract over the Missouri, Kansas & Texas from Waxahachie to Dallas, 31 miles. This will make the shortest line from Dallas to Galveston, as well as the shortest line between Fort Worth and Galveston. The company during the year has secured the Colorado Springs & Cripple Creek District Railway, 75 miles, and the Fort Collins (Colorado) Development Railway, 16 miles. It has nearly completed negotiations on satisfactory terms to buy the Wichita Falls & Oklahoma, operating from Red River to Wichita Falls, Tex., 22 miles; also the Wichita Valley Railway, extending from Wichita Falls to Seymour, Tex., 53 miles. It is also intended to buy the following roads now under construction: Wichita Valley from Seymour, Tex., to Stamford, 60 miles, and the Abilene & Northern from Stamford to Abilene, 38 miles, a total of 173 miles. The company with all these lines will have approximately 2,250 miles of road, besides its half interest in the Colorado Midland, which operates 336 miles. A contract has been entered into with the Rock Island Co. whereby the latter has taken a half interest in the Trinity & Brazos Valley.

Denver & Rio Grande.—Contracts, it is said, are to be let by this company for double-tracking the line from Adobe, Colo., west to Cannon City, 12 miles; also from Adobe east to Swallows, 13 miles.

Eagle Valley.—President David Eccles, of the Sumpter Valley

and the Ogden & Northwestern, at Ogden, Utah, is quoted as saying he will take over the Eagle Valley project, promoted by W. L. Vinson, and build a line from Baker City, Oregon, east to the Snake river, 75 miles. It is said that Baker City has raised a bonus of $100,000.

ESSEX COUNTY TRACTION.—Incorporated in New York with $1,500,000 capital to build an electric line from Westport on Lake Champlain west to Newman, in Essex County, N. Y., 49 miles. The Directors include A. S. Washburn and N. C. Spencer, of Hartford, Conn.; W. L. Kiley and George S. Raley, of Glen Falls, and R. L. Trumbull, of Ausable, N. Y.

GRAND TRUNK PACIFIC.—The National Trans-Continental Railway Commission will shortly ask bids for the construction of about 200 miles of road east and west from Lake Abitibi, Ont.

GREAT NORTHERN.—See Portland & Seattle.
See Vancouver, Victoria & Eastern.

GREENWICH & JOHNSVILLE.—An officer writes that this company is extending its line from Greenwich, N. Y., northeast via Battenville and Center Falls to a connection with the Salem & Washington County branch of the Delaware & Hudson at Rexleigh, 10 miles. There are about 150 men and 40 teams now at work on the grading. Contracts for bridges and for concrete work have not yet been let. There are to be four or five steel bridges. The work is to be pushed to completion, so as to have the line in operation by January. The new line will be known as the Salem branch of the G. & J.

GURLEY & PAINTROCK VALLEY.—Organized in South Dakota with $15,000 capital by the Cleveland Coal & Iron Co., which has bought 30,000 acres of coal lands in the Paintrock Valley, Jackson county, Alabama, to build a line nine miles long from Gurley, along the route of the old Gurley & Paintrock Valley, surveyed and largely graded some time ago. George E. McNeil is President, and J. D. Austin, Secretary, Treasurer and General Manager, both of Chicago.

INTEROCEANIC.—The Teziutlan branch of this road is being extended from Teziutlan to the port of Nautla, which is about midway between Vera Cruz and Tuxpan, and said to be one of the best natural ports in Mexico.

KEYSTONE AIR LINE (ELECTRIC).—A charter has been applied for in Pennsylvania by a company under this name with $450,000 capital, for the proposed trunk line to be built by Joseph Ramsey, Jr., and associates across the state of Pennsylvania. The application states that the proposed Indiana, Clearfield & Eastern, to be 25 miles long in Indiana and Clearfield counties; the Allentown, Tamaqua & Ashland, 50 miles, in Lehigh and Schuylkill counties, and the Brush Creek & Crow's Run, 10 miles in Beaver county, have arranged to build extensions so that they will connect and form the through line. (See New York, Pittsburg & Chicago Air Line, Aug. 17, p. 45.)

LOUISVILLE & NASHVILLE.—An appropriation, it is said, has been made by this company to be used for straightening, double-tracking and leveling its main line for nine miles between Oxmoor and Helena, south of Birmingham, Ala. A contract is also reported let to W. J. Oliver, of Knoxville, Tenn., for work on 25 miles of road near Birmingham, Ala., between Hardy and Grace, to include a double-track tunnel.

MEXICAN ROADS.—We are told that a company is being organized to carry out the work under the concession recently granted to Gualterio C. Palmer, of Zacatecas, to build a line from Gutierrez west via Sombrerete Chaichihuites to Durango, about 190 miles. Contracts for grading, track laying, etc., are to be let about Jan. 1, 1907. The work will be light; maximum grades will be 1½ per cent., with 5 deg. curves. There are to be 10 to 15 bridges but no tunnels.

MISSOURI, ARKANSAS & SOUTHWESTERN.—This company has completed surveys and secured right of way for 30 miles of the line which it is building from Batesville, Ark., on the St. Louis, Iron Mountan & Southern, northeast to Black Rock, on the St. Louis & San Francisco, 52 miles. B. I. Brookfield, of Jonesville, Ark., is Chief Engineer.

NORFOLK & WESTERN.—The new lines, extensions and work under way by this company, according to its yearly report, include the following: Blackstone & Sunenburg, south from Blackstone, Va., 5.75 miles to lumber mills on the south side of Nottoway river; to be put in operation next month. The Speedwell extension, 5.28 miles, a branch of the North Carolina extension, has been completed. This extension is now 16.41 miles long, extending from Ivanhoe, Va., to the large iron deposits at Speedwell and Cripple Creek. The construction of 3.70 miles of the Pocahontas & Western from Pocahontas, Va., up Laurel Creek has been completed this year, and the construction of 4.50 miles is to be carried out later. The Clear Fork branch from Gordon, W. Va., south has been extended 1.27 miles, and is now 11.20 miles long. The final revisions along the Guyandot and Tug rivers have been completed from the mouth of Pinnacle Creek on the Guyandot river to the mouth of Gilbert creek on the same river, thence to the west terminus of the line at Wharncliffe, W. Va. The Big Stony Railway, which is operated independently, 10.68 miles long, extending from Ripplemead, Va., to Interior, is to build an extension from the latter point to the West Virginia state line, 6.25 miles, and the Interior & West Virginia is authorized to build a line from the terminus of the above extension of the Big Stony through Monroe County to the Virginia state line, 17.55 miles. The Virginia & Potts Creek is authorized to build from the terminus of the Interior & West Virginia down the Valley of Potts Creek through Craig County, Va., to Potts Creek, in Alleghany County, 11.15 miles. The building of the above would enable the N. & W. to reach extensive ore deposits in the Potts Valley by building a connection with the Big Stony, which would furnish supplies for the Virginia furnaces along its line. The Big Creek branch near Richlands, Va., has been extended 1.18 miles to a new coal field, and is now 7.08 miles long. The Lick Fork branch, 0.92 miles long from a point east of Thacker to the Red Jacket Consolidated Coal mines, has been acquired by the N. & W. and extended, its present length being 2.79 miles. The Iaeger & Southern, which is controlled by the N. & W., and is now operated as the Dry Fork branch, was extended 23.21 miles up Dry Fork, and now has a total of 28.11 miles. This line was put in operation last April to Berwind. A further extension up Dry Fork to the upper plant of the New River & Pocahontas Consolidated Coal Co., with new yard facilities, is under construction. On the Big Sandy low grade line the permanent arching of tunnels, and the construction of stone arch masonry has been finished.

The report shows that the following work has been authorized and is now under construction: Forest branch, 7.60 miles; Concord branch, 14.52 miles from the Durham line, and a revision line with second track from Forest to Montvale, 26.60 miles. These two lines are to furnish a low grade line from Concord to Forest, and will be operated in connection with the existing line as a double-track between these points. The company is also carrying out the revision of its line with second track from Eggleston to Pembrook, six miles, which includes three tunnels, and from Welch to Davy, 7.20 miles, nearly completed. Second track from Davy to Claren, three miles; from Wilmore to Iaeger, 4.10 miles, and from east Ironton to Hanging Rock, 5.60 miles. Work is also well advanced on the storage and assembling yards at South Norfolk, as also on extensive enlargements of the yards at Roanoke, Bloomfield and Williamson. Extensive additions are to be made to the Roanoke and Portsmith shops in both the locomotive and car departments. The company is also considering improvements, which have not yet been started, including the continuation of the double-track system between Walton and Pearisburg, aggregating 18.79 miles, and the costly and heavy work, to include many tunnels, from Vivian to Thacker, between which places 50.40 miles of line are to be revised and double-tracked. On the completion of the above, the company will have a continuous double-track with easy grades and curves from Concord, Va., to Kenova, W. Va., 377 miles. A large number of additional passing tracks at various points, new equipment and further enlargements of the shops at Roanoke, Bloomfield and Portsmith are also included.

NORTHERN PACIFIC.—The new second main track from Mapleton, N. Dak., west to Casselton, seven miles, is now in use. It is expected that the line from Mapleton east to Haggart, six miles, will be finished this month, completing the double track from Fargo west to Casselton.

OPELOUSAS, GULF & NORTH EASTERN.—See Texas & Pacific.

OREGON RAILROAD & NAVIGATION.—Official announcement is made that the new line between Riparia and Lewiston, Ida., will be opened Jan. 1, 1907.

PENNSYLVANIA.—A contract is reported let by this company to D. F. Keenan, of Philadelphia, for building an extension of the Monongahela & Washington division from Ellsworth to a point on Daniel's Run, 10 miles. The work will be unusually heavy and calls for the excavation of about 1,000,000 cubic yards of earth and the building of 70,000 cubic yards of complete masonry. The work, it is said, will cover a period of two years.

Announcement is made that the Philadelphia & Erie division is to be double tracked between Wilkesbarre and Sunbury, 64 miles.

PORTLAND & SEATTLE.—This line, which is being built jointly by the Northern Pacific and the Great Northern, is not to cross the Spokane river east of Spokane, but will continue to follow the 2,000 ft. elevation and connect with the Northern Pacific main line at Trent, north of the river.

QUEBEC BRIDGE & RAILWAY.—At the annual meeting of this company Sept. 4, the Engineer's report showed that the bridge across the St. Lawrence river extends from the south shore abutment to a point about 200 ft. beyond the main pier, a total distance of

about 200 ft. Wharves are being built on the north shore for the reception of material for the false work and traveler. These fixtures used at present on the south shore, are to be removed this fall after the cantilever arm is erected.

Sacramento Valley & Eastern.—This company is to build a line from a point near Kennett, Cal., along Pit river to Squaw creek, and thence 16 miles to copper mines. The work will be through a rocky section, and will include a good deal of heavy side hill cutting. F. J. Dearborn, of Winthrop, Cal., is Chief Engineer.

Southern.—Announcement is made by this company that contracts are to be let for the construction of a line from Pineville, Ky., northeast to Harlan, 25 miles. Surveys were made about a year ago.

Southern Pacific.—A press despatch from San Bernardino says that the Southern Pacific has now decided to at once rebuild its line in the Salton Sink for about 50 miles, and on a grade 30 ft. higher than the present line; thus, it is believed, putting the railroad forever out of danger from the rising waters of the "sea" which is being formed by the overflow of Colorado river. Many gangs of men have already been put at work on the grading of the new line.

Temiskaming & Northern Ontario.—Bids are wanted October 2 by H. W. Pearson, Secretary of the Commission which manages this road for the Ontario Government (25 Toronto street, Toronto, Ont.), for grading three branch lines as follows: From the main line near Cobalt to the Kerr Lake region, four miles; from the main line to a point near Haileyburg Wharf, 1.75 miles, and from the main line near Englehart to Charleton, eight miles.

An additional 25 miles of this road has been completed and will be opened on Oct. 1.

Texas & Pacific.—This company guarantees the bonds secured by the $5,000,000 mortgage made last spring with the Mercantile Trust Co. of New York, as trustees, of the Opelousas, Gulf & North Eastern. This road is projected to run from Opelousas, La., northeast to a point near the Mississippi river and southwesterly from Opelousas to the Gulf of Mexico. It is now under construction from Melville to Crowley, 60 miles.

Union Pacific.—For the Washington & Northern, which this company is to build from Portland, Ore., north to Tacoma, Wash., bids are now being asked. The contracts are to be let in sections, and will call for the completion of the work by Jan. 1, 1908. The line has been definitely located from Kelso north of the Columbia river north to Chehalis. Between the latter place and Tacoma alternative surveys have been made, and a definite location will soon be made. The line will generally follow the Northern Pacific between Vancouver and Tacoma, and will cross that company's road several times.

Vancouver, Victoria & Eastern.—The work on this line presents one of the most difficult pieces of railroad building in the Pacific northwest. There is a fall of more than 2,800 ft. in nine miles. Midway, north of Spokane, has an elevation of 2,000 ft. above the sea level; Molson, Wash., at the summit of the mountain, is 3,703 ft., and Oroville, Wash., 900 ft. The distance between Oroville and Molson is nine miles air line, but it has been found necessary to build 27 miles of line to connect the two towns. Work on the Similkameen valley extension will begin about the middle of October.

Washington & Northern.—See Union Pacific.

Washington, Baltimore & Annapolis (Electric).—This company, which is building an electric line from Baltimore to Washington, 31 miles, with a branch to Annapolis, 14½ miles, has completed grading for half the distance and proposes to secure an entrance into Baltimore through the Baltimore Terminal Co., incorporated in Maryland with a capital of $1,500,000. The terminal company is building a line from a junction with the proposed line of the W., B. & A. near Clifford Junction north to Baltimore. The terminal company has secured a franchise in the city and nearly all the necessary right of way. It will build four and a half miles of double track, two and a half of which will be within the city limits. It is expected that both projects will be completed and the lines in operation by July of next year.

Western Pacific.—This company has filed with the Board of Supervisors plans showing the exact route proposed to be followed within the city limits of San Francisco. The road will enter the city at the intersection of Twenty-fifth and Water Front streets, and run in a generally northeasterly direction through the Potrero Hills, terminating at Ninth and Bryant streets, where its main passenger station is to be situated. Near Nineteenth street and Arkansas the line runs through a tunnel and passes through the Potrero hills for 10 blocks, emerging in block 299 just after passing beneath Mississippi street.

The tracks of this company in Utah have been extended 51 miles to the westward from Salt Lake City, and construction is progressing steadily. As a result of new surveys it has been decided to reduce the length of the proposed tunnel through the Pequop range in Nevada from 12,000 ft. to 6,500 ft. The contract for the construction of the tunnel is expected to be let soon.

Wise Terminal.—This company, which operates six miles of road in Virginia, is making surveys for extending the line north from Glamorgan, Wise County, to the Kentucky state line, about 15 miles. (See Construction Record.)

Wyoming & North-Western.—See Chicago & North-Western.

## RAILROAD CORPORATION NEWS.

Chicago Union Traction.—See Northern Chicago Street Railroad.

Cleveland, Akron & Columbus.—This company, which is controlled by the Pennsylvania Company, has declared a semi-annual dividend of 1½ per cent. on its $4,000,000 capital stock. The previous rate has been 2 per cent. annually.

Grand Trunk Western.—It is said that this company will pay, out of its earnings of the fiscal year ending June 30, 1906, the full interest on its $1,500,000 second mortgage 4 per cent. income bonds, on which only 1 per cent. was paid from the earnings of the previous year.

Interborough Rapid Transit.—The New York State Railroad Commission has given the Manhattan Railway permission to issue $1,800,000 additional capital stock for construction and equipment, making $60,000,000 outstanding, this being the total amount authorized. The company owns all the elevated railroads, 38 miles of main line, in the boroughs of Manhattan and the Bronx, New York City, and the road is leased to the Interborough Rapid Transit, which guarantees 7 per cent. annual dividends on the stock.

The New York & Queens County, which operates 40 miles of main line electric road in and about Long Island City, N. Y., and whose entire capital stock is owned by the Interborough Rapid Transit, has been given permission to make a mortgage for $10,000,000, of which $8,000,000 can be issued now. Of this latter amount, $2,000,000 is for refunding existing mortgages, and the remainder is for building a new power house, equipment and the rebuilding of part of the road. There is already outstanding $3,000,000 in bonds of various kinds.

Kansas City Southern.—This company has issued $600,000 series "B" 4½ per cent. equipment notes payable in 20 semi-annual instalments, beginning December, 1906. The New York Trust Company is trustee, and the notes are secured on 15 consolidation locomotives, 200 steel gondolas, 100 tank cars and 10 cabooses.

Manhattan Railway.—See Interborough Rapid Transit.

Maricopa, Phoenix & Salt River Valley.—A judgment of foreclosure has been rendered against this company for the $771,178 due on the $540,000 6 per cent. and the $78,000 5 per cent. bonds. The company operates 36 miles of road from Maricopa, Ariz., to Phoenix, and a seven mile branch from Tempe to Mesa. The $1,000,000 capital stock is all owned by the Southern Pacific Company.

New York & Queens County (Electric).—See Interborough Rapid Transit.

Norfolk & Southern.—A special meeting of the stockholders has been called for October 16th to vote upon a proposition to increase the capital stock from $2,000,000 to $3,000,000, and to authorize additional increases from time to time as may be required.

Northern Chicago Street Railroad.—A bondholders' committee consisting of N. W. Harris, D. M. Cummings, A. B. Forbes, A. K. Boisot and G. P. Hoover has been appointed to protect the interests of the holders of the 4½ per cent. refunding gold bonds of this company.

Pennsylvania Company.—See Cleveland, Akron & Columbus.

Portland & Rumford Falls.—Gross earnings for the year ended June 30, 1906, were $690,813, an increase of $32,150; net earnings $330,470, an increase of $49,767. Surplus after dividends and charges $116,376, an increase of $12,370.

Southern Pacific.—See Maricopa, Phoenix & Salt River Valley.

Toledo, Peoria & Western.—The gross earnings for the year ended June 30, 1906, were $1,293,394, an increase of $11,951; net earnings, $206,569, an increase of $2,167. Deficit after charges $21,642, a decrease of $11,230.

Wiscasset, Waterville & Farmingham.—The foreclosure sale of this company's 42 mile narrow gage road from Wiscasset, Me., to Albion, has been postponed until October 24, 1906. It has been in the hands of a receiver since Oct. 7, 1905.

# GENERAL NEWS SECTION

## NOTES.

The Southern Pacific has contracted with the Atlantic De Forest Wireless Company for wireless telegraph equipment for its new steamships "Momus," "Antilles" and "Creole."

The new ferry house of the Delaware, Lackawanna & Western at West 23d street, New York City, taking the place of the one that was destroyed by fire last December, was opened on October 1.

The conductors of the Norfolk & Western say that as a result of a conference between the officers of the road and the Order of Railway Conductors, the wages of this class of employees on that road are to be substantially increased.

According to a Cleveland paper, prominent interurban electric railways are going to ask the Interstate Commerce Commission to take full jurisdiction over them, as carriers of interstate traffic, this for the purpose of assuring themselves full privileges in the way of connections with steam railroads, where such may be desired.

As a result of joint action of the Trunk Lines, the published special import rates will only be applied on traffic coming from foreign ports into the United States and delivered to the carriers direct from the shipside or dock of the vessels bringing such freight or on traffic received by the carrier direct from the customs bonded warehouse.

The *Montreal Gazette* says that the Canadian Pacific makes the announcement, never before made by a railroad company, that it will henceforth assume the responsibility for all loss by fire which may happen to freight carried over its lines; that is to say, will assume the cost of fire insurance, which covers all fire losses except those due to invasion, insurrection, riot, etc.

It is officially announced at Washington that since January 1 a total of $283,076 has been collected by the Government from railroads granting rebates or conspiring to give rebates, this being exclusive of the money collected for violations of the safety appliance law. Over two hundred of the latter cases were filed, and in most of them the railroads went into court and confessed judgment.

A press despatch from Memphis says that since the revised Interstate Commerce law went into effect shipments of export cotton from that city have entirely ceased on all of the lines except those to New Orleans; but that now that the Interstate Commission has given permission for the continuance until November 1 of substantially the former practices, all of the shippers will rush large quantities to the Atlantic seaboard, as well as to the Gulf coast, so as to have their orders well cleaned up by the first of November, when the temporary permissive ruling of the Commission expires. The same press despatch says that the lumber exporters are complaining that the question of export rates on lumber was presented to the Commission by some unauthorized person and without consulting those actually interested most in the lumber trade.

By the furious hurricane and tidal wave which prevailed on the coast of the Gulf of Mexico, September 28, scores of large steamers were driven ashore and many of them wrecked, and innumerable buildings were blown down and otherwise damaged. In both Mobile and Pensacola the losses are estimated in millions. Press despatches said that the line of the Louisville & Nashville, between Mobile and New Orleans, was so badly damaged that it would be at least two weeks before it could be opened for business. The large wharves of this road at Pensacola were badly damaged, and on the Pensacola & Atlantic division of the road the track was badly washed out for 30 miles. A number of cars were destroyed and two engines damaged. A press despatch of October 2 from Mobile says that all railroads had been put in operation except the New Orleans division of the Louisville & Nashville, and that business conditions were almost normal. Street cars were running on all lines except the interurban roads, which are not likely to be repaired for some time. The Louisville & Nashville sent north a number of freight trains. An enormous amount of work has been done in restoring this line.

### Wilkinsburg and Jones.

W. R. Jones, engineer of the Pennsylvania Limited on the Pennsylvania Railroad, was before Burgess Arthur Stuart of Wilkinsburg (Pa.) again on Monday (October 1), charged with violating an ordinance by running his train through the borough at a speed which Chief of Police Doran declares was a mile in 55 seconds. In spite of his plea of not guilty he was fined $25 and costs. This was paid, but Jones's attorney took a transcript of the case. This is the third time Jones has been arrested and fined, but the speed of the limited through the borough is undiminished. Each day a policeman with a stop watch takes the time of the limited as it goes through the town. The matter probably will be fought out in the courts. It is understood that just before reaching Williamsburg the fireman and the engineer change places in the cab, and the charge will be made that the wrong man has been fined.—*Press Despatch.*

### Further Regulations by the Interstate Commerce Commission.

Where a joint rate is in effect which is higher than the sum of the locals, such higher joint rate may, until December 31, 1906, be changed by reducing the same to the sum of such locals, but not otherwise, upon posting a tariff one day in advance * * *

Desire to meet the rates of a competing line which has given the full statutory notice of change will not of itself be regarded as good cause for allowing changes in rates on a notice of less than thirty days.

All interstate or other rates which are used in combination with interstate rates for interstate shipments must be posted and filed with the Commission, and can only be changed, as to such traffic, in accordance with the act.

*Party Rate Tickets.*—The tariffs and regulations governing the issuance and use of party rate tickets, together with the rules relating to the allowance of free baggage to persons using such tickets must be regularly filed and published. The privileges so extended must not be limited to any particular class or classes of persons, but must be open to all. Regulations governing issuance and use of party rate tickets must not be such as will operate to evade or nullify any provisions of the law. The Commission suggests that the rules should provide that the party shall travel on one ticket and consist of not less than ten persons. In special or emergency cases prompt consideration will be given to requests to change tariff rates governing party rate tickets on less than thirty days' notice, when such requests are accompanied with full information as to the conditions and necessities upon which they are based

### New Disk Signals on Canadian Pacific.

The double track of the Canadian Pacific between Montreal and Ste. Annes, 20.4 miles, is being extended to Vaudreuil, 23.7 miles from Montreal. The Hall automatic block signal system now in use (enclosed disks) from Montreal to Montreal Junction, 4.8 miles (put in about ten years ago), will be extended to Vaudreuil. The extension will consist of 20 double home and distant signals (both signals being on the same mast) and three single home and one distant signal, all of the disk type.

The blocks will vary in length from three-quarters of a mile to two miles and a quarter. The gravity batteries for the track circuits are to be set in chutes at the end of each block section. The signal batteries will be Gordon No. 5 cells. The battery wells will be built of concrete.

### More Prosecutions Under Safety Appliance Law.

Attorney-General Moody has directed that suits be brought against the following railroads to recover penalties for violation of the coupler and brake law through failure to keep their cars and engines in proper condition. The largest number of violations charged against any road is 51 against the Delaware & Hudson. Other roads charged with more than 10 are indicated below. The defendants are: Buffalo, Rochester & Pittsburg; Chicago & Alton; Chicago & North-Western; Colorado & Northwestern; Colorado & Southern; Chicago Great Western; Cincinnati, Hamilton & Dayton; Chicago, Milwaukee & St. Paul, 12; Chicago, Rock Island & Pacific, 18; Cleveland, Cincinnati, Chicago & St. Louis; Delaware & Hudson, 51; Denver & Rio Grande; Duluth, Missabe & Northern; Fort Worth & Denver City; Great Northern; International & Great Northern; Kansas City Southern; Minneapolis & St. Louis; Missouri Pacific; Northern Pacific; Pennsylvania Railroad; Reynoldsville & Falls Creek; Rio Grande Southern; Susquehanna, Bloomsburg & Berwick; St. Louis, Iron Mountain & Southern; Toledo, St. Louis & Western; Wabash Railroad, 35. The total number of violations is 181, number of roads 27.

### Passenger Service on the Trans-Siberian.

Passenger service has been resumed by the Trans-Siberian route, first by one weekly express, and, since July 6, by a second. Travellers can now make the journey from Vladivostok to Moscow in 11½ days, with one change of cars, at Irkutsk. Trains leave Vladivostok on Mondays and Fridays at 8.03 a.m., connecting with the weekly mail steamers of the Russian East Asiatic Co. from Japan and China. Comfortable accommodations can be had with both first and second-class cars, the former being divided into compartments of two berths, while in the second-class compartments there are four berths. In the dining car attached to each train a table d'hote dinner is served in the middle of the day for about 77 cents; in the morning and evening meals may be ordered by the card. Fifty-four pounds of baggage can be checked free of charge by either first or second-class passengers. For excess baggage the charge is $1.38 per 9 lbs. to Moscow, and $1.42 to St. Petersburg. Very large valises, etc., can be carried in the sleeping cars, numerous racks being provided in the corridors and elsewhere in which they can be kept out of the way. The baggage of western-bound passengers is examined at the station "Manchuria," and that of eastbound passengers at Pogranichnaya, or, if desired, at Vladivostok. Hitherto these examinations have caused little inconvenience.

## TRADE CATALOGUES.

*Mail Crane.*—The Barker Mail Crane Co., Clinton, Iowa, sends an interesting pamphlet describing its mail crane. The front cover has an engraving from a photograph of the Chicago & North-Western "Colorado Special" catching a pouch at 65 m.p.h., the view being taken after the removal of the pouch but before the crane arms had time to fall. Inside the pamphlet are four photographic views showing how a pouch is placed on the crane. The construction and operation of the crane are described, its advantages enumerated, and a number of testimonial letter, from railroad officers and men who are using the cranes given.

*Gulf Coast Line Magazine.*—The 1906 summer number (No. 2, Vol. II.) of this quarterly magazine of the St. Louis, Brownsville & Mexico has just been issued. It is the best number yet issued; a most creditable piece of magazine work. The frontispiece is a fine colored half-tone of "The Maid of La Puerta." The 112 pages are filled with articles of historical and agricultural interest concerning the "Gulf Coast Line" country, and there are numerous full page half-tone engravings in illustration. The leading articles are: "The Irish Progenitors of Texas"; "And Nothing But the Truth"; "San Patricio and Refugio Counties"; "Agricultural Education in Public Schools"; "What I Have Accomplished—the Achievements of a Pioneer Rio Grande Farmer"; "The Dawn of Texas History"; "Some Texas Statistics." Interesting editorial comment fills the last 20 pages.

*Sand Blast Apparatus.*—A small pamphlet bearing the title "Sandcraft" describes the operation and use of the injector sand blast apparatus made by C. Drucklieb, New York. This apparatus is adapted to all purposes where sand blasting is required, such as in cleaning castings, renovating stone buildings and the cleaning of structural and other steel work preparatory to painting. A table which gives the number of cubic feet of free air per minute required for its operation with various diameters of nozzles is also given.

*Locomotives, Cars, Rails, Etc.*—The rail and equipment department of the Walter A. Zelnicker Supply Co., St. Louis, Mo., sends a circular giving a list of the locomotives, cars, rails and miscellaneous equipment in stock in the month of September. A large number of standard and narrow gage locomotives are offered, including a number of geared locomotives. The car equipment includes both passenger and freight, all kinds being listed. The rails include both new and re-laying, with some girder rails.

*Steam Shovel News.*—The September number contains an unusually interesting article regarding the Government dam at Roosevelt, Arizona, in connection with the project for irrigating the Salt River Valley. The caption of the piece is "Roosevelt Dam Roosevelt's Doom." Other interesting articles are reprinted from contemporaries and there is miscellaneous information about steam shovels and their work.

### National Window Fixtures.

The accompanying illustration shows a window as equipped with a National sash balance roller, a National sash lock and ratchet strip and four face and two edge sash springs, made by the National Lock Washer Co., Newark, N. J. The sash balance is a specially made spring roller, held in brackets, which are placed out of sight at the highest part of the sash side, as shown. The roller is held to the sash by two belts, one at each end. These belts are connected with the roller by brass straps locked in the groove of the roller, and the lower ends are connected to the sash by hooks secured to the belting by brass straps. These hooks fit into eyes which screw into the top of the sash, thus making it easy to take out the sash when necessary.

Car Window Fitted With National Window Fixtures.

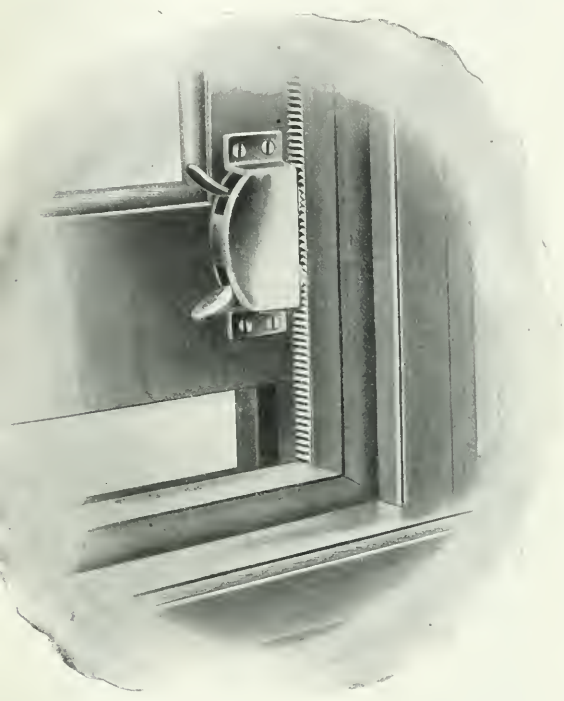
The screw eyes are made with a special thread and will sustain many times the weight required. They can also be raised or lowered one or more turns to equalize the belt on each side. If a stronger tension is required, one belt at a time can be unhooked and passed around the roller. If less tension is required, the belt

can be unhooked and one turn taken off, making it unnecessary to take the roller down to regulate or adjust it. All wearing parts are sheet brass, making it practically indestructible.

The movement of the sash when fitted with this balance is easy and noiseless. The tension of the balance roller is set to lift all but about three pounds of the weight of the sash. The remaining three pounds are lifted by the person operating the window. If used in combination with the National sash lock, an illustration of which is herewith given, the window may be held at any point desired by releasing the levers of the lock. When the window is required to be closed compress the levers and it will gently sag down. When the bottom of the window has reached the weather strip on the sill cap the window by gravitation will close itself to the bottom and lock securely on the sill.

Two springs are placed on the edge of the sash on the right-hand side, or on the same side as the lock. Four face springs bear against the inside stops and press the sash firmly against the outside stops.

The springs are applied one at each corner of the sash, set in a



The National Sash Lock.

pocket cut in the sash, and are completely hidden from view. These springs do away with the necessity of weather stripping the outside of the windows, and make the window practically dust and draught proof. They also prevent the rattle of the sash, and allow the inside stops to be applied loosely enough to prevent the sash from swelling tight.

### Pennsylvania Yearly Prizes.

In accordance with its long-standing annual custom the Pennsylvania will on October 17 distribute $5,400 to the men having charge of the main line tracks between New York and Pittsburg and between Philadelphia and Washington. The purpose of the prizes is to keep up a healthy rivalry among supervisors and assistant supervisors in keeping the tracks of their particular divisions in the most perfect condition. The last periodical inspection of the year by the main line track inspection committee will be made this week. This committee is composed of J. T. Richards, Chief Engineer of Maintenance of Way, Chairman; L. R. Zollinger, Engineer of Maintenance of Way; J. K. Johnston, Superintendent of the Tyrone division; W. G. Coughlin, Superintendent of the Elmira and Canandaigua division, and Victor Wierman, Superintendent of the Amboy division. The general manager's annual inspection will be made two weeks later (October 16 and 17). All general superintendents, their assistant engineers, supervisors and assistant supervisors will also go on this trip. There will be about 250 in the party, which will travel in the special track observation cars of the company. Six prizes, one of $1,200, four of $800 and one of $1,000, will be given to those supervisors and their assistants having the best line and surface of track between Jersey City and Pittsburg and Philadelphia and Washington during the year preceding the Annual Inspection. The main prize is given for the best line and surface maintained for the past full year, and the $1,000 prize for the greatest improvement in line and surface during the year. The award takes place at the end of the general manager's tour in Pittsburg.

### Manufacturing and Business.

The Union Switch & Signal Co., Swissvale, Pa., announces that it is to abandon the manufacture and sale of the Model X relay on October 15, but will continue to make and sell the Model 3 relay shown in Section 14 of its 1902 catalogue. The prices of the different forms of this model have been reduced.

W. B. Poland, who resigned from the Alaska Central on September 1, has been elected Vice-President and Chief Engineer of the Philippine Railways Company. After graduating from the Massachusetts Institute of Technology, Mr. Poland was engaged on river and harbor work for the United States Government, the most important being the construction of the Harbor of Refuge at Point Judith, of which he was Superintendent of Construction; later he served on the Peoria & Eastern, the C., C., C. & St. L., the Baltimore & Ohio Southwestern and the Baltimore & Ohio, doing work on surveys, construction, maintenance and operation. In 1904 he left the B. & O. to take charge, as General Manager and Chief Engineer, of the Alaska Central, a line 500 miles long, which is being built from the coast to the interior and of which 50 miles of line has been completed.

### Iron and Steel.

The Central of New Jersey has ordered an additional 700 tons of bridge material.

The Erie has ordered 25,000 tons of rails in addition to 38,000 tons previously ordered for 1907 delivery.

The Interborough Rapid Transit has given an order for 5,000 tons of heavy rails; the Las Vegas & Tonopah, 6,500 tons, and the Central Vermont, 3,000 tons.

The Northern Pacific is in the Chicago market for 1,500 tons of steel billets to be rolled at its Laramie works. Unconfirmed reports state that the order has been placed in Pittsburg.

The last of the ten new open hearth steel furnaces of the Carnegie Steel Co. have been completed and blown in at Homestead. The Carnegie people now have 60 furnaces in full operation at the one plant; each of them has a capacity of 50 tons of steel a heat.

The Isthmian Canal Commission has given an order to the United States Steel Corporation for 5,000 tons of 70-lb. rails. The Cuba Eastern, which requires 22,000 tons for use on several new lines now being built, will not let the contract during the present unsettled state of affairs in Cuba.

Negotiations are under way in the rail market for an aggregate of 500,000 tons. The Philadelphia & Reading has given a contract for 30,000 tons of standard steel sections for 1907 delivery, and electric lines in various parts of the country bought 10,000 tons additional for similar shipment. The Northern Pacific has let a contract for additional bridge work involving about 1,000 tons to the American Bridge Co.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### American Society of Civil Engineers.

At the meeting of this society October 3 a paper on "The Narragansett Bay Coal Depot," by Augustus Smith, illustrated with lantern slides, was presented.

### Railway Signal Association—Annual Meeting.

The annual meeting of this association will be held at the New Willard Hotel, Washington, D. C., October 16, 17 and 18. Sessions on Tuesday, 16th, 10 to 1 and 2 to 5; Wednesday, 10 to 1 and 2 to 5; Thursday, 9.30 until adjournment. Following are the principal topics for Tuesday:

Committee No. 8, report on standard specifications for all-electric interlocking and material for construction work, together with recommendations.

A special committee report on standard specifications for mechanical interlocking, embracing corrections.

Committee No. 4, report on storage battery.

Special committee report on how to remedy the effects of foreign currents on automatic block signals.

Amendment to the constitution.

WEDNESDAY.

Committee No. 12, specifications for Rubber Covered Wire.

Committee No. 11, report on oil to be used in signal lamps, and on Design of Lamps.

Special committee report embracing recommendations concerning the various positions and indications which can be derived from the signal operating in the upper quadrant, as recommended by this association at its last annual meeting.

Committee No. 1 recommends specifications for relays.

Committee No. 6 will present a progress report on "What Shall Constitute Cost in Estimates for Installation and in Record of Maintenance."

Committee No. 3, report on "Circuits for Interlocked Signals."

The following papers will also be presented:

"Devices to Keep Switches Free From Snow and Ice," by F. Shaw, and "The Optics of the Signal Lens," by William Churchill.

Secretary H. S. Balliet announces that a large programme of entertainment has been provided, and that President Roosevelt, by special appointment, will meet the entire association at the White House at 2.30 p.m., October 18.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Hocking Valley.*—H. R. Wilson has been elected a Director, succeeding Charles Steele, resigned.

*Wisconsin Central.*—George M. Cummings has been elected Chairman of the Board, succeeding W. L. Bull, resigned.

### Operating Officers.

*Elgin, Joliet & Eastern.*—A. H. Westfall, General Superintendent, has resigned to go to the Southern, and his former office has been abolished, the work being hereafter done by P. F. McManus, Superintendent.

*Cleveland, Cincinnati, Chicago & St. Louis.*—J. Q. Van Winkle, Assistant General Manager, has been appointed General Manager. H. A. Worcester, General Superintendent of the Lake Shore & Michigan Southern, succeeds Mr. Van Winkle, with office at Cincinnati, Ohio.

The authority of J. R. Smart, Superintendent of Dining Car Service of most of the New York Central Lines, has been extended over the C., C., C. & St. L., and C. B. Kols, heretofore Superintendent of Dining Car Service of this company, has been appointed Assistant Superintendent of Dining Car Service.

*Great Northern.*—J. McNaught, Assistant Superintendent of Terminals at Minneapolis, Minn., has been appointed Superintendent at Havre, Montana, succeeding C. O. Jenks, transferred. B. B. Green, Assistant Superintendent at Everett, Wash., succeeds Mr. McNaught. R. L. Knebel, Assistant Superintendent of the Willmar & Sioux Falls division at Sioux City, Iowa, succeeds Mr Greer. W. D. Mason succeeds Mr. Knebell.

*Lake Shore & Michigan Southern.*—J. J. Bernet, Assistant General Superintendent, has been appointed General Superintendent, succeeding H. A. Worcester, resigned to go to the Cleveland, Cincinnati, Chicago & St. Louis. S. W. Brown, Superintendent at Buffalo, N. Y., succeeds Mr. Bernet. H. M. Tompkins, Assistant Superintendent at Buffalo, succeeds Mr. Brown. E. B. Cook, Assistant Superintendent at Collinwood, Ohio, succeeds Mr. Tompkins. See Cleveland, Cincinnati, Chicago & St. Louis.

*New York Central & Hudson River.*—D. B. McCoy, Superintendent of the Hudson division, with office at New York, has been appointed assistant to the General Manager. J. H. Hustis, Superintendent of the Rome, Watertown & Ogdensburg division with office at Watertown, N. Y., succeeds Mr. McCoy. C. Christie, Superintendent of the River division, with office at Weehawken, N. J., succeeds Mr. Hustis. W. J. Fripp, Assistant Superintendent of the Mohawk division, with office at Albany, N. Y., succeeds Mr. Christie. W. K. McCoy, trainmaster at Utica, N. Y., succeeds Mr. Fripp. F. T. Slack, passenger trainmaster of the Hudson division, has been appointed Assistant Superintendent of that division, with office at New York. T. W. Evans, trainmaster at Jersey Shore, Pa., has been appointed Assistant Superintendent of the Pennsylvania division, with office at Corning, N. Y.

*St. Louis & San Francisco.*—D. C. Buell, heretofore Engineer of Tonnage Tests, has been appointed Inspector of Transportation, with office at Springfield, Mo., and his former office has been abolished.

*Southern.*—C. S. McManus, General Superintendent, has resigned to go into other business.

### Traffic Officers.

*Chicago & Alton.*—W. M. Bushnell, General Freight Agent of the Chicago, Peoria & St. Louis, has been appointed Assistant General Freight Agent of the Chicago & Alton, with office at Chicago, succeeding S. E. Stohr, resigned. See Wisconsin Central.

*Chicago, Peoria & St. Louis.*—See Chicago & Alton.

*New York Central & Hudson River.*—W. L. Kingman, General Freight Agent, has been appointed Industrial Agent, succeeding S. Goodman, deceased. H. D. Carter, General Freight Agent of the West Shore, succeeds Mr. Kingman, with office at New York. W. S. Kallman, First Assistant General Freight Agent, succeeds Mr. Carter. I. H. Hubble, Second Assistant General Freight Agent, succeeds Mr. Kallman, and W. A. Newman succeeds Mr. Hubble.

*Pennsylvania.*—R. L. Franklin, Assistant Freight Claim Agent, has been appointed Freight Claim Agent, succeeding F. D. Howell, deceased.

*Wabash.*—S. B. Knight, Industrial Commissioner, has retired. W. F. Schmitt, foreign freight agent at Chicago, succeeds Mr. Knight.

*Wisconsin Central.*—S. E. Stohr, Assistant General Freight Agent of the Chicago & Alton, has been appointed Assistant General Freight Agent of the Wisconsin Central, with office at Milwaukee, Wis., succeeding C. E. Wilson, resigned.

### Engineering and Rolling Stock Officers.

*Chicago & Eastern Illinois.*—W. S. Hanley has been appointed Assistant Engineer of the Chicago and Indiana divisions, succeeding C. B. Randell, resigned.

*Chicago, Rock Island & Pacific.*—L. A. Richardson, general foreman of the Oregon Shore Line at Pocatello, Idaho, has been appointed Master Mechanic of the C., R. I. & P. at Trenton, Mo., succeeding A. C. Adams, resigned.

*Denver, Northwestern & Pacific.*—George Thompson has been appointed Superintendent of Motive Power, with office at Utah Junction, Colo., succeeding A. Struthers, resigned.

*Philadelphia & Reading.*—C. M. Stewart, road foreman of engines at Tamaqua, Pa., has been appointed Master Mechanic at that place, succeeding G. S. Allen, retired on a pension.

### Purchasing Agents.

*Atlanta, Birmingham & Atlantic.*—The office of the Purchasing Agent has been removed from Waycross, Ga., to Atlanta.

## LOCOMOTIVE BUILDING.

*The New York Central Lines* have ordered 200 locomotives from the American Locomotive Co.

*The Buffalo, Rochester & Pittsburg*, it is reported, has ordered some heavy locomotives for freight and passenger service.

*The Denver, Northwestern & Pacific* has ordered two simple consolidation (2-8-0) locomotives from the Schenectady Works of the American Locomotive Co. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Consolidation |
| Weight, total | 210,000 lbs. |
| " on drivers | 186,000 lbs. |
| Diameter of drivers | 56 in. |
| Cylinders | 22 in. x 28 in. |
| Boiler, type | Extended wagon top |
| " working steam pressure | 210 lbs. |
| " Number of tubes | 426 |
| " material of tubes | Charcoal Iron |
| " diameter of tubes | 2 in. |
| " Length of tubes | 15 ft. |
| Firebox, length | 108 in. |
| " width | 72¼ in. |
| " material | Worth steel |
| " grate area | 54.2 sq. ft. |
| Heating surface, total | 3,505 sq. ft. |
| Tank, capacity | 8,000 gals. |
| Coal, capacity | 12 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Bell ringer | "Little Giant" |
| Boiler lagging | Sectional magnesia |
| Brake-beams | Diamond special |
| Conplers | Climax |
| Headlights | Pyle-National |
| Injector | Simplex |
| Jonrnal bearings | Magnus metal |
| Piston rod packings | Paxton-Mitchell |
| Valve rod packings | Paxton-Mitchell |
| Safety valve | Ashton |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan Bull's-eye |
| Springs | A. French Co. |
| Steam gages | Asbcroft |
| Steam heat equipment | Safety Car Heating & Lighting Co. |
| Tires, driving wheels | Standard Steel Works |

## CAR BUILDING.

*The Pere Marquette*, it is reported, has ordered, or is about to order, 2,000 cars.

*The Buffalo, Rochester & Pittsburg*, it is reported, has ordered a large number of freight cars.

*The Charlotte Harbor & Northern* has ordered 20 ventilated box cars from M. H. Treadwell & Co., Lebanon, Pa.

*The Atlanta, Birmingham & Atlantic* is having from 20 to 25 passenger cars built by the American Car & Foundry Co.

*The American Car & Foundry Co.* has received orders for 2,309 miscellaneous cars, the orders being in small lots of less than 100.

*The Boston & Maine* has ordered from the Pullman Co. 50 first class passenger coaches and eight first class dining cars, for delivery before next summer.

*The Chesapeake & Ohio* is in the market for 400 box cars of 80,000 lbs. capacity. These cars will weigh 38,000 lbs. and measure 38 ft. 7¼ in. long, 9 ft. 2½ in. wide and 13 ft. 10¼ in. high, ov r all. The special equipment includes:

| | |
|---|---|
| Axles | Carnegie |
| Bolsters | American Steel Fonndries |
| Brake-beams | Chicago Railway Equipment Co. |
| Brake-shoes | American Brake-Shoe & Fdry Co. |
| Brakes | Westinghouse |
| Brasses | Chesapeake & Ohio |
| Door fastenings | Security |
| Draft rigging | Miner |

*The Bessemer & Lake Erie* has ordered from the Standard Steel Car Co. for delivery next spring 250 steel hopper cars of 100,000 lbs. capacity. These cars will be 30 ft. long, 9 ft. 5½ in. wide, and 10 ft. high, all inside measurements, and 31 ft. 6 in. long, 10 ft. wide and 10 ft. 5 in. high over all. The bodies and underframes will be of steel. The special equipment includes:

| | |
|---|---|
| Axles | Carnegie Steel Co. |
| Bolsters | Simplex |
| Brake-beams | Waycott |
| Brake-shoes | Lappin |
| Brakes | Westinghouse |
| Brasses | Damascus |
| Conplers | Climax and R. E. Janney |
| Doors | Simonton |
| Draft rigging | Westinghouse Friction |
| Dust guards | Harrison |
| Journal boxes | McCord |
| Paint | Illinois Steel Co. |
| Trucks | Barber arch bar |
| Wheels | New York Wheel Co. |

*The Canadian Pacific* has ordered from its Angus shops 1,118 30-ton box cars, 84 30-ton flat cars, 14 30-ton stock cars and 10 40-ton Roger Hart convertible ballast cars. The box cars will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 8 in. long and 9 ft. wide, outside measurements. The flat cars will be 36 ft. 8 in. long and 8 ft. 10 in. wide, outside measurements. The stock cars will be 8 ft. 9¾ in. wide and 7 ft. 1¼ in. high, inside measurements. The ballast cars will be 36 ft. 8 in. long over all. The bodies and underframes of all cars will be of wood. The special equipment, so far as specified, for the stock cars, flat cars and ballast cars is the same as that for the box cars, except that the stock cars will not have Chicago roofs. The special equipment for the box cars includes:

| | |
|---|---|
| Body bolsters | Simplex |
| Truck bolsters | Simplex |
| Brake-beams | Simplex |
| Brakes | Westinghouse |
| Conplers | Tower |
| Door fastenings | Positive |
| Doors | Security |
| Draft rigging | Miner Tandem |
| Dust guards | Harrison |
| Jonrnal boxes | McCord |
| Paint | Mineral brown |
| Roofs | Chicago |
| Side bearings | Susemihl roller |
| Springs | C. P. R. standard |
| Trucks | Barber Roller Simplex |

## RAILROAD STRUCTURES.

Brandon, Man.—The Canadian Northern has plans for a new station to be erected here at a cost of $25,000.

Estevan, Sask.—The Canadian Pacific is to spend $30,000 on yard improvements here.

Fort William, Ont.—The ratepayers have voted $135,000 for the construction of a bridge over the Kaministiquia river. Address Mayor Whalen.

Las Vegas, N. Mex.—The Denver & Rio Grande is planning to build a bridge over the Rio Grande on the Ramon Vigil tract of timber near this place.

Livonia, N. Y.—The State Railroad Commission has determined upon the elimination of the West avenue grade crossing of the Rochester division of the Erie Railroad. An overhead street bridge is to be built, to be erected at a point 650 ft. north of the present West avenue crossing.

Providence, R. I.—The Harbor Commission has granted permission to the New York, New Haven & Hartford to build a new 900 ft. wharf between the Wilkesbarre pier and the marine railway on the east side of the river.

Roseville, Cal.—The Southern Pacific is rushing work on new buildings and tracks to accommodate the freight business to be handled at this place, which is to be a division terminal for freight. The plans call for more than 50 miles of side tracks. Additional land has been bought and work is well under way on a 32-stall roundhouse and repair shops; a second 32-stall roundhouse will also soon be built. The shop buildings are all to be of brick.

Winnipeg, Man.—The City Council demands the construction of an overhead bridge over the Canadian Pacific tracks. Estimated cost $175,000. Address Alderman Cox.

Winslow, Ariz.—The Atchison, Topeka & Santa Fe has made preparations for the early erection of machine shops and a 35-stall roundhouse here.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Albany, Cairo & Gulf.—This company was recently chartered in Georgia with $200,000 capital to build a line from Albany, Ga., to St. Joseph's Bay, Fla., about 175 miles. The incorporators are: W. B. Roddenberry, W. A. Walker, W. S. Wight, W. C. Jones, J. P. Malloy, O. T. Davis, M. L. Ledford, J. M. Sasser, S. W. Smith, L. E. Welch, S. Farkas, R. L. Hall and W. H. Hall, of Newton. The office of the company is at Cairo.

Ashland & Western.—Incorporated in Ohio, with $200,000 capital, by Z. W. Davis, Isaac H. Taylor, William Simpson, W. L. Stolzenbach and H. B. Stewart, to build a steam road across the state from Vermillion, on the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis, south through Erie, Lorain, Ashland, Wayne, Holmes, Coshocton, Muskingum, Noble, Morgan and Washington counties, to the Ohio river at Marietta, on the Baltimore & Ohio and the Pennsylvania, about 175 miles. The office of the company is at Ashland, Ohio.

Atchison, Topeka & Santa Fe.—The average mileage operated by this system, according to its report for the year ending June 30, 1906, was 8,433 miles, an increase of 129 miles, which includes the Cane Belt Railroad, Sealy to Matagorda, Texas, 105 miles, leased to the Gulf, Colorado & Santa Fe on July 1, 1905, and the Western Arizona Railway, McConnico to Chloride, Ariz., 22 miles, leased to the Atchison, Topeka & Santa Fe on Jan. 11, 1906. In addition, the company controls 1,093 miles of road in operation and 393 miles under construction. These new lines are as follows: Arizona & California, 66 miles; Eastern Railway of New Mexico, 186 miles; Fresno County, 7 miles; Jasper & Eastern, 40 miles, and Phoenix & Eastern, 95 miles. On the Eastern Railway of New Mexico, extending from Texico, N. Mex., to Belen, 250 miles, work is nearly completed; it will, however, be necessary to make extensive improvements on the lines east of Texico to bring them up to the standard of the other main lines. Track has been laid on the Arizona & California, from Wickenburg, Ariz., to within 20 miles of the Colorado river, about 100 miles from Wickenburg. The Jasper & Eastern has been opened for traffic from Kirbyville, Tex., to De-Ridder, La., and is nearly completed to Oakdale. The A., T. & S. F. has bought the Denver, Enid & Gulf, running from Guthrie, Okla., northwest to Kiowa, Kan., as well as its affiliated line, the Denver, Kansas & Gulf, now under construction from Kiowa, via Medicine Lodge to Belvidere, Kan. These two roads together will provide a short route from the main lines in Oklahoma to north Texas and the west; the Texas & Gulf, extending from Longview, Tex.,

south to Watterman has also been bought, and is to be connected with the A., T. & S. F. line, which has its present northern terminus at Center, in Shelby county. Work is under way on the Sulphur branch, 10 miles, from Davis, Ind. T., to Sulphur. A branch is also under construction from a point near Barnwell, Cal., on the California Eastern branch, to Searchlight, Nev., 23 miles; also on the Canyon City-Plainview line, from Canyon City, Tex., to Plainview, 58 miles. Second track was laid during the year for a distance of 161 miles, and 90 miles additional are now under construction.

Boston & New York (Electric).—This company is seeking incorporation in Massachusetts with a capital of $300,000, and, it is said, is planning to build an interurban road from Forest Hills through Hyde Park, Dedham, Canton, Sharon, Mansfield and North Attleboro to the Rhode Island state line, about 30 miles. A. B. Leach & Co., New York, are said to be interested. The line is projected from Boston to New York City, and the company will also apply for franchises in Rhode Island, Connecticut and New York. The entire line if built will cost between $15,000,000 and $20,000,000.

British Columbia Roads.—Wilson, Senkler & Bloomfield, of Victoria, B. C., have applied to the Provincial government for a charter to build a line from the confluence of the Rau Shuswap and South Fork of the Fraser river, up the river to the headwaters of the Swamp river, thence to Keithly lake via Long, Sandy and Cariboo lakes, to Coquette Pass via Cariboo lake and the North Fork of the Quesnell lake through Croquette pass to the dam at the outlet of Quesnell lake across the Fraser river to Blackwater, to Kuskya lake via the Blackwater river to the Salmon river via the Uhgako river near the forks of the same, thence to the Bella Coola river, with power to build branches to Barkerville and Horsefly.

Canadian Northern.—President William Mackenzie is quoted as saying that the work being carried out by this company will total about 500 miles of new lines, as follows: Prairie, 200 miles; Hudson Bay section, 90 miles; Ontario, 100 miles; Maritime Provinces, 50 miles, and the balance in Quebec

This company has decided to push work on the line now under construction from Edmonton north to Athabasca Landing, Alb. Work has commenced on the first twenty-one miles, and bids for the balance of the line, about 80 miles, are to be called for at an early date.

Surveys have been completed by this company from Edmonton, Alb., west to the Yellowhead Pass, in the Rocky Mountains, about 200 miles, and bids for construction will shortly be called for. H. C. Hahnop was Chief Engineer in charge of the surveys.

Canadian Pacific.—This company is about to build a line to a point on the east shore of Lake Winnipeg, beyond the Winnipeg river to reach a projected summer resort.

This company, which intended to begin double-track work this fall on its road between Montreal and Quebec, 172 miles, has decided to wait until the spring.

Official announcement is made that the James Bay (Toronto-Sudbury) branch of this road is to be put in operation October 10.

Announcement is made by this company that its new line, the Spokane International, from Kingsgate on the Canadian and United States border, at the junction with the Crow's Nest Pass line to Spokane, in the state of Washington, 150 miles, will be opened for freight traffic on Oct. 25. Passenger service is to be established next spring. Through freight service from Montreal and eastern points will be made via the "Soo" line through St. Paul and Minneapolis by way of the Kootenay and Crow's Nest Pass route to Kingsgate. (See Construction Record.)

Canadian River.—Incorporated in Oklahoma, with $5,500,000 capital. The offices are at Woodward, and the company proposes to build a line from that place southeast through Woodward, Dewey and Blaine counties to Watonga, from which point one line is to run eastward through Blaine, Kingfisher and Logan counties, to Guthrie, and the other through Blaine, Kingfisher, Canadian and Oklahoma counties to Oklahoma City, a total of 220 miles. The incorporators are: F. E. Jennison, of New York; Jesse G. Northcutt, of Raton, N. Mex.; B. W. Key, W. P. Halliday and A. M. Appleget, all of Woodward.

Canadian Roads.—Harvey, McCarter & Pinkham, attorneys, of Revelstoke, B. C., are applying to Parliament for a charter for a company to build a line from a point on the Arrow river north to the Yellow Head Pass, about 150 miles

Cabo Northern.—Incorporated in Texas with $1,000,000 capital to build a line from Caro, Nacogdoches county, on the Southern Pacific, north to Mount Enterprise, a new town in Rusk county. The incorporators include M. W. Jones and C. H. Morris, of Winnesboro; W. T. March, of Mount Enterprise; W. G. Ross, of the same place; W. W. Whiteman, of Ardmore, Ind. Ter., and others.

Chesapeake & Ohio.—The report of this company for the year ending June 30, 1906, shows an increase of 119 miles in length of road, as follows: Extension of Greenbrier division .10 miles, Piney Creek branch 14.10 miles, Guyandot branch 1.80 miles, Corn Creek branch 17.70 miles, and by readjustment .70 miles, a total of 34.40 miles for lines owned and for lines operated through stock ownership increase by readjustment .10 miles, and by the addition of the Big Sandy Railway, Whitehouse to Elkhorn City, Ky., including its Marrowbone branch 84.50 miles, a total of 84.60 miles.

It also shows that 37.20 miles of the 59.20 miles of second track mentioned in the previous report have been completed, and work on the remaining 19 miles so far advanced that it will be completed during 1906. Additional second track has been authorized at various points for a total of 91.80 miles. On the completion of this work the company will have a total of 360 miles of double-track, and in connection with the two main lines between Richmond and Clifton Forge, will have a double-track line from Newport News to Cincinnati, except 17 miles east of Richmond, 11 miles in West Virginia and 103 miles in Kentucky. The branch lines under construction when the previous report was made have all been completed and put in operation except 6.70 miles on Piney Creek. The company has authorized the construction of the Potts Creek branch, 20 miles, to connect with the main line at Covington, Va.; also advanced money for the construction of the Marrowbone branch, and for improving the main line of the Big Sandy Railway. It has also authorized the buying of the Coal River Railway, including 18 miles of completed road, and an agreement to make extensions aggregating 50 miles. The Inter-Terminal connection in Cincinnati is practically completed. The company has carried out a large amount of work, including the filling in of trestles, change of line, new passenger and freight stations, additions to shops and roundhouses, new undergrade crossings and highway bridges.

Chicago, Rock Island & Pacific.—Executive officers of this road recently completed a tour of the Iowa lines and approved extensive plans for improvements. These include the shortening of the line between Omaha and Davenport, the double-tracking of the main line, and general improvements to the branch lines.

Cincinnati & Birmingham Air Line.—This road, which is projected by J. H. Connor, of Nashville, Tenn., to build a line from Somerset, Ky., where connection is to be made with the Cincinnati, New Orleans & Texas Pacific southwest via Monticello, Ky., to Birmingham, Ala., about 300 miles, it is said, is having surveys made, and rights of way are being secured. The road will have light grades and easy curves and is to be laid with 80-lb. rails. All bridges are to be of steel. J. L. Short is Secretary and Treasurer, 17 Stegar Building, Nashville, Tenn.

Cincinnati, New Orleans & Texas Pacific.—It is reported that this company is planning to spend $100,000 to run its line around the King's Mountain tunnel, Kentucky, which is 3,981 ft., the longest on the road.

Cleveland, Cincinnati, Chicago & St. Louis.—G. J. Grammer, Vice-President of this company, is quoted as saying that a new line is to be built from Evansville, Ind., north to a connection with its road at Mount Carmel, Ill. The new line is to form part of a new route from Evansville to Chicago and to New York. Arrangements for financing the project, it is said, have been completed, and contracts are shortly to be let in Chicago. The new line, which is to be 30 miles long, is to reach the coal fields in southern Indiana and Illinois.

Denver & Rio Grande.—According to reports from Texas, a new Gould line is to be built from Mineral Wells, Tex., northwest to Trinidad, Colo., 600 miles, work to be started early next year. Preliminary surveys, it is said, were completed about two years ago.

Duquoin Rapid Transit.—The promoters of this company, which proposes to build an interurban line from Benton, the county seat of Franklin county, Ill., northwest via Duquoin to Belleville, about 75 miles, it is said, have practically completed all preliminary details, and work is to be started at once. Connection is to be made with the Belleville Interurban for St. Louis. The office of the company is at Duquoin.

Erie.—The long talked of cut for a new line through Bergen Hill to the Jersey City terminus is at last to be begun. The contract has been given to the Milliard Construction Company, of Philadelphia. It is said to amount to $1,500,000, and it requires the work to be started within ten days and to be completed by July, 1908. The cut will be about 5,300 ft. long, and will necessitate the excavation of 120,000 cu. yds. of earth and 500,000 cu. yds. of rock. The contract calls for a complete four-track route, for passenger service from the Jersey City yard, to the main line at the west end of the present tunnel. The tunnel will be used for freight service. This is the beginning of large improvements, under consideration for a long time, to be carried out at the Jersey City terminus, where a large new station is also to be put up.

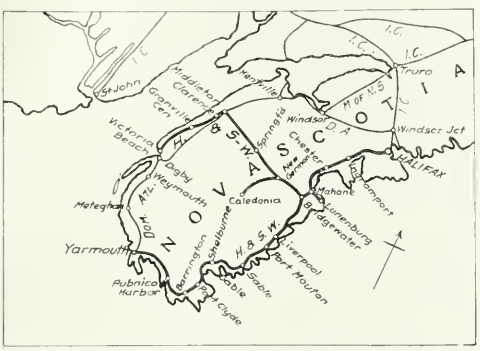
Georgia & Florida Pine Belt.—Incorporated in Georgia to build a line from Waycross, on the Atlantic Coast Line and the Atlantic & Birmingham, southwest to Statenville, Ga., about 60 miles. The incorporators include: W. B. Ellington, W. W. Sharp, G. R. Yeoman, J. S. Bailey, of Ware county; W. C. Dodson, C. J. Haden and B. W. Blackstock, of Atlanta; D. C. Newton, of Tatnall county, and W. L. Herendeen, of New York.

Georgia Eastern.—Incorporated in Georgia with $100,000 capital by J. P. Heard, J. O. Hamilton, J. J. Cooper, D. H. Rhompson and J. F. Howell, all of Vienna, in Dooly county, to build a line from Americus, in Sumter county, on the Central of Georgia and the Seaboard Air Line, east to Eastman, in Dodge county, about 80 miles, passing through Sumter, Dooly, Wilcox, Pulaski and Dodge counties. At Eastman connection is to be made with the Southern.

Grand Trunk Pacific.—Surveys are being made by this company for the line to connect Regina, Sask., and Brandon, Man., and construction work is to be started as soon as surveys are completed.

Surveys are about completed for the line to connect Quebec and Moncton, N. B., and bids for the work will be asked for shortly. P. E. Ryan, Secretary of the Transcontinental Commission, Ottawa, Ont., will give information.

Halifax & Southwestern.—An officer writes that this company has all but three miles of its new line completed. The system, old and new, consists of the line from Halifax, Nova Scotia (including 1.7 miles trackage on the Intercolonial), to Yarmouth, 248 miles; the Lunenburg branch, seven miles; Caledonia branch, 23 miles,




Western Part of Nova Scotia Showing the Halifax & South-Western Railroad System.

and Middleton section to Victoria Beach, 93 miles. On the remaining three miles, which is yet to be completed, there is some heavy work to be done. The line has easy grades. There are about 155 steel bridges on the new line ranging from 25 ft. to 80 ft.

Kingston, Smith's Falls & Ottawa.—This company is planning to build a line from a point on the Atlantic, a few miles west of Ottawa, southwest through Richmond and Smith's Falls, and thence south of the Rideau Lakes through Jones Falls, to Rideau station, six miles east of Kingston, on the Grand Trunk. The Ottawa City Council has been asked to renew the bonus of $50,000 voted some years ago for this project. The statement is definitely made that the new line is to be operated by the Grand Trunk as a part of its line between Toronto and Ottawa, which is to be a few miles shorter than that of the Canadian Pacific.

Lehigh Valley.—The work carried out and under way by this company, according to its report for the year ending June 30, 1906, included the completion of the Bay Shore Connecting Railroad, and the construction of the Lehigh & Lake Erie, which is the terminal railroad at Buffalo for the L. V. The last named is well under way, and the entire line is to be ready for laying single track by next June and for second track by the following October. Grades and alinement have been changed from Wysox to west of Towanda. A steel bridge over the Susquehanna river is in progress and will be finished in about one year. The third track from Fairview to Bear Creek Junction mentioned in the previous report has been extended to Braders, 4.26 miles, making a continuous third track for 11.16 miles. On the section from East Penn Junction to a point west of Freemansburg, where third and fourth tracks were authorized, 1.12 miles of third track has been laid. The fourth track from Packerton to Mauch Chunk is being extended to Glen Onoko, 2.30 miles. This work will shortly be completed. By the purchase of the Delaware, Susquehanna & Schuylkill, the construction of the Irvington Railroad and changes in branch lines the company increased its first track by 52.07 miles. Sidings for the company's lines were laid for 70.54 miles and private sidings for 13.90 miles. Four new steel bridges were built, and nine solid floor, through steel bridges and three reinforced concrete bridges replaced lighter metal structures. Eleven metal bridges were also put in to replace wooden structures and two metal and eight wooden bridges were filled in. The new shops at Sayre, together with the water pumping plant and reservoir, have been completed and put in operation. A new freight terminal has been established at 149th street, New York, with a frontage of 463 ft. on the east side of the Harlem river. A steel shed was also put up at East 124th street. A new freight house has been built at Newark, and new passenger stations at Rochester, and at Montrose, also a gravity locomotive coaling station at South Easton.

Milltown Air Line.—This company, which operates ten miles of road from Milltown, Ga., south to Naylor, is planning, it is said, an extension from Naylor southwest to Valdosta, 15 miles. These places are already connected by the Atlantic Coast Line.

Milwaukee & Northern (Electric).—This company, which was incorporated in Wisconsin in 1905, with a capital of $100,000, has completed 15 miles of its proposed 100 miles of electric line to run from Milwaukee to Cedarburg, from which point one branch will extend northeast to Grafton, Port Washington and Sheboygan, and another northwest to West Bend and Fond du Lac. The company expects to have the entire line in operation within two years. M. J. Seamann, of Sheboygan, is President.

Missouri & North Arkansas.—This company, which is the successor of the St. Louis & North Arkansas, is to soon begin work extending its line. Bids, it is said, are wanted Oct. 15 for grading and bridges. W. S. Dawley is Chief Engineer of the Allegheny Improvement Co., Security Bldg., St. Louis, Mo., which has the contract to extend this road from Seligman, Mo., the present northern terminus to Joplin, Mo., 50 miles, and from Leslie, the southern terminus to a point on the Mississippi river, about 140 miles. (Aug. 17, p. 45.)

Mobile & Western.—An officer writes that this company, which is building a line from Mobile, Ala., west to a point in Mississippi, not yet determined upon, has let all contracts for the work now in hand to H. A. Filkens, of Mobile. Grading has been completed for 15 miles and track laid for 10 miles. (Sept. 21, p. 75.)

Moline, Rock Island & Eastern Traction.—Incorporated in Illinois, with office at Rock Island and capital of $5,000, by J. F. Porter, F. G. Young, J. F. Lardner, R. Casteel and D. F. Peck, of Rock Island, to build a line from Rock Island, Ill., to Carbon Cliff, on the Chicago, Rock Island & Pacific, also from Rock Island south to Galesburg.

Morgantown & Southern (Electric).—This company has been incorporated in West Virginia with a capital of $100,000 to build an electric road from Fairmont, W. Va., northeast to Morgantown, both of which places are on the Baltimore & Ohio. The incorporators are: J. W. Miles, Edward Herd, I. G. Lazelle, C. W. Huston, D. B. Purinton and M. W. Reed.

Nevada Northern.—This road has been opened for business and trains are now running between Cobre, Nev., on the Southern Pacific, and Ely, at which place the Nevada Consolidated mines are situated. (July 20, p. 19.)

Northern Pacific.—Location maps have been filed with the United States land office by this company for important Missouri slope branches, one running south from Mandan, N. Dak., to the Standing Rock Indian reservation, 40 miles, and the other north from Mandan, 60 miles, to a point on the Missouri river in Mercer county, near Mannhaven. Work on both lines is to begin at once and they are to be completed the coming year. These lines leave the Northern Pacific main line about half a mile east of Mandan and each follows the river closely. The south branch is to run around the bluffs below Fort Abraham Lincoln, and strike the river again opposite the south end of Sibley Island, crossing the Little Heart river about three miles from its mouth. The Cannonball is crossed at its junction with the Missouri; and the route continues along the last named river to a point opposite Hampton, Emmons county, 18 miles north of Standing Rock and old Fort Yates. The north line follows the river to a point above Rock Haven, thence along Square Butte creek for seven or eight miles, and again strikes the Missouri above Harmon, following the river most of the way, thence along the south shore of Mandan lake. The big bend, on which Washburn is located on the opposite side, is cut across from Hensler to the south bend at Deapolis, and Knife river is crossed near its mouth at a point near the town of Stanton, Mercer county.

Orizaba Railway Co. of Mexico City, Orizaba and Guthrie.—Incorporated in Oklahoma, with $250,000 capital, to build from

Orizaba to Laperla and Vera Cruz with branches; estimated length 20 miles. The incorporators include H. W. Pentecost and C. B. McKennon.

Rio Grande.—This road, which operates a narrow gage line from Brownsville, Tex., to Point Isabelle, 22 miles, is to be changed to standard gage. The officials of the road are considering the question of using gasolene motor cars in place of steam engines.

St. Louis, Rocky Mountain & Pacific.—J. Van Houten, Vice-President and General Manager of this road, announces that the line from Preston to Cimarron, N. Mex., including the Koehler branch, is now open for freight traffic. This section is 34.18 miles long. (Aug. 10, p. 39.)

South & Western.—An officer writes that this company, which is building from Elkhorn, Ky., via St. Paul, Trenchport, Kingsport, Johnson City, Spruce Pine and Marion to Rutherfordtown, N. C., has given contracts to Walton, Witten & Graham, of Graham, Va., for 13 miles; to Walton, Wilson, Oates & Co., of Knoxville, Tenn., for 12 miles; to Carpenter & Boxley, of Clifton Forge, Va., for 18 miles, and to Purcell, Allen, Sheehan Co., of Harrisonburg, Va., for four miles. Seventy miles of track have been laid. Contracts for steel bridges will be let shortly. The work includes many tunnels and several important steel bridges.

Southern Pacific.—Surveyors of this company are running lines for the construction of tracks to reach the site of the rolling mills which are to be built south of San Francisco by Scott and associates.

Spokane International.—See Canadian Pacific.

Shelby County.—Incorporated in Missouri, with $110,000 capital. The offices are at Shelbina, Mo., and the company proposes to build a line from Shelbyville, Mo., south to Shelbina, eight miles. The incorporators are W. C. Clark, R. L. Carter and J. E. Ragsdale.

Spring City, Athens & Pikeville.—Incorporated in Tennessee with $100,000 capital to build a line from Pikeville, the northern terminus of the Sequatchie branch of the Nashville, Chattanooga & St. Louis east via Spring City, in Rhea county, to Athens, McMinn county, on the Southern and the Tellico railroads, about 40 miles. The incorporators are T. C. Davidson, G. Young, M. V. Reed, A. S. Holloway, J. C. Locke and W. M. Snyder.

Thomasville & Northeastern.—Incorporated in Georgia with $75,000 capital by J. F. Harris and C. C. Shellay, of Pavo; B. Crott, of Hempstead; J. J. Hodges and others, to build a line from Thomasville, in Thomas county, on the Atlantic Coast Line, northeast to Sparks, in Berrien county, about 50 miles.

Virginia & Kentucky.—This company, operating five miles of road from Norton, Wise County, Va., on the Norfolk & Western, north to Wise, announces that the line will be extended north toward the Kentucky border, opening up rich coal and timber lands.

Wabash.—It is reported from Pittsburg that an agreement will shortly be made between the Wabash and the Pennsylvania allowing the former to build an elevated line over the Monongahela division of the Pennsylvania near Clairton, Pa., at once. The Wabash needs this line in order to reach the Clairton plant of the United States Steel Corporation. They have been notified that work may begin at once, although the agreement has not yet been signed.

## RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—Gross earnings during August were $7,251,524, an increase of $1,094,552. Operating expenses increased only $320,958, leaving net earnings of $2,913,147, an increase of $773,594.

The Atchison is now delivering freight at its new yards at China Basin, San Francisco. The old yards at the foot of Spear street are still being used but the bulk of the business will be handled at the new location, where filling in has been in progress for the past two years. Sheds for perishable freight have been put up along the 1,000 ft. of sea wall, and two large warehouses are now under construction. About 150 cars can be placed on the unloading tracks. The cost of this terminal work will be about $500,000.

The directors have declared a semi-annual dividend of 2½ per cent. on the $101,955,500 outstanding common stock, to shareholders of record November 8. The annual rate has been 4 per cent. for the last four years.

Beaver Valley Traction.—See Philadelphia Company.

Boston & Maine.—The stockholders of the Fitchburg Railroad, which is controlled by, and leased to, the B. & M., have authorized the directors to issue $2,000,000 additional bonds for the purpose of refunding the $1,500,000 4 per cent. bonds maturing April 1, 1907, and also for the payment of floating debt and for improvements. These bonds are not secured by any mortgage.

Canadian Northern.—See Canadian Northern Quebec.

Canadian Northern Quebec.—A meeting of the stockholders has been called for October 22 to authorize the issue of 4 per cent. debenture stock to be guaranteed by the Canadian Northern. The amount to be issued at present is limited to the sum necessary to be exchanged for the outstanding bonds of the Great Northern of Canada, the Chateauguay & Northern and the Quebec, New Brunswick & Nova Scotia, recently amalgamated under the name Canadian Northern Quebec. The rest of the stock is to be issued at a rate not exceeding $20,000 per mile of road hereafter built or acquired. (Aug. 10, p. 40.)

Canadian Pacific.—At the annual meeting it was announced that the deferred payments and interest on land sales would be distributed among the shareholders. The sum to be thus distributed will amount this year to about 1 per cent. on the outstanding stock; it will be paid in two equal instalments, April 1 and October 1.

Fitchburg Railroad.—See Boston & Maine.

Hocking Valley.—The time for deposit of stock under the plan for the consolidation of this company with the Kanawha & Michigan has been extended from September 29 to November 30. (Aug. 10, p. 40.)

Kanawha & Michigan.—See Hocking Valley.

Kansas City, Mexico & Orient.—The Texas Railroad Commission has authorized this company to issue $945,000 bonds on the completed line between Sweetwater, Tex., and Knox City, 78 miles.

Lehigh Valley.—Gross earnings of this company for August were $3,299,827, an increase of $463,789; net earnings, $1,516,462, an increase of $298,275.

Pennsylvania.—The 250,000,000 francs (about $48,250,000) Pennsylvania Company 15-year 3½ per cent. bonds, which were floated in France recently, have been listed on the Paris Bourse, this being the first time that American securities have been listed on this exchange. (June 22, p. 182.)

Philadelphia Company.—A part of the proceeds of the sale of the $3,240,000 common stock recently issued is to be used to refund the $800,000 notes given for the capital stock for the Beaver Valley Traction and $475,000 for the stock of the Washington & Canonsburg. The Beaver Valley Traction had $1,075,000 outstanding capital stock and $1,500,000 outstanding bonds. It owns and operates 32 miles of road, connecting various towns in Beaver county, Pa. The Washington & Canonsburg has $1,000,000 capital stock outstanding and $650,000 bonds. It owns and operates 13 miles of electric road in Washington and Canonsburg.

Southern Pacific.—Kuhn, Loeb & Co. have bought from this company a block of consolidated refunding 4 per cent. bonds, being part of the authorized issue of $160,000,000. The proceeds of this sale will be used to retire the $7,401,000 first mortgage 6 per cent. bonds due Oct. 1, 1906.

Tonopah & Goldfield.—A Philadelphia despatch states that extra dividends have been declared on the $1,650,000 common stock and the $500,000 preferred stock, making the annual rates 14 per cent. on the common and 7 per cent. on the preferred. The first dividends (3½ per cent. on each class) were declared last May.

United Railroads of Yucatan.—This company has sold to Ladenburg, Thalman & Co., New York, $1,000,000 5 per cent. gold notes, maturing in five equal annual instalments beginning September 1, 1907. The proceeds are to be used for liquidating existing floating indebtedness incurred principally by the buying of equipment and the building of an extension. The rest of the proceeds will be used to pay for additional construction. The company, which now operates 375 miles of road, mostly narrow gage, in the northwestern part of Yucatan, has no bonded debt and is paying 3 per cent. on its $11,500,000 (gold) capital stock.

Washington & Canonsburg (Electric).—See Philadelphia Company.

Wisconsin Central.—The stock held by Edward Sweet & Co., Maitland, Coppell & Co., Brown Brothers & Co. and James B. Colgate & Co. has been sold to interests represented by W. A. Bradford, President of the Chicago, Cincinnati & Louisville, and associates. No changes have yet been made in the Board of Directors, except the resignation of W. L. Bull as Chairman of the Board; his successor is George M. Cummings.

# GENERAL NEWS SECTION

## NOTES.

In the Supreme Court of Massachusetts at Boston, September 28, the New York, New Haven & Hartford was fined $1,000 for contempt of court in not obeying an injunction to remove certain tracks across Magazine street.

On the Memphis division of the Southern Railway "train auditors" are to be employed. The train auditor makes occasional and unannounced visits to different trains, taking up the financial work of the conductor and continuing in charge of it to the end of the trip.

It is reported in Pittsburg that beginning with November all of the roads in the Central Passenger Association will make cash fares 15 per cent. higher than the prices for tickets, and that the excess thus collected will not be refunded. It is said that this is not forbidden by the Ohio two-cent law.

According to the *Chicago Tribune*, Mr. Midgley expects to have a co-operative car company ready to do business within three months. Mr. Midgley says that various railroad companies will join in a company, with a hundred millions capital, to furnish refrigerator, stock and other special freight cars.

A press despatch from Washington on Monday of this week says that the machinists employed by the Southern Railway, 800 in number, have struck for an increase of 25 cents a day in their pay. Protracted negotiations have been held between the officers of the road and those of the International Association of Machinists, but without favorable results.

The State Railroad Commission of Texas has notified the railroads that all passenger rates less than those prescribed by statute or by order of the Commission must be submitted to the Commission and approval of the Commission obtained, before being put in effect. In other words, all excursion rates must be referred to the Commission before being published.

The New York, New Haven & Hartford announces that it will run four through passenger trains each way daily, except Sunday, between Providence, R. I., and Fitchburg, Mass., by way of Worcester. These trains will run over the Boston & Maine from Worcester to Sterling Junction, 12 miles. Trains going north will have to be backed into the Union station at Worcester.

In spite of the reduction in passenger rates to 2½ cents a mile with an unlimited two cent mileage book made by the Pennsylvania, the Pennsylvania State Board of Trade is now proposing to keep up its agitation for the reduction of all classes of tickets to two cents a mile, and the Republican candidate for Governor in that state declares that if he is elected he will see that a two-cent rate is adopted on all the railroads of the state.

The City of New York, which has now for several months been operating a ferry boat line between Manhattan and Staten Island, five miles, has bought control of another ferry, that from Manhattan to Thirty-ninth street, South Brooklyn. The city will begin operating this line next Monday. The sum paid is reported as $750,000, which appears to be the cost of the franchises, as the boats have not been bought. The city will lease the present boats until it can provide new ones.

The Attorney General of Massachusetts has begun suit in the Supreme Court against the New York, New Haven & Hartford on account of the ownership by that road of the stocks and bonds of Massachusetts street railways. The railroad company has disposed of its ownership in these properties to a separate corporation, but the Attorney General desires to question before the court the validity of some of the acts which were done by the railroad in connection with the transfer.

Both the Southern Pacific and the Atchison, Topeka & Santa Fe are continuing and increasing their efforts to publish throughout the country the need of skilled workmen in the building trades at San Francisco, and also laborers in railroad building, in fruit growing and in the Union Iron Works. Wages range from $7 a day for bricklayers to $2.75 for unskilled laborers, in San Francisco, and $2 a day, with lodging, for laborers on new railroad work. Attention is called to the fact that the California winter is warm and sunny, permitting outdoor work to be carried on throughout the season.

According to the *Times-Democrat*, of New Orleans, the export grain traffic through that city has fallen off seriously because the Illinois Central, in consequence of the change in the Interstate Commerce law, has taken into its own hands the management of its grain elevators there, abrogating the leases under which the elevators have heretofore been managed by two grain exporting companies. The quantities handled at these elevators in September were 220,000 bushels of wheat and 30,000 bushels of oats, whereas the average quantity of grain handled monthly during the past year has been 2,000,000 bushels.

The Society of American Florists & Ornamental Horticulturists has complained to the Interstate Commerce Commission of excessive rates charged on flowers by the United States Express Company. The members of the society ship large quantities from points in New Jersey and Pennsylvania to New York City, and they say that since last May the express company has doubled its rates, making them nearly ruinous. By this announcement we see how Mr. Hepburn's act has added a little poetry to the humdrum life of the Interstate Commerce Commission. As Secretary Moseley is himself a florist, our of office hours, the New Jersey complainants ought to be sure of a sympathetic hearing—in spite of the Secretary's impartiality.

The Federal Grand Jury at New York City on Tuesday of this week made public eight indictments for giving and receiving rebates. It is not clear whether this list is made up wholly of new indictments, or partly of those published several months ago, but there are some names which did not appear in the announcement made in the summer. The present list includes eight items, all apparently based on shipments of sugar from New York to the West. The names are: The American Sugar Refining Company; the American Sugar Refining Company, of New York; C. G. Edgar, Edwin Earle, Western Transit Company, Delaware, Lackawanna & Western, Northern Steamship Company, New York Central and Hudson River Railroad and Brooklyn Cooperage Company.

According to the *Barnesville* (N. Dak.) *Record*, a northbound and a southbound train of the Great Northern were recently held at stations 30 miles apart in the middle of the night by the error of a despatcher. An order was sent to train No. 7 northbound to meet train No. 6 southbound at Downer, while No. 6 was ordered to meet No. 7 at Averill, 30 miles further north. Neither of these stations has a telegraph office, so that the crews of both trains were left in suspense. After about two hours the northbound train sent on a hand car with a red lantern, to see what was the matter. It had not gone far before it met an engine which had been sent south on a similar errand. An order with negative lap certainly has its merits as a safety device. For convenience it is open to criticism.

In a rear collision on the Boston & Maine at Lansingburg, N. Y., October 4, five passengers were killed and 20 or more were injured. The regular day passenger train from Boston to Albany, standing at the station, was run into at the rear by a special train carrying troops bound for Newport News to embark for Cuba; and the two rear cars of the standing train were wrecked and knocked down a bank. The engine of the special train was also overturned, and the car behind it was wrecked. The special train consisted of an engine and 18 cars and approached the station on a descending grade at uncontrollable speed. An officer of the road says that the special was signaled at a sufficient distance to enable it to be stopped, and that the engineman answered the flag signal by two blasts of the whistle.

The Santa Fe has begun planting trees on its land in San Diego county, southern California. The tract is 8,650 aches in extent and is known as the Rancho San Diegito. It is near Del Mar. It will be converted into a eucalyptus grove. About 700 acres a year will be planted for a number of years. The wood will be used for ties and piles. F. P. Hosp, who has charge of this class of work, estimates that $3,000 worth of timber for ties can be raised on one acre. The red gum will be planted, as this, as well as the sugar and iron bark varieties of eucalyptus, has been shown by experiments in Australia to last more than 25 years underground, while the blue gum will not last more than three years underground. The seeding will be done during the winter and the seedlings for the first year's planting are now in preparation. About 3,000 boxes of small seedlings are required.

At Lynchburg, Va., October 2, a conference was held between officers of the Norfolk & Western, the Chesapeake & Ohio and the Southern Railways and a committee representing religious bodies of Virginia, with a view to making an agreement concerning the running of freight and excursion trains on Sunday. Another conference is to be held soon, and it is proposed to draw up a bill, to be presented to the next Legislature, regulating the movement of trains on Sundays. The men at the conference were: Dr. W. W. Smith, Rev. W. W. Royall, Rev. Dr. R. H. Fleming, George E.

Caskie and H. H. Harris, of the committee, and President Stevens and General Manager Doyle, of the Chesapeake & Ohio; Second Vice-President Finley, General Manager Spencer and General Counsel Thom, of the Southern, and President Johnson and General Manager N. D. Maher, of the Norfolk & Western.

### New Steamers for the St. Lawrence.

The Rutland Transit Co. will soon give orders for two new freight steamers to be duplicates of the steamers "Rutland" and "Ogdensburg" built for this company by the American Shipbuilding Co. This is one of the New York Central lake lines.

### Reduced Freight Rates in Minnesota.

A press despatch from St. Paul, October 8, says that the railroads of Minnesota will accept the reductions in freight rates of 10 to 20 per cent. recently ordered by the State Railroad and Warehouse Commission. They have waived the right of appeal and sent formal notice, through a committee, that they will make the reductions. The decision was made at a meeting and was agreed to by all the roads to whom the order was issued, which includes all the roads in the State except a few logging roads. It will take at least two weeks to make up the tariffs and the roads want to make changes in their interstate tariffs at the same time. These last must be sent to the Interstate Commerce Commission thirty days before they go into effect, so that November 15 is the earliest day when the change can reasonably be put in effect.

### Completion of the Pennsylvania North River Tunnels.

The two headings of the second or south tube of the Pennsylvania tunnels under the North river met on morning of October 9 and a party of engineers and invited guests walked through from the New Jersey end to Manhattan. Air pressure was turned on the south tunnel in the Manhattan heading in June, 1905, and in the New Jersey heading a month later. The two shields met about 100 ft. east of the center, the west shield having been pushed faster than the other. The north tube was opened through on September 12. The completion of these two tubes in about 15 months is a new record in the construction of submarine tunnels. There have been no serious accidents and no lives have been lost. It is expected to have both tubes lined and finished complete ready for running trains in 18 months.

### Panama Canal to be Built by Contract.

It has been decided to ask contractors to bid on the work of digging the Isthmian Canal and invitations for proposals were issued by the Canal Commission last Tuesday. The form of contract under which the work is done was made public by Chairman Shonts, who also gave out a letter written to the Secretary of War, giving the Commission's reasons for its present action.

Each bidder must undertake the entire work of construction. No bar will be offered to corporations associating in the undertaking, but they must be legally organized into a single body with which the Government can deal. Bidders will not be considered who do not have available capital of $5,000,000. A certified check for $200,000 is required with each proposal and a bond of $3,000,000 will be required from the successful bidder. The bidding is not limited to American contractors. All proposals are to be in before noon of December 12, when they will be opened. Proposals are to be expressed in terms of percentages of the estimated cost of construction which is to be fixed by a board of five engineers, three representing the Government and two representing the contractors.

Sixty days after signing of the contract actual work is to begin and the contractor is to take over all employees on the isthmus which the Commission does not wish to retain. No American employee is to work more than eight hours.

### The Grand Trunk Pacific.

Charles M. Hays, president of this company, and vice-president and general manager of the Grand Trunk system, has returned from an extensive trip by horseback and wagon over the route of the new road, and tells of what he has seen.

"The great wheat growing region of Manitoba, Assiniboia and Alberta and the rich mineral regions of British Columbia, will afford a heavy traffic for the road and the district is so large that there is no danger of overbuilding railroads. The distance between New York and Yokohama over this route will be 1,500 miles shorter than the San Francisco route, 500 miles shorter than the Canadian Pacific and fully as much less than the Hill routes. "Our location on the Pacific Coast, being almost directly opposite the 'great circle,' where boats have to come before starting west, gives us an advantageous position. Then our harbor is second to none on the Pacific Coast.

"At Prince Rupert we have a harbor ten miles long and five miles wide with no limit to depth of water. Digby Island forms a natural breakwater and affords full protection. The entrance to the harbor is 2,000 ft. wide and 40 ft. deep.

"Our road is being constructed on a four-tenths of 1 per cent. grade, and we hope to cross the mountains with less than 1 per cent. The maximum curvature in the mountains will be only six degrees. The road from Winnipeg to Edmonton, where we intersect the Canadian Northern and Canadian Pacific, is under construction and fully 60 per cent. of the grading has been done. We have promised the people of Edmonton that we will help carry out the 1907 wheat crop."

### Harbor Improvements in Africa.

The Cape of Good Hope Government Gazette contains an act to provide $281,770 for the purpose of improving the harbor works of East London and Mossel Bay, South Africa.

The following public works are projected in Algeria, North Africa: At Nemours it is proposed to spend $660,000 on the construction of a port where vessels may anchor safely. The matter is now under the consideration of the Council-General of Ways and Harbors. At Arzew the sum of $240,000 has been asked for harbor improvements. At Mostaganem the large jetty is to be put in thorough order. At Algiers a project is in view for joining the Island of Al-Djefua to the shore by a mole. At Port Gueydon the works for the protection of the jetty have now been completed, and a scheme is on foot to prolong the jetty. At Tigzirt a prolongation of the landing stage is in contemplation. At Bône the works for the new phosphate quay and the making of a new quay at the mouth of the Seybouse have been decided upon. The entire cost of the works in progress at this port will total $1,628,000.—*Consular Reports.*

### The Mexico, Oaxaca & Yucatan.

An interesting project is under way for building a railroad in the southeastern part of Mexico from Mexico City easterly to Merida, the capital of the state of Yucatan, running through the states along the isthmus between the Gulf of Campeche, which is a part of the Gulf of Mexico, and the Gulf of Tehuantepec, in the Pacific ocean. The Mexico, Oaxaca & Yucatan has been incorporated in Maine with $1,000,000 capital, which is to be increased at the rate of $32,000 gold for each mile of line built and equipped. First mortgage bonds are to be issued at the same rate per mile, and it is said that arrangements have been made for their underwriting and sale. The road is to be about 1,300 miles long; it will run from the City of Mexico southeast through the city of Puebla to Oaxaca, the capital of the state of Oaxaca, 360 miles, thence east to Santa Lucretia on the Tehuantepec National, and then northeast through the states of Chiapas, Tabasco and Campeche to Merida, which is about 30 miles inland from the coast of the Gulf of Mexico. From Concepcion, in Oaxaca, a branch is to be built southeast to the port of Belize, in British Honduras. Other branch lines will be built, making a total of about 300 miles. On the line from the city of Oaxaca to Merida, 750 miles, the Mexican government has agreed to pay a subsidy of $12,800 gold per mile in cash and $2,400 gold per mile in grants of public lands. It is proposed to acquire the San Rafael & Atlixco, a narrow gage road running from the City of Mexico south to Atiixco, 108 miles, which is to be made standard gage.

The country through which the new line will run is said to be as rich in minerals and timber as any part of Mexico. The road runs through 400 miles of hard wood forest, largely mahogany, and in Oaxaca there are extensive iron mines which can be worked profitably when the product can be shipped by railroad; they have been abandoned for some years as mule trains were the only available means of transportation. There are also large deposits of oil and coal. The company has ordered a large number of locomotives, all of which are to be oil burning. Preliminary surveys have been completed and construction, it is expected, will begin early next year. The President of the company is W. G. Seaver; W. S. Carter, of St. Louis, and W. J. Allen are Vice-Presidents; R. E. Briggs, formerly on the Mexican Central, is Chief Engineer, and Santiago Mendez, Inspector General of the National Lines of Mexico, is Consulting Engineer. R. C. Fraser, 10 Wall street, New York, is Secretary and Purchasing Agent.

### Nationalization in France.

Rumors of the impending purchase of the Western Railway of France by the Government are again afloat, and investigations are at present being carried out with a view to presenting a report on the financial aspects of the proposal to the Chamber. The arguments used by those in favor of nationalization are much the same as elsewhere, and divided management and difficulty of arranging through rates are said to cause great hindrance to trade; after the companies agree to any given through rate, Government sanction has to be obtained. But, even if the difficulties attending company administration were much worse than they are, the nationalization of the whole railroads of France would be, as in America or England, but a leap from the frying pan into the fire. With the exception of the Swiss railroads it is impossible to find any state-operated line which has shown the same energy or care for the public as have the best companies in France, such, for example, as the Nord. However, the purchase of the Ouest Railway will undoubtedly be a good thing for the shareholders, and the terms are likely to be fair.

## TRADE CATALOGUES.

*Derails.*—Circular No. 43 of the Hayes Track Appliance Co., Geneva, N. Y., reproduces some excellent photographs of the Hayes lifting derail installed on several roads entering Chicago. A list is given of the number of these devices used on each of some of the more important railroads.

*The Yale & Towne Manufacturing Co.*, New York, is distributing attractive small pamphlets giving suggestions for selling Yale padlocks. The burden of one of these is a story of newly married life called "The Little Black Box."

*Self-Measuring Oil Tanks.*—S. F. Bowser & Co., Ft. Wayne, Ind., send a number of cuts of their self-measuring oil outfits. They are printed in colors, each on a separate sheet of heavy enamel paper 7 x 9.

### Manufacturing and Business.

J. W. Cain, formerly Assistant Engineer of Tests of the Atchison, Topeka & Santa Fe, has taken a position with McCord & Co., Chicago.

The Power Specialty Co., New York, has opened a branch office in Philadelphia in the Land Title Building. It is in charge of W. E. Dowd, Jr.

The H. A. Rogers Company, 19 John street, New York City, report important orders from the Philippine Islands for railroad construction material and machine shop equipment.

The Chicago Pneumatic Tool Co., Chicago, has received orders from the Chicago, Burlington & Quincy R. R. for 114 Boyer speed recorders, to be applied to new equipment now being received.

H. S. Brown, New England Sales Manager of the Power Specialty Co., New York, with offices at 10 Post Office Square, Boston, sailed this week for a short stay in Europe and will return about Nov. 10th.

C. F. Baker has been engaged by L. B. Stillwell, Consulting Engineer, as superintendent of power and construction in connection with the engineering and operating contract which Mr. Stillwell has recently made with the United Railways & Electric Company, of Baltimore. Mr. Baker has been President of the American Street Railway Mechanical & Electrical Association, and of the New England Railroad Club, and is a member of the New England Street Railway Club. For many years he was with the West End Street Railway Co., of Boston, and the Boston Elevated, in charge of the construction and operation of power plants and rolling stock.

The partnership between J. A. L. Waddell and Ira G. Hedrick, under the firm name of Waddell & Hedrick, Consulting Engineers, will be dissolved by mutual agreement on December 31, 1906, notwithstanding the fact that the firm's business has been eminently successful. Mr. Waddell will form a new partnership on January 1, 1907, with John Lyle Harrington, under the firm name of Waddell & Harrington, Consulting Engineers, with offices at Kansas City, Mo. This firm will engage mainly in bridge and structural engineering. Mr. Harrington is at present Chief Engineer of the Locomotive & Machine Company of Montreal. He was formerly engineer of the C. W. Hunt Company, of New York. Mr. Hedrick will open offices as consulting engineer at Kansas City. He will continue in bridge engineering, but will also engage in engineering work in the promotion and development of new railroads and other enterprises.

It is said that probably a greater variety and number of steam shovels has been used in the Missabe iron range of Minnesota in recent years than in any other section of like area in the world. But in the past three or four years the selection has narrowed to two makes. Last year out of a total number of 27 machines for which bids were asked The Marion Steam Shovel Co., Marion, Ohio, supplied 20. Bids were again asked just recently on 28 machines and the entire award was made to this company. The total number finally furnished was one in excess of the original request, or 29 in all, claimed to be the largest single order of steam shovels ever placed. An order also has been received from the Republic Iron & Steel Co. for shovels for use in this same locality. H. S. Kerbaugh, Philadelphia, has bought about 20 Marion shovels during the past year. The company at present ships from 35 to 40 shovels a month and is increasing its facilities for production.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### General Passenger Agents' Association.

The annual meeting of the American Association of General Passenger and Ticket Agents will be held at Atlantic City, N. J., October 16. Following are the principal items of business covered in the announcement: Report of committees on safety paper; reports from co-operating associations—accounting officers, general baggage agents, Canadian ticket agents, and traveling passenger agents; proposed amendments to constitution; limiting liability on baggage; proposed discontinuance of making sleeping car reservations in advance; proposed adoption of oval or round punch for limiting tickets.

The annual address will be delivered by Mr. John J. Byrne, of the Atchison, Topeka & Santa Fe. There will be a meeting of the Fraternal Society following the regular meeting.

### Freight Traffic Officers.

The American Association of Freight Traffic Officers will hold its annual meeting at the Waldorf-Astoria, New York City, October 17. The President of the Association is D. M. Goodwyn, General Freight Agent of the Louisville & Nashville, and the Chairman of the local committee for the present meeting is Mr. H. B. Walker, Vice-President of the Old Dominion Steamship Company, New York City.

### Railway Signal Association.

In connection with the annual meeting at Washington next week the Secretary announces that the members will be received by President Roosevelt at the White House on Wednesday afternoon, October 17, at 2.30 o'clock.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Lehigh & New England.*—The offices of the General Manager, Chief Engineer and the Assistant Treasurer have been removed from Pen Argyl, Pa., to Bethlehem, Pa.

*McCloud River.*—The offices of the President and the Traffic Manager have been removed from San Francisco, Cal., to Oakland. J. H. Osmer has been appointed Auditor, with office at McCloud, Cal.

*Midland Valley.*—The offices of the General Solicitor and the Auditor have been removed from Fort Smith, Ark., to Muskogee, Ind. T.

*Missouri, Oklahoma & Gulf.*—E. R. Jones has been elected Secretary, with office at Muskogee, Ind. T., succeeding F. T. Taylor.

*Texas & Gulf.*—F. G. Pettibone has been elected President, succeeding N. C. Nixon.

*Tonopah & Goldfield.*—L. J. Lyon has been appointed Auditor, with office at Tonopah, Nev., succeeding W. W. Keith.

*Wisconsin Central.*—W. A. Bradford, Jr., President of the Chicago, Cincinnati & Louisville, has been elected also President and a Director of the Wisconsin Central, succeeding H. A. Whitcomb, resigned. Howard Morris, Vice-President and General Counsel, has resigned. F. H. Dewey has been appointed Assistant to the President. G. W. Webster has been elected Secretary, succeeding C. M. Morris, and R. T. Goodell has been appointed Assistant Secretary, succeeding J. S. Dale. The following Board of Directors has been elected: George M. Cumming, William A. Bradford, Jr., T. L. Chadbourne, Jr., George A. Fernald, John P. Hill, F. H. Dewey, Harry Starr, C. G. Rasmus, Mark T. Cox, William F. Vilas and Fred T. Gates.

### Operating Officers.

*Denver & Rio Grande.*—H. F. Stanley has been appointed Assistant Superintendent of the third division, with office at Salida, Colo., succeeding A. S. Exter.

*East Broad Top.*—E. C. Hall, Assistant to the General Manager, has been appointed to the new office of Superintendent, with office at Orbisonia, Pa.

*Erie.*—A. J. Grymes has been appointed Superintendent of the Marine Department, with office at Jersey City, N. J., succeeding to the duties heretofore performed by C. H. Van Keuren, who was Superintendent of Floating Equipment, and who resigned some months ago. C. R. Stewart has been appointed Assistant Superintendent of the Marine Department, with office at Jersey City.

*Interoceanic of Mexico.*—J. C. Seilsky has been appointed Superintendent of Terminals at Vera Cruz, succeeding H. A. McCulloch.

*Lake Shore & Michigan Southern.*—H. M. Tompkins, who was recently appointed Superintendent at Buffalo, N. Y., was born in 1864 at Galesburg, Ill., and was educated in the public schools of that place. He began railroad work in 1877 as a messenger boy on the Chicago, Burlington & Quincy, and remained on that road until 1904, serving successively as clerk, telegraph operator, car distributor, train despatcher, chief despatcher and trainmaster. He then went to the Lake Shore, and for a year did special work in helping to put in operation a system of handling trains on double track with block signals, and revising the book of rules. Early in 1905 he was appointed Assistant Superintendent at Buffalo, from which position he has now been promoted.

*Lehigh & New England.*—A. S. Wright has been appointed Superintendent of Car Service.

*Mexican Central.*—W. T. E. ... has been appointed Superintendent of ... at Tampico, Mex.

*National of Mexico.*—H. H. Allison, Superintendent of Terminals, Mexico City, has been appointed Superintendent at Monterey, succeeding G. F. De Wolf, who takes Mr. Allison's place at Mexico City.

*Rio Grande Western.*—B. A. Campbell has been appointed Assistant Superintendent with office at Salt Lake City, Utah.

*Southern.*—A. P. Co... has been appointed Assistant Superintendent of the Washington division, with office at Alexandria, Va.

*Ulster & Delaware.*—R. O'Sullivan, roadmaster, has been appointed Assistant General Superintendent.

### Traffic Officers.

*Birmingham Belt.*—E. T. Willcox has been appointed General Freight Agent, with office at Birmingham, Ala.

*Florida West Shore.*—C. R. Capps has been appointed General Freight Agent.

*Missouri, Kansas & Texas of Texas.*—E. S. Briggs has been appointed Assistant General Freight Agent, with office at Houston, Tex., succeeding T. Noel.

*New York Central & Hudson River.*—William L. Kingman, who was recently appointed Industrial Agent, was born in New York State in 1842 and educated at Owego (N. Y.) Academy. He began railroad work in 1860 as a freight clerk on the New York & Erie, now part of the Erie. After working up in this department, he went in 1872 to the auditing department and next year was made station agent at Elmira, N. Y. After being manager of the McIntyre Coal Co., at that place, he was made in 1878 General Coal Agent of the New York Central. He was appointed Assistant General Freight Agent of this road in 1893 and General Freight Agent in 1895, which he held until his recent appointment.

### Engineering and Rolling Stock Officers.

*Cleveland, Cincinnati, Chicago & St. Louis.*—George Crocker has been appointed Division Engineer in charge of construction on the Cincinnati division, with office at Middletown, O., succeeding H. P. Delano, resigned.

*Colorado Midland.*—R. Griffith has been appointed Master Mechanic, with office at Colorado City, Colo., succeeding to the duties heretofore performed by W. J. Schlacks, who has resigned.

*El Paso & Southwestern.*—The office of the Superintendent of Motive Power has been removed from Douglas, Ariz., to El Paso, Tex.

*Evansville & Terre Haute.*—J. W. Hunter has been appointed Division Engineer at Evansville, Ind.

*Lehigh Valley.*—H. W. Lewis, Supervisor of Signals at Easton, Pa., has been appointed Signal Engineer, with office at South Bethlehem, Pa., succeeding C. C. Rosenberg, resigned.

*McCloud River.*—J. Kennedy has been appointed Master Mechanic, with office at McCloud, Cal.

*Mexican Central.*—E. J. Lass has been appointed Acting Mechanical Engineer, succeeding C. T. Bayless, deceased. C. F. Roberts, General Foreman at Monterey, has been appointed Master Mechanic at Cardenas, succeeding J. J. Cavanaugh, resigned.

*Michigan Central.*—G. H. Harris, Division Engineer at Niles, Mich., has been appointed Assistant Engineer, with office at Detroit, Mich. Mr. Harris will assist the Assistant Chief Engineer, C. C. Hill succeeds Mr. Harris.

*National of Mexico.*—M. J. Schneider has been appointed Superintendent of Motive Power, with office at Laredo, Tex., succeeding James Farrell.

*Rio Grande Junction.*—W. A. Whitney has been appointed Superintendent, with office at Grand Junction, Colo., succeeding W. G. Choate resigned.

*Tennessee Railroad.*—J. F. Ashworth has been appointed Master Mechanic.

*Yazoo & Mississippi Valley.*—M. H. Hovey has been appointed Signal Engineer, with office at Chicago, Ill., succeeding W. A. D. Short, resigned.

### Purchasing Agents.

*Georgia Southern & Florida.*—W. P. Harper has been appointed Purchasing Agent, with office at Macon, Ga.

*Tonopah & Goldfield.*—J. H. Kuhns has been appointed Purchasing Agent, with office at Tonopah, Nev.

## LOCOMOTIVE BUILDING.

*The Buffalo, Rochester & Pittsburg* denies having recently ordered any heavy locomotives for freight and passenger service.

*The Charlotte Harbor & Northern* has ordered from the Baldwin Locomotive Works for December, 1906, delivery one simple ten-wheeler (4-6-0) and one simple consolidation (2-8-0) locomotive. The consolidation locomotive is to have cylinders 20 in. x 24 in. and the ten-wheeler, 18 in. x 24 in.

*The Chicago, Milwaukee & St. Paul* is building 18 ten-wheel passenger (4-6-0) locomotives and 15 freight locomotives at its West Milwaukee shops. The specifications are as follows:

*General Dimensions.*

| | Ten-wheel. | Freight. |
|---|---|---|
| Type of locomotive | Ten-wheel | Freight |
| Weight, total | 178,000 lbs. | 177,000 lbs. |
| Weight on drivers | 131,000 lbs. | 156,000 lbs. |
| Cylinders | 20½ in. x 26 in. | 21 in. x 30 in. |
| Boiler, wkg. steam pressure | 200 lbs. | 200 lbs. |
| " number of tubes | 304 | 350 |
| " diameter of tubes | 2 in. | 2 in. |
| " length of tubes | 15 ft. | 15 ft. |
| Firebox, length | 8 ft. 11½ in. | 9 ft. 11½ in. |
| " width | 3 ft. 5½ in. | 3 ft. 5½ in. |
| " grate area | 30.3 sq. ft. | 34.16 sq. ft. |
| Heating surface, total | 2,538.6 sq. ft. | 2,919.0 sq. ft. |
| Tank capacity | 7,000 gals. | |
| Coal capacity | 10 tons. | |

*The Bangor & Aroostook* has ordered from the American Locomotive Co. three simple ten-wheel (4-6-0) locomotives. The specifications are as follows:

| | |
|---|---|
| Weight on drivers | 113,000 lbs. |
| Total weight | 146,000 lbs. |
| Diameter of cylinders | 20 in. |
| Stroke of pistons | 26 in. |
| Diameter of drivers | 66 in. |
| Type of boiler | Extended wagon top |
| Working steam pressure | 180 lbs. |
| Heating surface, total | 2,952 sq. ft. |
| Tubes, number | 277 |
| " outside diameter | 2 in. |
| " length | 13 ft. 8 in. |
| Firebox, length | 96 in. |
| " width | 41 in. |
| Grate area | 27 sq. ft. |
| Tank capacity for water | 4,000 gals. |
| Coal capacity | 7 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Brake beams | Sterlingworth |
| Couplers | Tower |
| Headlights | Dewey |
| Sanding devices | Leach |
| Steam heat equipment | one engine Consolidated Car Htg. Co. |
| Tires, driving wheel | Milvale |

*The Canadian Pacific*, as reported in our issue of Sept. 28, has ordered 30 simple superheater ten-wheel (4-6-0) locomotives and 20 simple superheater consolidation (2-8-0) locomotives from the Locomotive & Machine Co., of Montreal. The ten-wheel locomotives are for December, January and February delivery. The specifications are as follows:

*General Dimensions.*

| | Ten-wheel. | Consolidation. |
|---|---|---|
| Type of locomotive | Ten-wheel. | Consolidation. |
| Weight, total | 190,000 lbs. | 186,200 lbs. |
| Weight on drivers | 141,000 lbs. | 163,700 lbs. |
| Diameter of drivers | 63 in. | 58 in. |
| Cylinders | 22½ in. x 28 in. | |
| Boiler, type | Radial stay wagon top. | |
| " wkg. steam pressure | 175 lbs. | |
| " No. of tubes | 240 2-in. and 24 5-in. | |
| " length of tubes | 14 ft. 4 in. | 14 ft. 2½ in. |
| Firebox, length | 102⅛ in. | 96⅝ in. |
| " width | 69⅝ in. | 65¼ in. |
| " material | Otis. | |
| " grate area | 49 sq. ft. | 43 sq. ft. |
| Heating surface, total | 2,413 sq. ft. | 2,216 sq. ft. |
| Tank capacity | 5,000 Imperial gals. | |
| Coal capacity | 10 tons. | |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Perth & Lozer (steel) |
| Boiler ringer | "Little Giant" |
| Boiler lagging | Sectional magnesia |
| Brake-beams | Sandlex |
| Brake shoes | Canadian Pacific standard |
| Couplers | Washburn and Tower |
| Headlights | Pyle National |
| Injector | Hancock |
| Journal bearings | Canadian Pacific standard |
| Piston rod packings | Lewis & Kunzer's |
| Valve rod packings | Lewis & Kunzer's |
| Safety valve | World brand |
| Sanding devices | Leach |
| Sight-feed lubricators | Detroit |
| Springs | Canadian Pacific standard |
| Steam gages | Star |
| Steam heat equipment | Gould |
| Other specialties | Vaughan-Horsey superheater |

*The Intercolonial* has ordered two simple ten-wheel (4-6-0) passenger locomotives from the Canadian Locomotive Co., Ltd. The specifications are as follows:

| | |
|---|---|
| Weight, total | 87,500 lbs. |
| Weight on drivers | 75,500 lbs. |
| Dimension of cylinders | 16 in. |
| Stroke of pistons | 22 " |
| Diameter of drivers | 66 " |
| Boiler, type | Extended wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 250 |
| Tubes, material | Charcoal iron |
| " outside diameter | 1¾ in. |
| " length | 12 ft. |
| Firebox, material | S. F. B. steel |
| Tank capacity | 3,600 gals. |
| Coal capacity | 5 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Hammered steel |
| Bell ringer | Automatic |
| Boiler lagging | Asbestos |
| Brake-beams | Simplex |
| Injector | Hancock |
| Journal bearings | Ajax |
| Piston rod packings | W. S. metallic |
| Valve rod packings | W. S. metallic |
| Safety valve | Coale |
| Sanding devices | Wilson's |
| Sight-feed lubricators | Detroit |
| Springs | Crucible cast-steel |
| Steam heat equipment | Safety Car Htg. & Lighting Co. |
| Other specialties | Elvin grease cups |

*The Mexico, Oaxaca & Yucatan* has ordered from the Baldwin Locomotive Works 60 ten-wheel (4-6-0) locomotives, 40 consolidation (2-8-0) locomotives, and four switching locomotives. All locomotives are to be oil burning, and the ten-wheelers and the consolidation engines are for December, 1907, delivery. The special equipment is the same for all classes. The specifications are as follows:

| | Consolidation. | Ten Wheel. |
|---|---|---|
| Weight on drivers | 174,000 lbs. | 126,000 lbs. |
| " total | 195,000 lbs. | 168,000 lbs. |
| Diam. of cylinders | 22 in. | 20 in. |
| Stroke of pistons | 28 in. | 28 in. |
| Diam. of drivers | 57 in. | 63 in. |
| Type of boiler | Straight top | Extended wagon top |
| Working steam pressure | 200 lbs. | 200 lbs. |
| Heating surface—total | 3,162 sq. ft. | 2,766 sq. ft. |
| Tubes—number | 321 | 360 |
| " material | Charcoal iron | Charcoal iron |
| " outside diam. | 2¼ in. | 2 in. |
| " length | 16 ft. | 14 ft. |
| Firebox, length | 108 in. | 102 in. |
| " width | 66 in. | 66 in. |
| " material | Homogeneous steel | Homogeneous steel |
| Grate area | 58½ sq. ft. | 46⅞ sq. ft. |
| Tank capacity, water | 6,000 gal. | 5,000 gal. |
| Oil capacity | 5,000 gal. | 4,500 gal. |
| | | Switching. |
| Total weight | | 113,000 lbs. |
| Diameter of cylinders | | 19 in. |
| Stroke of pistons | | 24 in. |
| Diameter of drivers | | 52 in. |
| Type of boiler | | Straight top |
| Working steam pressure | | 180 lbs. |
| Heating surface—total | | 1,451⅗ sq. ft. |
| Tubes—number | | 229 |
| " material | | Charcoal iron |
| " outside diameter | | 2 in. |
| " length | | 11 ft. 1 in. |
| Firebox—length | | 91⅛ in. |
| " width | | 41 in. |
| " material | | Homogeneous steel |
| Grate area | | 25⅝ sq. ft. |
| Tank capacity for water | | 4,000 gal. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Hammered steel |
| Brake beams | Buffalo-Vanderbilt |
| Couplers | Tower |
| Headlights | Pyle-National |
| Injector | Hancock |
| Piston rod packings | U. S. Metallic Packing Co. |
| Safety valve | Ashton |
| Sanding devices | Leach |
| Sight-feed lubricators | Detroit |
| Springs | Baldwin standard |
| Steam gages | Ashcroft |
| Steam heat equipment | None |
| Tires, driving wheel | Baldwin standard |
| " truck wheel | Baldwin standard |
| " tender wheel | Baldwin standard |
| Wheel centers | Cast iron |

## CAR BUILDING.

*The Seaboard Air Line* is in the market for 1,000 box cars and 1,000 gondolas.

*The Northern Pacific* is reported as in the market for about 160 passenger cars.

*The Mobile, Jackson & Kansas City* has ordered 20 flat cars from the Western Steel Car Co.

*The St. Louis Southwestern* contemplates building about 450 cars at its Pine Bluff (Ark.) shops.

*The Boston & Maine* has ordered 500 box cars of 60,000 lbs. capacity from the Western Steel Car Co.

*The Buffalo & Susquehanna* has bought 500 steel gondola cars of 100,000 lbs. capacity each with six drop doors.

*The Canadian Pacific* is building 3,000 additional box cars of 60,000 lbs. capacity at its Angus shops exactly like the 1,118 box cars reported in our issue of October 5.

*The Grand Trunk* has ordered 1,000 self-clearing steel hopper bottom coal cars of 100,000 lbs. capacity from the Pressed Steel Car Co., for March and April, 1907, delivery.

*The Hudson Companies*, 111 Broadway, New York, have ordered 50 steel passenger cars from the American Car & Foundry Co. for delivery early next spring. An additional order for 150 cars will be given later.

*The Lake Superior & Ishpeming* has ordered 100 steel ore cars from the Pressed Steel Car Co., which are the same design as those ordered by the Marquette & Southeastern, specifications for which were published in our issue of Sept. 28.

*The Pere Marquette* has ordered from the Pullman Co. 2,000 box cars of 80,000 lbs. capacity; this is in addition to the order for 2,000 similar cars given to the same company last April.

*The Charlotte Harbor & Northern* has ordered from Barney & Smith, for December, 1906, delivery, one day coach and one combination passenger and baggage coach to be built at Dayton, Ohio. Bodies and underframes will be of wood.

*The Chicago, Rock Island & Pacific* is reported to be in the market for a large number of passenger cars, and has ordered 2,000 box, 400 furniture, 300 flat, 250 stock and 250 coal cars and 50 cabooses from the American Car & Foundry Co.; 650 National coal dump cars from the National Coal Dump Car Co., and 100 Hart convertible ballast cars from the Rodger Ballast Car Co.

*The Minneapolis, St. Paul & Sault Ste. Marie* has ordered 1,000 box cars of 60,000 lbs. capacity, 200 flat cars of 60,000 lbs. capacity, and 25 cabooses, as reported in our issue of Sept. 28, from the American Car & Foundry Co. The box cars will weigh 34,000 lbs. and measure 34 ft. 4 in. long, 8 ft. 4 in. wide and 8 ft. high, inside measurements. The flat cars will be 40 ft. long and 8 ft. 6 in. wide, outside measurements. The cabooses will weigh 24,000 lbs. and measure 31 ft. 4 in. long and 9 ft. wide, over all. The special equipment for all includes:

| | |
|---|---|
| Bolsters | Common Sense |
| Brake-beams | Simplex |
| Brake-shoes | Walsh |
| Brakes | Westinghouse |
| Brasses | National-Fulton |
| Draft rigging | Miner |
| Journal boxes | McCord |
| Springs | Simplex |

*The Atchison, Topeka & Santa Fe* has ordered 2,500 box cars of 70,000 lbs. capacity from the Standard Steel Car Co., for April, May and June, 1907, delivery; 1,600 gondolas of 100,000 lbs. capacity, 500 refrigerator cars of 60,000 lbs. capacity, 500 stock cars of 70,000 lbs. capacity, and 400 ballast cars of 100,000 lbs. capacity from the American Car & Foundry Co. The gondolas to be delivered from February to June, 1907, and the refrigerator cars for December delivery. The Atchison has also ordered 21 first class coaches, 20 chair cars and 20 smoking cars from the Pullman Co. for April and May, 1907, delivery. The box cars will weigh 38,000 lbs. and measure 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, inside measurements. The gondolas will weigh 44,000 lbs. and will measure 40 ft. long, 9 ft. 3½ in. wide and 4 ft. 7¼ in. high, inside measurement. The refrigerator cars will weigh 60,000 lbs., and will measure 32 ft. 6 in. long, 8 ft. 2¾ in. wide and 7 ft. 3⅛ in. high, inside measurements. The stock cars will weigh 46,000 lbs. and will measure 40 ft. long, 8 ft. 8 in. wide and 7 ft. 9 in. high, inside measurements. The ballast cars will weigh 45,500 lbs. and will measure 41 ft. 6 in. long, 10 ft. 3½ in. wide, and 9 ft. 10 in. high over all. The first class coaches will weigh 116,000 lbs. and will measure 70 ft. long, 10 ft. wide and 6 ft. 9⅛ in. high, inside measurements. The chair cars will weigh 113,000 lbs. and will measure 69 ft. 4 in. long, 10 ft. wide and 6 ft. 9⅛ in. high, inside measurements. The smoking cars will weigh 111,700 lbs. and will measure 69 ft. 2 in. long, 9 ft. 1 in. wide and 6 ft. 9 in. high, inside measurements. The special equipment for all cars includes:

| | |
|---|---|
| Axles | Cambria Steel Co. |
| Bolsters | American Steel Foundry |
| Brake beams | Kewanee & National Hollow |
| Brake-shoes | (Passenger cars) Diamond special |
| Brakes | Westinghouse |
| Brasses | Hewitt Mfg. Co. |
| Couplers | (Passenger cars) Janney; (Freight cars) National |
| Curtain fixtures | Forsyth |
| Curtain material | Pantasote |
| Door fastenings | Security (for box cars) |
| Draft rigging | Miner |
| Dust guards | Soule |
| Heading System | Pullman |
| Journal boxes | Symington (for passenger cars) |
| Journal boxes | McCord (for freight cars) |
| Springs | Simplex Appliance Co. |
| Trucks | Pullman |
| Wheels | Standard Steel Wks. (for passenger) |
| Wheels | Griffin (for freight) |

*The Harriman Lines* have ordered 113 coaches for the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation, the Southern Pacific, the Galveston, Harrisburg & San Antonio, Morgan's Louisiana & Texas, the Louisiana Western and the Cananea, Yaqui River & Pacific; five chair cars for the Oregon Short Line, two postal cars for the old Oregon and California, and 12 mail and baggage cars for the Oregon Short Line and the Cananea, Yaqui River & Pacific, all from the St. Louis Car Co., for delivery beginning February 1, 1907; 29 baggage cars for the Oregon Short Line, the Oregon Railroad & Navigation, the Oregon & California, the Southern Pacific, the Cananea, Yaqui River & Pacific, the Maricopa & Phoenix, Salt River Valley from Harlan & Hollingsworth, for January, 1907, delivery. The coaches and chair cars will weigh 88,000 lbs. and will measure 60 ft. long, 9 ft. 8 in. wide and 14 ft. 1⁹/₁₆ in. high, over all. The postal cars will weigh 101,500 lbs. and will measure 60 ft. 7¼ in. long, 9 ft. 8 in. wide and 14 ft. 1⁹/₁₆

in. high, over all. Seven of the mail and baggage cars will measure 60 ft. long, and five will measure 69 ft. long. The baggage cars will weigh 85,000 lbs. and will measure 68 ft. 1⅛ in. long and 9 ft. 7⅛ in. wide, inside measurements. The special equipment includes:

| | |
|---|---|
| Brake-shoes | American Brake-Shoe & Foundry |
| Couplers | McConway & Torley |
| Curtain material (coaches and chair cars) | Pantasote |
| Draft rigging | Sessions |
| Heating System | Consolidated Car Heating Co. |
| Journal boxes | National Malleable Castings Co. |
| Lighting | Safety Car Heating & Lighting Co. |
| Platforms | Standard Coupler Co. |
| Springs | Railway Steel Spring Co. |
| Vestibules | Pullman |
| Wheels | Standard Steel Works |

## RAILROAD STRUCTURES.

Atlanta, Ga.—Temporary shops are to be put up here by the Western & Atlantic to replace the buildings recently destroyed by fire. Plans are being considered for permanent structures to cost about $250,000.

Chicago, Ill.—The Chicago & North-Western is to build a new terminal station at Chicago. It will be on the West Side, between Madison, Lake, Canal and Clinton streets. Work will begin early next spring and be pushed to completion so as to have the station in service within two years.

Norfolk, Va.—Preliminary plans for the Tidewater Railway's new coal pier at Sewell's Point are about completed. It will be 1,370 ft. long with a maximum height of 82 ft. at low water, eight feet higher than the Lambert's Point piers, which are about 860 ft. long.

Omaha, Neb.—The Union Pacific, it is said, has given a contract for additional car shops here to consist of a main building of 300 x 600 ft. with an addition of 300 x 200 ft.

Oswego, N. Y.—The New York Central & Hudson River has asked bids for putting up a new passenger station at West First and Utica streets.

Scranton, Pa.—The Delaware, Lackawanna & Western is making plans for putting up a new passenger station at Platt Place and Lackawanna avenue.

Toledo, Ohio.—The new freight house which the Lake Shore & Michigan Southern is to build on the middle grounds will be 800 ft. long.

Vera Cruz, Mexico.—The preliminary surveys are being made for the proposed Union Terminal Station at this place. The several railroads have formed the Vera Cruz Terminal Company. Modern facilities for the prompt loading and discharging of vessels are also to be provided. The upper part of the passenger station is to be utilized as a hotel, with a frontage facing the Gulf. The plans now being prepared are to be presented to the Government for its approval within four months, and it is expected that work is to commence immediately thereafter.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Alabama City, Gadsden & Attala (Electric).—A meeting of the shareholders of this road is to be held October 15th to vote on the authorization of a new mortgage to secure funds, part of which will be used for extending the line from Gadsden, Ala., to Noccalula Falls, five miles. The company at present owns 11 miles of road, connecting Gadsden, Attala, Alabama City and Black Creek Falls Park.

Bessemer & Lake Erie.—The Western Allegheny branch of this road has been extended from East Brady west to Newcastle, about five miles. (July 13, p. 10.)

Brookville & Mahoning.—See Pittsburg, Shawmut & Northern.

Canadian Northern.—Work, it is said, has been started by this company on a branch line from Dalmeny to Coulter, Man., 45 miles.

Canadian Pacific.—This company is said to be back of a project to build a line from Gretna northwest to Portage la Prairie, Man., about 80 miles.

Chicago, Rock Island & Pacific.—The report of this company for the year ending June 30, 1906, shows that it had a total length of road of 7,426.26 miles, and that the average mileage operated was 7,218.07. Changes in operated mileage during the year by the acquirement of trackage rights, changes in alinement and the construction of a branch from Lehigh Junction to Lehigh, Indian Territory, 6.54 miles, made a total increase of 220.92 miles. The company has under construction on the Chicago, Rock Island & Pacific 12.73 miles between Haileyville, Indian Territory, and Wilburton, and on the Chicago, Rock Island & El Paso from the Texas-New Mexico boundary to Tucumcari, N. Mex., 41.12 miles, but on this no work had been done during the year; on the Chicago, Rock Island & Gulf from Amarillo, Tex., to the Mexican boundary, 69.87 miles, no work done during the past year; on the Rock Island, Arkansas & Louisiana active work is in progress from Haskell, Ark., which is 3.58 miles north of Traskwood, on the Hot Springs branch, to Eldorado, 100.78 miles, and on a branch from Tinsman to Crossett, 42.75 miles, a total of 143.53 miles, about one-third, 50.75 miles from Haskell, which is the north end of the line, to Fordyce, is now in operation. Surveys have been made for a line from Alexandria, La., to Eunice, 56.10 miles. On this construction work is to be pushed, making a total of 272.60 miles now under construction.

According to reports from Kansas City, this company is planning to make continuous freight yards from Twelfth and Mulberry streets across the Kaw river through Armourdale to a point north of the Procter & Gamble Soap Works. To carry out these improvements, the company has bought land along the right of way in Armourdale. A bridge has been built across the Kaw river, and the company has authorized an expenditure of about $500,000 for additional improvements. The present roundhouse and yards are to be removed to make room for tracks and a new building. The plans provide for the building of 39 miles of yard tracks, making a total in the Kansas City terminals of 80 miles of track, with an approximate capacity of 6,000 cars. The work requires the filling in of about 100,000 cubic yards of earth before the tracks can be laid. The plans include yards to be used for inbound freight west of the present Rock Island Junction at Twelfth street in Armourdale. The outbound freight yards will extend from Fourth to Twelfth streets in Armourdale, and the new yards for passenger trains will be in the west end of Armourdale. In the city freight yards between Belt and Genesee streets, extending south from Twelfth to Sixteenth streets, team tracks, to have a capacity for 150 cars, are to be laid. There is also to be a 30-stall brick roundhouse, a gravity coal chute of 350 tons capacity, water plant for purifying water for engines, an ice house and two large shops each for repair work.

Coeur d'Alene & Spokane.—A new division, called the Hayden Lake division, has been opened for business from Coeur d'Alene, Idaho, to Hayden Lake, seven miles. (Aug. 17, p. 44.)

Colorado-Utah Southwestern.—Incorporated in Colorado to build a line from Grand county, Colorado, west to Salt Lake City. Connection is to be made with the Denver, Northwestern & Pacific. The names of the incorporators are not given.

Council Bluffs, Taber & Southern (Electric).—W. J. Dobbs, of Taber, Iowa, President of this company, and F. M. Clarke, Treasurer of the Omaha Commercial Club, are negotiating for $2,000,000 capital for this proposed electric line to be built from Omaha, Neb., to Tarkio, Mo. Favorable reports have been made by Engineer S. W. Craig on his examination of the proposed line from Council Bluffs to Tarkio, and on a branch to Hornbury, Ia., a total distance of 76 miles.

El Paso & Southwestern System.—According to reports from New Mexico plans are being made to build a line from Corona, on the El Paso & Rock Island north via Encino and Las Vegas, Mex. Chas. Henning is the Engineer in charge of locating the new line, which is to be about 200 miles long.

Grand Trunk Pacific.—Surveys, it is said, are being made by this company for building a line across Vancouver Island.

Bids will be asked next month by P. E. Ryan, Ottawa, for building about 500 miles in eastern Canada as follows: Superior Junction, eastward; La Toque, westward; Quebec, eastward, and 200 miles east and west of Lake Abittibi.

Hudson Companies.—The contract for the Sixth avenue subway extension from the Hudson River Tunnel at Twelfth street and Sixth avenue, under Sixth avenue to Sixth avenue and Thirty-third street, New York City, about one mile, has been let to the Degnon Contracting Company. The work, which is to be started at once, includes the excavation of about 200,000 cubic yards, and must be completed within two years.

Kansas City, Lawton & Pacific.—G. E. A. Hill, Assistant General Manager, is quoted as saying that contracts have been let for building the Hampton and Wewoka section of the Grand River and Lawton division, and that work will shortly be started. Surveys are being made and rights of way secured. (Aug. 10, p. 38.)

Kansas City, Mexico & Orient.—This company has extended the Chihuahua division from a point south of Bocayne, Mexico, to Agnatos, 4.3 miles.

Lake Shore & Michigan Southern.—The four-tracking of this road from Buffalo to the east end of the Dunkirk yard has been completed.

Louisiana & Pine Bluff.—This road has been opened for business from Huttig, Ark., to Dallas Junction, 2.5 miles. Connection is to be made at the latter point with the Eldorado & Bostrop, and

at Huttig with the Farmerville & Southern and the Little Rock & Monroe.

Mexican Central.—The concession granted in the interest of the Mexican Central last May to build a number of branch lines from Cuernavaca on the Mexican Central has been amended, so as to permit the building of a line from Zacatepec, on the Cuernavaca division of the Mexican Central, to Jojutla and Tlaltenango, in the state of Morelos; also to build a number of short branches from the main line in this district. Five miles must be completed by May, 1907, and the entire line and branches completed within three years.

The Saltillo branch of the Monterey division of this road, extending from Paredon south to Saltillo, 44.7 miles, was formally opened for regular service on September 2d. Passenger trains will run from Saltillo through Monterey, and the line will compete for passenger traffic with the Mexican National between these points. Connections will also be made with the Tampico lines of the Mexican Central and with the Coahuila & Pacific, which is owned by this company.

Mexican Roads.—Vice-Consul J. H. Brickwood, of Nogales, reports a new railroad project in the Sonora district, of which he says: A projected railroad in this district will open up a valuable mining territory hitherto inaccessible except by wagon trains. As originally intended, the new road was to be built from Port Lobos, on the Sonora side of the gulf of California, northeast to Caborca, about 50 miles, concessions for which had been obtained. After surveys had been made it was determined to extend the line 150 miles farther in the same direction to Tucson, Ariz., crossing the boundary line at a point near the junction of the Altar and Magdalena districts. A concession has recently been granted by the Mexican Government for the strip from Caborca to the boundary line. Surveys from the gulf port to Caborca have been completed and work on that section will begin early in November. Surveys between Caborca, Sonora and Tucson, Ariz., will be started shortly, and will be pushed through. As soon as practicable construction work will begin, and every effort made to have the new line between the Gulf and Tucson, Ariz., completed at an early date.

A concession has been granted to Ricardo Crombe for building a line from Culiacan, state of Sinaloa, to Tepehuanes, in the state of Durango, about 100 miles, giving the former place direct rail connection with the Mexican International. The terms of the concession require that six months after its date surveys must be completed for 20 miles, and within 18 months the road must be completed for a similar distance.

Mexico, Oaxaca & Yucatan.—See article on the construction of this road on page 94, General News Section.

New Orleans Great Northern.—This company, on August 1, began operating trains into New Orleans over the tracks of the New Orleans & North-eastern.

The company has opened for business a new branch from Florenville Junction, La., north to Bogalusa, 26 miles.

Norfolk & Southern.—A meeting is to be held October 16th of the stockholders of this road and the Virginia & Carolina Coast to vote on a proposition to increase the capital stock from $2,000,000 to $3,000,000, to secure funds for an extension of the road from Edenton, N. C., to a point near the northwestern boundary of that state; to authorize to sell to the Atlantic & North Carolina Co. the Pamlico, Oriental & Western; and to sell to the John L. Roper Lumber Co. a portion of the Virginia & Carolina Coast line south of Winthrop, N. C. (May 11, p. 143.)

Northern Pacific.—On the extension being built by this road from Grangeville to Cul de Sac, Idaho, 55 miles, grading has been completed for 15 miles.

Oregon Electric Railways.—This company, which was incorporated in Oregon last spring with a capital of $2,500,000, is building an electric line from Portland south to Salem, 50 miles. It is expected to have the line in operation by July, 1907. The financing of the road has been carried out by Moffat & White, of New York. The company controls the Willamette Valley Traction Co.

Otselic Valley.—Incorporated in New York with $120,000 capital, and office at South Otselic. The promoters of this company propose to build a line from South Otselic, Chenango County, New York, northeast to Georgetown Station, in Madison County, on the West Shore, 12 miles. The directors include B. F. Gladding, M. K. Perkins, D. W. Crumb, E. J. Stack and R. R. Brown, all of South Otselic.

Overton County.—According to reports from Tennessee, this company, which operates 19 miles of road in Tennessee, is to build an extension from its present northern terminus at Livingston north to Burnside, Ky., about 60 miles, where a connection is to be made with the Cincinnati, New Orleans & Texas Pacific. Work is to be started at once.

Pittsburg, Shawmut & Northern.—A contract has been given by this company to the Miller Construction Co., of Lockhaven, Pa., for building part of the Brookville & Mahoning from Hydes, Pa., southwest to Knoxdale, 36 miles. The line is to connect Elk county with Pittsburg. Additional contracts for the section from Knoxdale to Freeport, about 65 miles, are to be let early next year. W. W. Henshey, Chief Engineer, with offices at Brookville, says that surveys for the entire line have been completed, and that it will pass through Brockwayville, Allen's Mills, Brookville, Knoxdale, Kittanning and Ford City. Grading has been started between Brookville and Knoxdale, but work will not be started on the southern end until next year. (See Construction Record.)

Salem-Mehama (Electric).—Surveys, it is said, have been completed and part of the right of way secured for building an electric line from Salem, Oregon, southeast via Turner and Stayton to Mehama, about 35 miles. The project is backed by residents of Stayton.

San Francisco, Idaho & Montana.—It is said that James J. Hill has bought all the rights of this projected road, for which E. H. Harriman was reported to be negotiating. Surveys from Butte to Boise and to San Francisco have been completed. (June 8, p. 168.)

Seaboard Air Line.—The Tallahassee, Perry & Southeastern has been extended from Wacissa, Fla., east to Covington, 11 miles.

Sierra Pacific.—An officer writes that this company was recently organized in California with a capital of $5,000,000, which shortly is to be increased. The principal promoter is Otto E. Bashore, 326 Main street, Porterville, Tulare County, Cal., who is President of the company. J. W. Davis is First Vice-President; C. B. Reas, Second Vice-President, and T. A. Howeth, Secretary, all of Porterville, and R. Linder, of Tulare, Treasurer. The other directors are George D. Avery and F. Ackerman, of Porterville; L. E. McCabe, of Visalia; J. H. Stufflebeem, Kern City; C. E. Henley, Globe, and F. A. Dodge, of Hanford. L. E. McCabe, of Visalia, is Chief Engineer, and A. M. Robertson, of Tulare, Deputy Chief Engineer. It is proposed to use steam locomotives on 250 miles of the road and electricity for about 30 miles over the steeper grades. The total length of the road is to be 280 miles, with several branches. The proposed main line is from Globe, Tulare County, which is to be the eastern terminus, southwest through Success and Worth to Plano and Porterville, and thence northwest via Woodville and Tulare to Tagus; thence west via Hanford, Armona, Lemoore and Huron to Coalinga, northwest of which point the line crosses the Coast Range mountains; thence south via Paso Robles, Templeton, Santa Margarita and San Luis Obispo to the western terminus at Port Hanford on San Luis Obispo Bay, approximately 193 miles from Globe. One branch is to be run from Tagus northeast to Visalia, thence northwest via Reedley, Orosi and Sanger to Fresno, 70 miles; and one from Tagus south to Bakerfield, about 60 miles. A contract for grading has been let and work is to be started at once. Bids are wanted for track laying, also for rails, etc., and for bridges. The grading will not be difficult. There will be needed about ten small bridges and two steel ones. (Sept. 21, p. 76.)

South & Western.—This road has been extended from Spruce Pine, N. C., south to Altapass, four miles.

Tallahassee, Perry & Southeastern.—See Seaboard Air Line.

Tehuantepec National.—A concession was granted in August to S. Pearson & Son, Ltd., of London, for building a line from a point on the Tehuantepec road to Minatitlan, about 10 miles. The road will practically be a branch of the Tehuantepec and will reach oil fields recently discovered in the neighborhood of Minatitlan.

Texas Traction.—Incorporated in Texas with $3,000,000 capital to build an electric line from Dallas to Sherman and to operate street railways in these cities. The incorporators include: Frank H. Proctor, Boston; W. R. Brents of Grayson county, F. A. Jones of Harris county, and J. F. Strickland, D. A. Templeton and J. N. Simpson, of Dallas.

Tremont & Gulf.—This road has been opened for business from Chathamville south via Jonesboro Junction to Pyburn Junction, La., 26 miles; also on branches west from Jonesboro Junction to Jonesboro, about 20 miles, and from Pyburn Junction to Dobson, La., about 10 miles.

Union Pacific.—Engineers of this company are reported to have finished surveys for a cut-off from Laramie, Wyo., south to Platteville, Colo., about 90 miles, on the Denver-Cheyenne line of the Union Pacific. The right of way has been partially secured. The new line will shorten the distance from Denver to Ogden on the Union Pacific and eliminate the heavy grades between Cheyenne and Denver.

Wabash.—The improvements on this road to be provided for by the bond issue at the special meeting of stockholders in Toledo, on October 22, include the double-tracking of the line between St. Louis and Chicago. Only 30 miles of the road is now double-tracked, principally between Decatur and St. Louis. Work is in progress between Decatur and Taylorville, Ill., and when this is completed next spring there will be 80 miles of double track. The double-

track work will be continued during the next two or three years, those parts of the line where traffic is heaviest receiving the first consideration. As the double-tracking progresses other improvements will be carried out to make the expansion uniform. The next piece of double-tracking will probably be between Taylorville and Litchfield, Ill.

Western Allegheny.—See Bessemer & Lake Erie.

Yosemite Valley.—This road, which operates a line from Merced, Cal., on the Atchison, Topeka & Santa Fe and the Southern Pacific northeast to Merced Falls, 24 miles, has been extended from Merced Falls to Pleasant Valley, 13 miles.

## RAILROAD CORPORATION NEWS.

Alabama Northern.—See Atlanta, Birmingham & Atlantic.

Atlanta, Birmingham & Atlantic.—This company has acquired the Eastern of Alabama and Alabama Northern, and now operates them as its Alabama division; both roads have hitherto been operated under lease by the Louisville & Nashville. The Eastern of Alabama runs from Stockdale, Ala., to Pyriton, 20 miles; the Alabama Northern runs from Pyriton to Ashland, 7 miles.

Canadian Pacific.—At the annual meeting, the stockholders authorized an issue of 4 per cent. debenture stock, the proceeds of which are to be used for the building of branch lines in the West, and the leasing of about 170 miles of road in Ontario and Quebec owned by the Georgian Bay & Seaboard, the Walkerton & Lucknow, the Berlin, Waterloo & Lake Huron and the Joliet & Brandon.

Chattanooga Southern.—See Louisville & Nashville.

Eastern of Alabama.—See Atlanta, Birmingham & Atlantic.

Gray's Point Terminal.—See St. Louis Southwestern.

Great Northern.—The long-expected consummation of the "ore deal" was on October 5 announced by the chairman of the Board of Directors of the United States Steel Corporation, in the following statement:

> After long negotiations a contract has been signed for the acquisition on a royalty basis of the Hill ore properties (so-called) by companies controlled by the United States Steel Corporation. The quantity of ore has not been accurately determined, but it is a large body. The price to be paid is $1.65 per ton, delivered at the upper lake docks, with an increase of 3.4 cents per ton each succeeding year. The minimum agreed to be mined is 750,000 tons for the year 1907, and increases by 750,000 tons per year until it reaches 8,250,000 tons, and thereafter it continues on that basis.

The ore, which will be mined by the Steel Corporation, is to be carried over the Great Northern, and as the present rate is 80 cents per ton for this traffic, it is understood that the royalty paid on the ore is 85 cents a ton. This price is for 59 per cent. ore. Other grades are to be paid for on a sliding scale. The following table shows on this average basis the price per ton of ore delivered at the docks, the minimum amount to be mined in each year, and the corresponding minimum payment over the 11 years during which there is a rising amount of ore which the steel corporation agrees to mine. In the years succeeding 1917 the figures given for that year will represent the minimum production:

| Year. | Price per ton and freight. | Amount ore, tons. | Payment. |
|---|---|---|---|
| 1907 | $1.650 | 750,000 | $1,237,500 |
| 1908 | 1.684 | 1,500,000 | 2,526,000 |
| 1909 | 1.718 | 2,250,000 | 3,865,500 |
| 1910 | 1.752 | 3,000,000 | 5,256,000 |
| 1911 | 1.786 | 3,750,000 | 6,697,500 |
| 1912 | 1.820 | 4,500,000 | 8,190,000 |
| 1913 | 1.854 | 5,250,000 | 9,733,500 |
| 1914 | 1.888 | 6,000,000 | 11,328,000 |
| 1915 | 1.922 | 6,750,000 | 12,973,500 |
| 1916 | 1.956 | 7,500,000 | 14,670,000 |
| 1917 | 1.990 | 8,250,000 | 16,417,500 |
| Total | | 49,500,000 | $92,895,000 |

Hudson Companies.—A contract has been let, as noted in our Construction Columns this week, for building a subway from Twelfth street and Sixth avenue, New York City, up Sixth avenue to Thirty-third street, which will be the terminal of the line. Both tubes of the tunnel under the Hudson River have been for some time completed, and work is now under way on the continuation of this tube construction from the river front at Christopher street to Twelfth street and Sixth avenue. The Hudson Companies were incorporated in January, 1905, to merge control of the New York & Jersey, which had begun work on the double-tube tunnel above referred to, and the Hudson & Manhattan, which was incorporated in 1903 to build a pair of tunnels from Exchange place, Jersey City, under the Hudson river to Cortlandt street, New York. Work on these tunnels is about half finished, and the foundations are being built for the Terminal building at Fulton and Church streets, New York City. This building will be finished some time before the tunnel itself is in operation, but will at once become a source of income through its use as an office building.

Louisville & Nashville.—This company has made an agreement for the purchase of the Chattanooga Southern, which runs from Gadsden, Ala., to a point near Chattanooga, Tenn., about 100 miles of road including branches. It was sold under foreclosure in 1905 to a reorganization committee, which paid $600,000 for the road. The L. & N. is to pay $50,000 in cash and $1,200,000 in 50-year 4 per cent. bonds, being part of a total authorized issue of $2,000,000, the remainder to be reserved for extensions and improvements.

See Atlanta, Birmingham & Atlantic.

New York Central & Hudson River.—The New York State Railroad Commission has given permission to this company to increase its authorized capital stock from $150,000,000 to $250,000,000 and to issue $29,839,560, making the total outstanding $179,282,060. The vice-president in charge of accounting testified that since the increase of $35,000,000 was authorized in April, 1902, $18,000,000 has been spent for improvements, and that the improvements now being made would cost $51,000,000, and new equipment $9,000,000. The vice-president in charge of construction said that the electrification of the lines in and near New York City would cost $70,000,000, and that of the additional stock authorized $20,000,000 was to be spent on the other proposed improvements.

New York Central Lines.—Gross earnings of these lines for recent periods are as follows:

| | 1906. | | |
|---|---|---|---|
| *September.* | | | |
| New York Central & Hudson River | $8,430,237.01 | Inc. | $323,940.30 |
| Lake Shore & Michigan Southern | 3,769,845.74 | " | 285,553.67 |
| Lake Erie & Western | 465,707.48 | Dec. | 12,604.29 |
| Chicago, Indiana & Southern | 201,236.24 | Inc. | 23,805.35 |
| New York, Chicago & St. Louis | 812,461.64 | " | 47,296.06 |
| Michigan Central | 2,277,213.73 | " | 121,775.55 |
| Cleve., Cin., Chicago & St. Louis | 2,227,016.78 | " | 154,880.03 |
| Peoria & Eastern | 261,465.46 | Dec. | 11,701.72 |
| Cincinnati Northern | 99,019.09 | Inc. | 16,765.55 |
| Pittsburg & Lake Erie | 1,197,858.96 | " | 126,748.59 |
| Rutland | 273,614.80 | " | 22,908.28 |
| *Quarter Ended Sept. 30.* | | | |
| New York Central & Hudson River | $24,782,968.08 | Inc. | $1,395,177.21 |
| Lake Shore & Michigan Southern | 11,177,682.34 | " | 1,108,429.17 |
| Lake Erie & Western | 1,408,183.08 | " | 59,744.00 |
| Chicago, Indiana & Southern | 537,993.98 | " | 25,350.25 |
| New York, Chicago & St. Louis | 2,430,732.45 | " | 240,883.26 |
| Michigan Central | 6,571,666.55 | " | 455,694.37 |
| Cleve., Cin., Chicago & St. Louis | 6,735,668.20 | " | 614,353.14 |
| Peoria & Eastern | 792,285.33 | " | 47,385.88 |
| Cincinnati Northern | 302,417.83 | " | 57,227.36 |
| Pittsburg & Lake Erie | 3,771,107.73 | " | 490,413.99 |
| Rutland | 811,056.66 | " | 73,756.24 |
| *Nine Months to Sept. 30.* | | | |
| New York Central & Hudson River | $67,662,193.58 | Inc. | $5,084,839.04 |
| Lake Shore & Michigan Southern | 31,784,778.35 | " | 3,548,581.66 |
| Lake Erie & Western | 3,933,562.51 | " | 295,752.62 |
| Chicago, Indiana & Southern | 1,684,257.16 | " | 134,739.90 |
| New York, Chicago & St. Louis | 7,316,751.99 | " | 783,972.31 |
| Michigan Central | 19,190,809.58 | " | 2,347,677.90 |
| Cleve., Cin., Chicago & St. Louis | 18,098,187.83 | " | 1,745,848.40 |
| Peoria & Eastern | 2,253,842.07 | " | 202,936.36 |
| Cincinnati Northern | 778,878.80 | " | 153,340.19 |
| Pittsburg & Lake Erie | 10,818,264.70 | " | 1,484,278.09 |
| Rutland | 2,078,924.39 | " | 199,332.58 |

New York, New Haven & Hartford.—This company has bought the Hartford & New York Transportation Company, which operates a steamboat line from Hartford, Conn., to New York City, its most important interest being coal carrying on barges. It has $500,000 stock and $200,000 4½ per cent. bonds.

Pullman Company.—Edward W. Hanck has been elected chairman of a stockholders' committee, which is trying to get a larger dividend rate and a distribution of part of the present surplus of about $27,000,000. A committee composed of Henry E. Smith, of New York; A. B. Kellogg, of Buffalo, and E. W. Hanck, is to prepare the plan and go to the annual meeting of the company next November, to present its formal request to the Board of Directors. The board will be asked the purpose for which the surplus is being accumulated.

St. Louis Southwestern.—The stockholders of the Gray's Point Terminal Railway have authorized a mortgage securing not more than $4,000,000 first refunding and extension mortgage 5 per cent. 50-year bonds to be guaranteed by the St. Louis Southwestern, which owns all the capital stock of the road, has a 50-year lease on it beginning December 1, 1897, and already guarantees the outstanding $380,000 first mortgage 5 per cent. bonds. The road runs from Delta, Mo., to Gray's Point, 16 miles. The stockholders have also ratified a supplemental agreement leasing the road to the present lessee for 50 years from August 1, 1906.

Sioux City, Homer & Southern.—The property of this company has been sold under foreclosure at Dakota City, Neb., to James A. Foye, of Sioux City, for $16,700. Rails have been laid out of South Sioux City about six and one-half miles, and about ten miles more has been partly built.

# GENERAL NEWS SECTION

## NOTES.

The Philadelphia & Reading has increased the wages of enginemen, conductors, brakemen and other employees on all divisions from 5 to 10 per cent. The order took effect October 1.

A serious car shortage exists both at Pittsburg and at Chicago. The vice-president of the New York Central Lines West in charge of traffic estimates the daily shortage at Chicago at 5,000 cars.

Beginning November 8 the Atlantic Coast Line is to operate a special car once a week between Chicago and Jacksonville, Fla., to handle butter and cheese only. The route of the refrigerator car will be over the Illinois Central, Nashville, Chattanooga & St. Louis, Central of Georgia, and the Atlantic Coast Line.

J. J. Byrne, assistant passenger traffic manager of the Atchison, in an address before the General Passenger Agents' Association at Atlantic City, said that during the past year the railroads of the United States earned $500,000,000. He had found that 10 per cent. of the travel was for health, 40 per cent. for business and 50 per cent. for pleasure.

The Southern Fruit Despatch Co. has been formed by the Southern Pacific, the Texas & Pacific and the Missouri, Kansas & Texas. The line will carry fruit from southern California to Kansas City, St. Louis and Chicago. The first train was to Los Angeles on October 15, and the trains are to have precedence over all other trains. It is intended that the M., K. & T. should get the train from Fort Worth to Kansas City at an average speed of 25 miles an hour.

The Cattle Raisers' Association of Texas has filed a complaint with the Interstate Commerce Commission to the effect that the recent cancellation of joint rates on live stock by three roads has resulted in discrimination, an advance having been made from $15 to $25 per car. James B. Mason complained that the Chicago, Rock Island & Pacific had charged him for the shipment of 24,000 lbs. of freight, although only 19,230 lbs. could be put into the cars in which the shipment was made.

### Progress of the Quebec Bridge.

Satisfactory progress has been made during the summer months on the erection of the cantilever bridge over the St. Lawrence river at Quebec. This bridge, which is the longest cantilever in the world, has a clear span over the channel of 1,800 ft. On the south side of the river the steel work erected up to September 1 extended from the shore abutment to about 200 ft. beyond the main pier, a total distance of about 900 ft. The quantity of metal erected up to that date amounted to 11,300 tons. In addition to this, there is in storage at the works of the Phoenix Bridge Company, Phoenixville, Pa., and at the bridge site, 20,700 tons of manufactured material. On the north shore wharves are being built to receive material for the false work and traveler, which is being used at present on the south side and which will be transferred to the north side after the south cantilever arm is erected. Preparations are being made to commence work on the foundations for the false work on the north side. These foundations will be sunk by caissons. Work will be begun on the erection of the north anchor arm next spring and by May, 1907, it is expected that the manufacture of all the metal at the bridge works will be completed.

### Opening of Purdue University.

Purdue University opened on September 12th with 1,588 students enrolled at the end of the second week. Of this number 1,379, or 86 per cent., were registered in the schools of engineering. New appointments to the instructional staff of the engineering departments for the present year have been announced as follows: W. K. Hatt, Ph.D., formerly Professor of Applied Mechanics, to be Professor of Civil Engineering, in charge of the department; Mr. Paul B. Breneman, B.S. 1894, C.E. 1897, State College of Pennsylvania, formerly engineer and superintendent mining construction and operation, to be instructor in Civil Engineering; Mr. Arthur W. Cole, B.S. Worcester Polytechnic Institute, 1902, formerly of the University of Maine, to be instructor in Thermodynamics; Mr. L. W. Wallace, B.S. Texas A. and M. College, 1903, late with the motive power department of the Santa Fe Railroad, to be instructor in Car and Locomotive Design; Mr. W. T. Small, B.S. Purdue, 1903, formerly with the Cooper-Hewitt Electric Company, to be instructor in the electrical laboratory; Mr. C. E. Schutt, B.S. Purdue, 1905, formerly with the New York Telephone Company; Mr. George W. Lamke, B.S. University of Michigan, 1906, and Mr. W. A. Rush, B.S. Purdue, 1906, to be assistants in the electrical laboratory; Mr. R. D. Kneale, B.S. Purdue, 1906, and Mr. M. L. Allen, B.S. University of Wisconsin, 1906, to be assistants in the civil engineering department.

The facilities of the engineering department have been increased by the completion of a building containing three floors, each 75 x 130 ft., for the Department of Civil Engineering, and by an addition to the Electrical Laboratory 68 x 90 ft., to give room for additional equipment. This room is to be served by a traveling crane which may be utilized in transferring heavy equipment from the laboratory to a new lecture room which adjoins. There have been added to the Materials Testing Laboratory and to the Steam Engine Laboratory a number of important machines, including a 100,000 pound Olsen testing machine, a Fairbanks-Morse 50 h.p. gas producer and gas engine, a 20 h.p. De Laval steam turbine with direct-connected centrifugal pump, a 16 and 10 x 14 air and 11 and 18 x 14 steam Ingersoll-Rand air compressor, a Foster superheater of the type supplied by the Power Specialty Company, a Gerry-Emmons gasolene engine, an Abner Doble water motor, and an Allis Chalmers 8 x 24-in. Corliss engine direct-connected with a centrifugal pump of 4,000 gallons capacity.

### New York Central Sugar Rebate Case.

On October 16 at the trial in the United States Circuit Court at New York City of the New York Central for granting certain rebates, the following letters were admitted as evidence. The first is from the head of the traffic department of the American Sugar Refining Company:

New York, April 11, 1904

Nathan Guilford, Traffic Manager, N. Y. C. & H. R. R. Co., New York City:
(Personal and Confidential.)

Dear Sir:—A very serious state of affairs seems to threaten us in regard to shipments of sugar for W. H. Edgar & Son. Mr. Edgar's son called on me last week with a proposition to the effect that they would like this season to have their shipments of sugar made from New York by canal to Buffalo, we prepaying charges up to that point only. They state they have an arrangement with the Detroit & Buffalo line to take the sugars at Buffalo for distribution to Detroit and Edgar's other points in Michigan.

I wrote Mr. James Edgar on April 6 in regard to this matter as per copy of my letter attached, and I beg to call attention to his reply on April 8. They figure that they can land sugars in Detroit via canal to Buffalo and via D. & B. line for say, 13 cents per hundredweight, which weight is divided 7 cents to Buffalo, 1 cent for handling at that point, and 5 cents for hundredweight for the D. & B. line haul to Detroit.

I think that if we could arrange to give him a net rate of all rail of 18 cents per hundredweight to Detroit and the same relative basis to other Michigan points, that we could make an arrangement with him whereby these shipments would be confined strictly to the New York Central and West Shore fast freight lines throughout the entire year. If some arrangement of this kind cannot be made it is quite certain that Edgar's business will be put on the canal and rates arranged on it by himself beyond Buffalo. If such a course is pursued it will simply mean the disintegration of the present understanding for the division of the sugar traffic, as if a large shipper like Edgar is permitted to make his own rates it will only be a very short time before every large wholesale grocer in the United States will want the same privilege.

As you can easily see, this is a matter of the most vital importance, not only to us, but to the railroad companies, and I sincerely trust that you will see your way clear to giving us authority to make such an arrangement with Edgar as will confine his business to the all-rail route.

You understand that before the time that sugar was put into the fifth class the rate to Detroit by the standard lines was 20 cents per hundredweight, as against the differential line rates of 18 cents, and if this latter figure can again be secured for them, I am quite hopeful that we can make a satisfactory arrangement with Edgar which will do away with his demands for canal and lake shipments.

Yours very truly,
LOWELL M. PALMER (in person).

N. Y. C. & H. R. R. Co.
New York, April 26, 1904.
F. L. Pomeroy, Ass't Traffic Mgr.
(Private and Confidential.)

Lowell M. Palmer, Esq.

Dear Sir:—Referring to your letter of April 11, and my conversation over the 'phone yesterday, the 25th instant, with your Mr. Riley, which, I understand, was repeated to you and verified, all in regards to such shipments for W. H. Edgar & Son.

This is to advise that, taking effect immediately, we will undertake to handle Edgar's shipments for Detroit, and such shipments as are to be reforwarded from there to points on the Michigan Central Railroad at the rate of 18 (eighteen) cents per one hundred pounds, New York to Detroit, all rail shipments to be billed at tariff rates and refund made by voucher.

As advised over the 'phone, I think it would be well to confine arrangement to Edgar's traffic, as outlined above, leaving his traffic that is going to points on the Grand Trunk, Pere Marquette and G. R. & I. roads to move via such lines as he may elect, with the understanding that where he can favor either the West Shore or this company, as far as the haulage is concerned, he will undertake to do so. Please advise if satisfactory and understood.

Yours truly,
(Signed) F. L. POMEROY.

H. T. Leeming, who was formerly a clerk in the sugar company, testified that he had made out claims for the rebates due

under the arrangement agreed to in the above letters. He sent these claims which were at the rate of 5 cents for each 100 lbs., to the railroad company, which sent drafts in payment, and these he deposited to the credit of Mr. Palmer in a New York bank. The railroad company and Mr. Pomeroy were each found guilty on six counts; the maximum penalty is $20,000 for each offense. The case will be appealed.

### Boston Terminal on Labor Day.

Perhaps the most envied railroad operating officers that could be named would be those who operate the Boston Terminal Company, with its eight main tracks and other magnificent facilities. On Labor Day this year 50 extra trains were run to or from the station and yet there was only one short delay, as shown in the statement below, furnished by an officer:

*Memorandum of Trains and Cars Handled at Boston South Station, on Labor Day, Monday, Sept. 3, 1906.*

| | Trains—Regular—Out. | In. | —Extra—Out. | In. | Total. | No. of cars.—Out. | In. | Total. |
|---|---|---|---|---|---|---|---|---|
| Boston & Albany | 113 | 112 | 9 | 4 | 238 | 544 | 475 | 1,019 |
| Plymouth Division | 113 | 114 | 9 | 11 | 247 | 538 | 548 | 1,086 |
| Providence Division | 141 | 140 | 7 | 10 | 298 | 531 | 490 | 1,021 |
| Midland Division | 44 | 44 | .. | .. | 88 | 117 | 123 | 240 |
| Totals | 411 | 410 | 25 | 25 | 871 | 1,730 | 1,636 | 3,366 |
| Engines. | 871. | | Total cars and engines | | | | | 4,237 |

Fifty extra trains were run. On account of holiday, seven regular trains were omitted. The only delay in the terminal yard was of one train, six minutes, by changing engines when wrong cars were backed in for an outgoing train. The cars and engines represented in the statement would, if coupled together, reach approximately 53 miles.

### Changes in the University of Colorado.

At a recent meeting of the Regents of the University of Colorado the name of the engineering department was changed from the School of Applied Science to the College of Engineering of the University of Colorado. Professor M. S. Ketchum, formerly Dean of the School of Applied Science, is Dean of the College of Engineering.

### New Passenger Steamer for Lake Erie Service.

Orders were recently given for eight new steamers, which is one of the largest orders for merchant ships, to the American Shipbuilding Company by the Lackawanna Steamship Company. The steamers are to be delivered in time for the opening of the new season of navigation in 1908. The contract is valued at about $3,000,000.

### New Hudson River Steamer for the Albany Day Line.

Negotiations are under way for the construction of a new steamer similar to the "Hendrik Hudson," recently placed in commission by the Albany Day Line. The steamer is to be built at the Marvel Ship Yard at Fishkill Landing, N. Y. Although designed to be a sister ship of the "Hendrik Hudson," the new steamer will present some pleasing contrasts to the other steamer. It is expected that the "Fulton" will be put in commission in 1909, in time to participate in the joint Hudson-Fulton celebration planned for that year.

### Dissolution of Ohio Bridge Companies.

According to press despatches of October 9, five bridge companies in Ohio have surrendered their charters; the Champion Bridge Company of Wilmington, the King Bridge Company of Cleveland, and the Canton, Bellefontaine and Massillon companies. The four last named companies, with the Mount Vernon Bridge Company, were indicted about six months ago for violation of the Ohio anti trust law, and five agents were also indicted, one connected with each company. In the Common Pleas Court all were found guilty and fined $500 each. The Mount Vernon Bridge Company is not named among those which have surrendered their charters and, it is supposed, will continue the contest in the courts. The court appointed trustees to wind up the affairs of the five companies which have surrendered.

### New Engineering Building of the University of Pennsylvania.

On Friday, October 19th, the new engineering building of the University of Pennsylvania is to be dedicated. The principal addresses will be given by F. W. Taylor, President of the American Society of Mechanical Engineers, and Dr. A. C. Humphreys, President of Stevens Institute of Technology. The building has a frontage of 300 ft. and is 210 ft. deep at one side and 160 ft. at the other. In the basement are laboratories for geodetic and hydraulic work and for testing construction material. On the first floor are offices, a cement laboratory and part of the hydraulic laboratory, which extends into the basement. In the center of this floor is a space 200 ft. x 50 ft. for wood and iron working shops, a foundry and a forge shop. The mechanical laboratory and part of the electrical laboratory are also on this floor. The library, reading room and lecture rooms are on the second floor. On the third floor is a large assembly room for the engineering societies and recitation rooms. The engineering department of the university was started in 1874. There are now 40 teachers and nearly 600 students in this department.

## TRADE CATALOGUES.

*Coaling Cranes.*—The Brown Hoisting Machinery Co., Cleveland, Ohio, is distributing a pamphlet illustrated from photographs of "Brownhoist" locomotive-coaling cranes at work coaling locomotives, filling coaling pockets and unloading gondola cars. These machines are pivoted on four-wheel trucks or eight-wheel flat cars in the same manner as a wrecking crane, and a clam shell bucket is suspended from the end of the boom.

*Railroad Machinery.*—The Quincy, Manchester, Sargent Co. sends half a dozen of their recent catalogues, describing metal sawing machines, portable tools for repair shops, riveting machinery and car and engine equipment. The pamphlets are bound in an adjustable binder which is noticeable for its convenience and attractive appearance.

*Pneumatic Drills.*—Bulletin No. 2,007 of the Ingersoll-Rand Co. is devoted to "Imperial" piston drills. The motor used in these tools has three cylinders revolving around the rigid main bearing, which serves as a valve seat for the rotating valve carried by the cylinders. A special feature of the drill is that the main pin forms a Corliss valve.

*Direct Current Motors.*—Bulletin No. 219 of the Sprague Electric Co. illustrates and gives full descriptions of the round type direct current motors for driving machine tools, pumps and other machinery. A special pamphlet is also being distributed by this company describing motors for driving, ventilating fans and blowers.

*Electric Motors for Machine Tool Drive.*—The Northern Electrical Manufacturing Co., Madison, Wis., is distributing bulletin No. 53, which gives a history and full description of their single voltage variable speed motors for driving machine tools as well as of the controlling apparatus for different motor driven tools.

*"Through Frisco's Furnace."*—Under this title, the Joseph Dixon Crucible Co., Jersey City, N. J., has published some unusually fine photographs taken shortly after the San Francisco fire. The buildings in the pictures are some of those in which the structural work was painted with Dixon's graphite paint.

*Steel Sheet Piling.*—The United States Steel Piling Co., Chicago, is distributing an illustrated pamphlet showing several structures in the foundations of which United States sheet piling is being used.

## Manufacturing and Business.

H. G. Jansen, manager of the car department of M. H. Treadwell & Co., Lebanon, Pa., has resigned.

The General Storage Battery Co. is starting work at Boonton, N. J., on a new five-story building, and additional generating units are being installed.

The Goldschmidt Thermit Company has moved its plant from 179 Christopher street, New York City, to their new building at the corner of Cornelison and Bishop streets, Jersey City, N. J.

Rudolph P. Miller, M. Am. Soc. C. E., formerly Chief Engineer of the Bureau of Buildings, New York City, has opened an office as Consulting Engineer at 527 Fifth avenue, New York City.

The Kennicott Water Softener Co., Chicago, has received through its London office an order from the Eckstein Group of the Rand Mines, Ltd., Johannesburg, South Africa, for seven water softeners.

The B. F. Sturtevant Co., Boston, have recently installed heating apparatus in the New York Central shops at West Albany, N. Y., and in the 12-stall roundhouse of the Southern at Greenville, N. C.

C. R. Naylor, assistant chief clerk to the Superintendent of Motive Power of the Atchison, Topeka & Santa Fe, will go to the western sales office at Chicago of the T. H. Symington Co., makers of journal boxes at Corning, N. Y., on November 1st.

E. H. Lynde, who has for some years been in charge of the Bessemer rail department of the Lackawanna Steel Co., has gone to Robert W. Hunt & Co., Chicago, to take charge of the departments in that company formerly managed by Albert W. Fiero, who died recently.

The Foundation Company, New York, has begun work on the piers, abutments and pedestals for a railroad bridge and a highway bridge across the canal which carries water to the plant of the Pittsburg Reduction Co. at Massena, N. Y. The piers of the railroad bridge will be 50 ft. high, resting on bed rock about 30 ft.

below water level. The work on the foundations for both bridges will be done with pneumatic caissons.

The Universal Portland Cement Co. has been incorporated, as a subsidiary of the United States Steel Corporation, and has taken over the property and business of the cement department of the Illinois Steel Co. The new company will continue the manufacture of Universal Portland cement and new plants are being built, to be in operation by the summer of 1907, which will increase the output from 6,500 barrels per day to over 17,000 barrels. E. M. Hager, who for the last six years has been manager of the cement department of the Illinois Steel Co., is president of the new company, with offices at The Rookery, Chicago, Ill.

The Dixon Car Wheel Co., Houston, Tex., recently acquired 20 acres of land on Washington street at that place and has begun work on a new car wheel foundry on part of the property. Contracts have been let also for additional machinery and supplies needed in the new building. The plant will turn out 400 wheels a day. The present foundry, which has a capacity of 210 wheels per day, will be operated until the new foundry is in operation early next year. Ultimately the entire new ground will be covered with machine and pattern shops. A. W. Slocum, formerly superintendent of the National Car Wheel Co., Pittsburg, Pa., is superintendent of the new foundry.

P. E. Kobbe, Director and Assistant Secretary of the Westinghouse Electric & Mfg. Company, died at his summer home at Stockbridge, Mass., on Friday, September 21st, aged 64 years. Mr. Kobbe was born in New York in 1842 and received his education in Germany. In 1883 he was elected treasurer of the United States Electric Lighting Company, which position he held until 1890, when the United States Electric Lighting Company was absorbed by the Westinghouse Electric & Mfg. Company, at which time Mr. Kobbe was made treasurer of the latter company. In 1896 Mr. Kobbe was made vice-president in addition to his duties as treasurer, and in 1902 he became a director of the company. It was in the year 1900, when Mr. Kobbe was on his way to Europe to undertake important work in connection with Mr. Westinghouse's foreign interests that he was stricken by an attack of paralysis, from which it is believed he never fully recovered. Continued ill health recently compelled him to be relieved of his duties as treasurer and vice-president, but up to the time of his death he remained on the board of directors and held the office of assistant secretary. He was the fortunate possessor of an evenly balanced mind which enabled him to consider the most trying and perplexing problems in a manner which could only bring confidence and inspiration to those who worked with him.

### Iron and Steel.

The Canadian Pacific has ordered 19,000 tons of steel for bridges from a Canadian firm.

The American Bridge Company has been given orders for 1,000 tons of fabricated steel for ore docks for the Chicago & North-Western, and 2,000 tons for the construction of cement plants in Pennsylvania.

The order for 66,000 tons of rails for the Baltimore & Ohio was divided as follows: Maryland Steel Co. 11,500 tons, Cambria Steel Co. 17,400 tons, and Carnegie Steel Co. 37,100 tons, for delivery during the first half of 1907. The contracts are worth about $1,848,000. The National Railroad of Mexico has let a contract for 5,000 tons of rails, and the Mexican International has placed an additional order for 5,000 tons for 1907 delivery with eastern mills. A number of small contracts for structural shapes have been let—the largest order for railroad work being 1,200 tons for the Pennsylvania, while the New York Central and New York, New Haven & Hartford bridge work is still pending.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### The Engineers' Club of Philadelphia.

At the meeting of this club October 20 a paper on "Further Notice on the Summation of Stresses in Certain Structures," by John C. Trautwine, Jr., illustrated by lantern slides, will be presented.

### Franklin Institute.

At the stated meeting of the Institute Oct. 17 the programme included an address on "Legislative Engineering," with illustrations, by J. C. Trautwine, Jr.; also one on "Recent Progress in Metallurgy," by Prof. A. E. Outerbridge, and a demonstration of the Decker primary battery by Prof. Carl Herring.

### Car Foremen's Association of Chicago.

At the annual meeting, held Monday, October 8, the following officers were elected: President, O. M. Stimson (M. C. B., Swift & Co.); First Vice-President, T. H. Goodnow (M. C. B., L. S. & M. S.); Second Vice-President, P. H. Peck (M. M., C. & W. I.); Treasurer, W. E. Sharp (Supt. Armour Car Lines); Secretary, Aaron Kline (326 N. 50th Court).

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Albany & Susquehanna.*—George B. Butler has been elected President of the Albany & Susquehanna. The following directors have been elected: John S. Kennedy, John Harsen Rhoades, Adrian H. Joline, George B. Butler, William Stewart Todd, Isaac N. Phelps Stokes, Howard O. Sturges, George L. Shearn, William A. Stewart, John H. McClement, Arthur W. Butler and Henry E. Howland, of New York, and Charles C. Cooley, of Hartford, Conn. They succeed Robert M. Olyphant, David Wilcox, Robert Olyphant, Charles A. Walker, R. Suydam Grant, Charles A. Peabody, of New York; William L. M. Phelps, Robert C. Pruyn, James H. Manning and Abel I. Culver, of Albany; George I. Wilber, of Oneonta; Harrison L. Beatty, of Bainbridge, and DeWitt C. Dow, of Cobleskill.

*Baltimore & Ohio.*—J. R. Foard, President of the Joseph R. Foard Lighterage Co., of Baltimore, has been elected a Director of the Baltimore & Ohio, succeeding John B. Thayer, who resigned recently.

*Boston & Maine.*—Moses Williams, President of the Fitchburg Railroad, has been elected a Director of the Boston & Maine, succeeding Henry R. Reed, deceased.

*Chicago & Alton.*—B. F. Yoacum has been elected Chairman of the Executive Committee, which consists of E. H. Harriman, James Stillman, W. H. Moore, B. F. Yoacum and B. G. Reid. Robert Mather, who is a member of the Finance Committee of the Rock Island Company, has been appointed General Counsel of the Chicago & Alton. George F. Boggs has been appointed Secretary, succeeding Alexander Millar. H. E. R. Wood, Assistant Treasurer, has been appointed Treasurer. C. W. Hillard has been appointed Comptroller, succeeding William Mahl.

*Chicago, Peoria & St. Louis.*—Chas. E. Kimball, President, has resigned. Mr. Kimball remains on the Board of Directors.

*Cincinnati, Hamilton & Dayton.*—R. R. Rhodes, Cleveland; Samuel Spencer, President of the Southern; Henry F. Shoemaker, of New York, and W. L. Dechant, Middletown, Ohio, have been elected Directors.

*Delaware & Hudson.*—See Albany & Susquehanna.

*Illinois Central.*—James D. Cutting, New York, has been elected a Director, succeeding W. M. Grinnell, deceased.

*Lake Erie & Pittsburg.*—W. H. Newman, President of the New York Central & Hudson River; D. W. Pardee, Secretary of the New York Central; E. A. Handy, General Manager of the Lake Shore & Michigan Southern, and Samuel Rockwell, Chief Engineer of the Lake Shore & Michigan Southern, have been elected also to the same offices on the Lake Erie & Pittsburg.

*New York Central & Hudson River.*—See Lake Erie & Pittsburg.

*Oregon Short Line.*—L. H. Connell and H. B. Taylor, both of New York, have been elected Directors, succeeding Otto H. Kahn and G. M. Lane.

*Pennsylvania.*—R. H. Groff, Assistant Secretary at New York, has been transferred to Philadelphia with the same title. J. W. Marshall, Assistant Treasurer, succeeds Mr. Groff.

*Seaboard Air Line.*—W. J. Calvert has been appointed Assistant Treasurer, with office at Portsmouth, Va., succeeding R. L. Nutt, promoted.

*Temiskaming & Northern Ontario.*—C. B. Smith, Chairman of the Board, has resigned to go into other business.

*Union Pacific.*—A. J. Earling, R. W. Goelet and David Wilcox have been elected Directors, succeeding Otto H. Kahn, T. T. Eckert and Jacob H. Schiff.

*Wabash.*—J. J. Slocum has been elected a Director, succeeding Russell Sage, deceased.

### Operating Officers.

*Central Vermont.*—E. D. Nash, Assistant Superintendent at New London, Conn., has been appointed to the new office of Superintendent of the Southern division, with office at New London, and his former office has been abolished.

*Chicago Great Western.*—The office of Assistant General Manager, formerly held by Tracy Lyon, who resigned recently, has been abolished.

*Jamestown, Chautauqua & Lake Erie.*—C. M. Harrison, Superintendent, has resigned to go to another company.

*Lake Shore & Michigan Southern.*—J. J. Bernet, who was recently appointed General Superintendent, was born in New York State in 1868. He left school when 15 years old and worked for five years as a blacksmith. He began railroad work in 1889 as a telegraph operator on the Lake Shore and he has been with that company ever since. He was made train despatcher in 1895 and trainmaster in 1901. Two years later he was appointed Assistant Superintendent of the Eastern division. In February, 1905, he was promoted to be Superintendent of the same division and later in the year was made Assistant General Superintendent. He was promoted to his present position on Oct. 1, 1906.

J. J. Bernet.

*New York Central & Hudson River.*—D. B. McCoy, who was recently appointed Assistant to the General Manager, began railroad work when 15 years old as telegraph operator on the Pittsburg division of the Pennsylvania. The next year, 1862, he was a telegraph operator in the United States Army. In 1863 he was transferred to the Pittsburg, Ft. Wayne & Chicago. He was later appointed train despatcher and then Division Superintendent of this road after it had been leased to the Pennsylvania. In 1881 he went to the Chicago & North-Western as Superintendent of the Wisconsin and Milwaukee divisions. Three years later he was made Superintendent of the Buffalo division of the West Shore, and in 1890 was appointed Superintendent of the Hudson and Putnam divisions of the New York Central as well as Superintendent of the Hudson River Bridge Company. He remained in these offices until his recent promotion.

D. B. McCoy.

James H. Hustis, who has been appointed Superintendent of the Hudson division, was born in New York in 1864. After a public school education, he began railroad work in 1878, and has been on the New York Central & Hudson River ever since, starting as an office boy in the office of the Superintendent of the road; he was made Chief Clerk to the General Superintendent and then Trainmaster of the Harlem division. He was next appointed Assistant Superintendent of that division and then Superintendent. He was transferred to the River division, and in 1902 was made Superintendent of the Rome, Watertown & Ogdensburg, where he remained until his recent appointment.

J. H. Hustis.

*New York, Chicago & St. Louis.*—W. L. Blair, Superintendent at Buffalo, N. Y., has been appointed to the new office of Superintendent of Transportation, with office at Cleveland, Ohio. W. F. Watterson, trainmaster at Conneaut, Ohio, succeeds Mr. Blair.

*New Orleans & Northwestern.*—A. E. Wyatt, Superintendent, has resigned to go into other business.

*Vera Cruz & Pacific.*—John D. Melville, who was recently appointed Superintendent, was born in Canada in 1858 and educated at public and military schools. He began railroad work in 1880 as a brakeman on the Grand Trunk. After serving on several south and southwest roads, he went to the National of Mexico. He was made Superintendent of Construction of the Coahuila & Zacatecas, and after building the road remained a year as Superintendent. He was then appointed Superintendent of Construction of the Coahuila & Pacific, and after the completion of that road was made General Superintendent. He resigned for a year and a half on account of ill health, and started business as a contractor for railroad construction. He re-entered railroad service as Superintendent of the Vera Cruz & Pacific.

## Traffic Officers.

*Baltimore & Ohio.*—J. P. Dugan, traveling baggage agent, has been appointed General Baggage Agent, with office at Baltimore, Md., succeeding B. E. Peddicord, deceased.

*Canadian Pacific.*—John Halstead has been appointed Assistant General Freight Agent at Calgary, Alberta, succeeding H. H. Abbott, resigned.

*New York Central & Hudson River.*—Herbert D. Carter, who was recently appointed General Freight Agent, was born in New York state in 1860 and began railroad work when 15 years old as a telegraph operator on the Rome, Watertown & Ogdensburg. The next year he was made clerk in the General Freight office of the same road, being appointed chief clerk in 1881. Seven years later he was transferred to the Williamsport, Pa., freight office of the Northern Central and the Philadelphia & Erie, now part of the Pennsylvania. After serving for two years in the general freight office of the Philadelphia & Reading, he was made Assistant General Freight Agent of the St. Lawrence & Adirondack. When this road was consolidated with the New York Central, Mr. Carter was made division freight agent of the St. L. & A. division. In 1902, he was appointed Assistant General Freight Agent of the New York Central and of the West Shore. In 1904 he was promoted to be General Freight Agent of the West Shore, where he has remained until his recent appointment.

H. D. Carter.

The jurisdiction of division freight agents has been rearranged as follows:

Western District.—All stations on N. Y. C. & H. R. and West Shore R. R., Despatch, Pittsford, Wheelers, N. Y., and west thereof, including R., W. & O. division west of Webster, N. Y., also Charlotte branch (N. Y. C.) and Rochester branch (R., W. & O.).

Middle District.—All stations on N. Y. C. & H. R. and West Shore east of Despatch, Pittsford and Wheelers, N. Y., to, but not including Utica and New York Mills, N. Y., also including Chenango branch West Shore. This does not include traffic moving from Geneva and Lyons to or via Pennsylvania district stations, or from Syracuse and Rome to or via Northern district stations. Such traffic will be under the jurisdiction of the Division Freight Agents of the Pennsylvania and Northern districts, respectively.

Mohawk District.—All stations on N. Y. C. & H. R. and West Shore, Utica and New York Mills, N. Y., and east thereof to and including Troy, Rensselaer and Ravena, N. Y., also including Troy and Troy branch (N. Y. C.) and Albany branch (West Shore). This does not include traffic moving from Utica to or via Northern or Adirondack district stations, or from

Herkimer to or via Adirondack district stations. Such traffic will be under the jurisdiction of the Division Freight Agents of the Northern and Adirondack districts, respectively.

Eastern District.—All stations on N. Y. C. & H. R., south of Rensselaer, also Chatham, N. Y., and south thereof, including Putnam division, and all stations on West Shore south of Ravena, including Wallkill Valley Railroad.

Northern District.—All stations on R., W. & O. division, Webster, N. Y., and east thereof to Sackets Harbor, Cape Vincent, Clayton, Ogdensburg, Massena Springs, Syracuse, Rome and Utica, including traffic from Syracuse, Rome and Utica to or via Northern district stations only; also Gouverneur & Oswegatchie (Edwards branch) and Carthage and Adirondack branch.

Pennsylvania District.—All stations on N. Y. C. & H. R. south of Lyons and Geneva, N. Y., also including traffic moving from Lyons and Geneva to or via Pennsylvania district stations.

Adirondack District.—All stations on N. Y. C. & H. R. and St. L. & A. north of Herkimer, N. Y., to Hinckley and Saranac Lake, N. Y., and Montreal, P. Q., including traffic moving from Utica and Herkimer, N. Y., to or via Adirondack district stations; also including Raquette Lake Railway.

*San Pedro, Los Angeles & Salt Lake.*—E. W. Gillett, General Freight and Passenger Agent, has resigned to go into other business.

### Engineering and Rolling Stock Officers.

*El Paso & Southwestern.*—The office of the Superintendent of Motive Power has been removed from Douglas, Ariz., to El Paso, Tex.

*Illinois Central.*—M. H. Hovey has been appointed Signal Engineer, with office at Chicago, succeeding W. A. D. Short, resigned. Mr. Hovey began railroad service with the Chicago & North-Western in 1897. He was for two years General Foreman on the Houston & Texas Central, and for the past two years has been with the General Railway Signal Co. at Buffalo.

*Pennsylvania.*—J. W. Sanford, Master Mechanic at Meadows, N. J., has been retired on a pension.

*Philadelphia & Reading.*—G. S. Allen, Master Mechanic at Tamaqua, Pa., has been retired on a pension. C. M. Stuart, road foreman of engines at Tamaqua, succeeds Mr. Allen.

*Seaboard Air Line.*—W. D. Faucett, Assistant Engineer at Savannah, Ga., has been appointed First Assistant to the Chief Engineer, with office at Portsmouth, Va. E. C. Bagwell succeeds Mr. Faucett.

## LOCOMOTIVE BUILDING.

*The Great Northern* has ordered 150 locomotives from the Baldwin Locomotive Works.

*The Northern Pacific* has ordered from the American Locomotive Co. 60 locomotives in addition to the recent order for 90 engines.

*The Chicago, Rock Island & Pacific* has ordered 30 consolidation (2-8-0) locomotives from the American Locomotive Co., and 20 switching engines from the Baldwin Locomotive Works.

*The New York Central Lines* have ordered 15 locomotives from the American Locomotive Co. in addition to the 200 locomotives reported in our issue of October 5th, and contracts are to be let for 200 more.

*The Norfolk & Western* is in the market for 15 Pacific (4-6-2) locomotives. These will be duplicates of the five Pacific type locomotives ordered from the American Locomotive Co. last year, the specifications for which were published in our issue of Aug. 18, 1905.

*The Minneapolis, St. Paul & Sault Ste. Marie* has ordered 50 locomotives from the American Locomotive Co. Thirty-two of these 50 locomotives will be compound mogul (2-6-0), exact duplicates of the locomolives reported in our issue of March 16 last. The balance of the order (18) have not yet been decided upon.

*The Erie* has ordered from the American Locomotive Co. for April, 1907, delivery, three Mallet compounds. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Mallet (0-8-8-0) |
| Weight, total | 410,000 lbs. |
| Weight, on drivers | 410,000 lbs. |
| Cylinders | 25 in. x 28 in. and 39 in. x 28 in. |
| Diameter of drivers | 51 in. |
| Working steam pressure | 215 lbs. |
| Total heating surface | 6,108 sq. ft. |
| Tubes, number | 468 |
| Tubes, diameter | 2¼ in. |
| Tubes, length | 21 ft. |
| Firebox, length | 128 in. |
| " width | 114 " |
| Grate area | 100 sq. ft. |
| Tank capacity | 8,500 gals. |
| Coal capacity | 16 tons |

*The Chihuahua & Pacific* has ordered three simple consolidation locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Consolidation |
| Weight, total | 155,000 lbs. |
| Weight, on drivers | 142,000 " |
| Diameter of drivers | 50 in. |
| Cylinders | 20 in. x 26 " |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 320 |
| Material of tubes | Charcoal iron |
| Diameter of tubes | 2 in. |
| Length of tubes | 13 ft. 4½ " |
| Firebox, length | 112 " |
| " width | 42 " |
| " material | Homogeneous steel |
| Grate area | 32 sq. ft. |
| Heating surface, total | 2,466 " |
| Tank capacity | 6,000 gals. |
| Coal capacity | 10 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse American |
| Boiler lagging | Magnesia |
| Couplers | Standard Coupler Co. |
| Injector | Sellers |
| Piston rod packing | Jerome |
| Valve rod packing | Jerome |
| Safety valve | Coale |
| Sight-feed lubricators | Detroit |

*The Atchison, Topeka & Santa Fe* has ordered 12 compound Santa Fe (2-10-2) locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Santa Fe |
| Weight, total | 287,240 lbs. |
| Weight, on drivers | 234,580 lbs. |
| Diameter of drivers | 57 in. |
| Cylinders | 19 and 32 in. x 32 |
| Boiler, type | Wagon top |
| " working steam pressure | 225 lbs. |
| " number of tubes | 391 |
| " tubes, material | Tyler iron |
| " diameter of tubes | 2¼ in. |
| " length of tubes | 19 ft. 11 in. |
| Firebox length | 108 in. |
| " width | 78 in. |
| " material | Lukens acid steel |
| " grate area | 58 sq. ft. |
| Heating surface, total | 4,796 sq. ft. |
| Tank capacity | 8,500 gals. |
| Coal capacity | 13½ tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Cambria steel |
| Bell ringer | Golmar |
| Boiler lagging | Magnesia |
| Brake-beams | National-Hollow |
| Brake-shoes | Perfecto |
| Couplers | Tower and National |
| Headlights | Company's Standard |
| Injector | Ohio |
| Journal bearings | Hewitt Mfg. Co. |
| Piston rod packing | U. S. Metallic Packing Co. |
| Valve rod packing | U. S. Metallic Packing Co. |
| Safety valve | Crane |
| Sanding devices | Leach |
| Sight-feed lubricators | Chicago |
| Springs | Simplex Railway Appliance Co. |
| Steam gages | American Steam Gage & Valve Mfg. Co. |
| Tires, driving, truck, and tender wheels | Standard Steel Works. |

## CAR BUILDING.

*The Boston & Maine* has ordered 1,000 box cars from the Laconia Car Co.

*The Chesapeake & Ohio* is receiving bids on 2,000 hopper cars of 100,000 lbs. capacity.

*The Pittsburg & Lake Erie* has ordered 1,000 steel cars from the Standard Steel Car Co.

*The Boston & Maine* denies having ordered any passenger coaches and dining cars from the Pullman Co.

*The Hudson Companies* have ordered 10 steel cars for February delivery from the Pressed Steele Car Company.

*The Delaware, Lackawanna & Western* has ordered 500 40-ton gondolas and is building some automobile cars at its own shops.

*The Gould Lines* are reported to be preparing standard specifications for a large number of cars to be ordered in the near future.

*The O. F. Jordan Co.*, Chicago, has ordered three flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works. These cars will weigh 26,000 lbs., and measure 36 ft. long, 6 ft. 6 in. wide and 4 ft. 2 in. high, over all.

*The Texas & Pacific* is building six passenger coaches at its Marshall, Tex., shops. These cars will weigh 98,000 lbs. and will measure 76 ft. 9½ in. long, 10 ft. wide and 11 ft. high, over all. The special equipment includes:

| | |
|---|---|
| Brake-beams | National Hollow |
| Brakes | Westinghouse |
| Couplers | National |
| Curtain fixtures | Curtain Supply Co. |
| Draft rigging | T. & P. Standard |
| Heating system | Gould |
| Light | Pintsch gas |
| Platforms | Standard Coupler Co. |
| Springs | Railway Steel Spring Co. |
| Vestibules | Pullman |
| Wheels | Marshall Car Wheel Co. |

*The Mexico, Oaxaca & Yucatan*, 10 Wall street, New York City, will shortly be in the market for from 5,000 to 6,000 flat, box, stock and gondola cars.

*The Mexican Southern* has ordered three passenger coaches and two baggage cars for February delivery from the Mexican Car & Foundry Company, Mexico City.

*The Mississippi Central* is building at its Hattiesburg, Miss., shops 200 flat cars of 40 tons capacity. The cars will weigh 28,500 lbs., and will measure 40 ft. long and 8 ft. 6 in. wide, over all. Bodies and underframes will be of wood. The special equipment includes:

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Decatur Car Wheel Mfg. Co. |
| Brake-beams | Simplex |
| Brake-shoes | Streator |
| Brasses | More-Jones |
| Couplers | Janney |
| Draft rigging | Bradford |
| Dust guards | Harrison |
| Journal boxes | Symington |
| Paint | Charles R. Long, Jr., Co. |
| Springs | Phoenix Car Spring Co. |
| Sill pockets | Western Railway Equipment Co. |
| Trucks | Andrews Cast Steel |
| Wheels | Decatur Car Wheel Mfg. Co. |

*The Norfolk & Western* is in the market for 25 passenger coaches, 10 baggage and express cars and four combination passenger and baggage cars. The passenger coaches will weigh 84,000 lbs., the baggage and express cars will weigh 86,000 lbs., and the combination passenger and baggage cars will weigh 85,600 lbs. The special equipment for all includes:

| | |
|---|---|
| Brake-beams | Norfolk & Western |
| Brakes | Westinghouse |
| Brasses | Ajax plastic bronze |
| Couplers | Janney |
| Curtain fixtures | Edwards |
| Draft rigging | Gould |
| Light | Pintsch gas |
| Paint | Norfolk & Western specification |
| Platforms | Gould |
| Springs | Railway Steel Spring Co. |
| Trucks | Norfolk & Western |
| Vestibules | Pullman wide |

## RAILROAD STRUCTURES.

Chattanooga, Tenn.—Plans for a new passenger station to be built by the Chicago Station Company to be used by the railroads now entering the central station have been submitted for approval, and contracts for the work will be let shortly.

Fort Francis, Ont.—A steel drawbridge 510 ft. long, with a 75-ft. swing span, is to be built by the Duluth, Rainy Lake & Winnipeg over the Rainy river at this place.

Fort William, Ont.—A vote is to be taken on a by-law October 24 to authorize the construction of a steel and concrete roller lift bridge over the Kaninistikwin river. The bridge will be 400 ft. long and the estimated cost is $100,000.

Globe, Ariz.—The Gila Valley, Globe & Northern machine shops and roundhouse were recently destroyed by fire; the loss is about $100,000.

Kansas City, Mo.—The Chicago, Burlington & Quincy, it is said, has begun the construction of a bridge over the Missouri river here, to cost more than $1,000,000. This bridge is to replace the Hannibal bridge, built 50 years ago, which has been condemned by the government engineers.

Pense, Sask.—The Canadian Pacific will build a new station here.

Peoria, Ill.—Bids are wanted Nov. 6 for the construction of the superstructure work of a Scherzer rolling lift bridge across the Illinois river at this place. E. A. Furry is Commissioner of Public Works, Peoria.

Portland, Ore.—The Southern Pacific is replacing 32 wooden bridges on the Shasta route between Ashland, Ore., and this place with steel structures, also a number on the lines of the Oregon Railroad & Navigation Co. along the Columbia river and its tributaries were to be built during 1906. Steel has been ordered for the construction of the South Umpqua bridge near Myrtle Creek, Ore., which is being changed from a wooden trestle to a steel bridge with a through Pratt truss 180 ft. long. Each of the two approaches will be built with deck-plate girders 60 ft. long. The tracks will be 30 ft. above high water. The steel bridge over the Willamette river at Harrisburg, Ore., is nearly completed. It has cylinder piers and trestle approaches. There is one 150-ft. span, a 200-ft. steel span, a 240-ft. steel draw and another 200-ft. steel span.

Quebec City, Que.—The Canadian Northern is planning to build shops here.

Sacramento, Cal.—The new Western Pacific bridge across the American river at this place, on which work has been started, will be a pile pier structure at first, and concrete piers will be put in later. It will have plate girders.

Salamanca, N. Y.—The improvements to be made by the Erie Railroad at this place include additional tracks to cost $38,000; new ice house, $5,200; new freight house, $6,300, and new transfer platforms, $24,000. (Sept. 28, p. 81.)

Toronto, Ont.—The Canadian Pacific, it is said, will build a new station at Port Arthur; also concrete and steel additions to its engine houses at Revelstoke, and probably large machine shops at Lethbridge, Alb.

Winnipeg, Man.—Bids are wanted Nov. 20 by Alderman J. G. Latimer, Chairman, Committee on Works, for the steel superstructure of a highway bridge over the Red river, at Redwood avenue, Winnipeg. Col. H. N. Ruttan is City Engineer, Winnipeg.

Action is being taken by the Canadian Northern for the erection of hospitals for its employees at terminal points.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Amador.—Incorporated in California with $1,250,000 by J. L. Scotchler, C. B. Mills, J. C. Sullivan and J. B. Peck, of Berkeley; T. Hahns and L. A. Borger, of San Francisco, and T. N. Harvey, of Oakland. The company proposes to secure control of the Ione & Eastern, 12 miles long, in Amador County, and to extend the road northeast from Martell to Bartons, 21 miles.

Athens Terminal.—Incorporated in Georgia with $25,000 capital to build a two-mile spur track from Athens to the Seaboard Air Line. The incorporators include: W. W. Mackall, T. M. Cunningham, C. B. Epps, W. B. Davis and others.

Canadian Northern.—The St. James Bay line is to be opened for traffic from Toronto north to Parry Sound early this autumn, and will next year be extended north to Moose Mountains, 296 miles from Toronto, where the company owns extensive iron deposits. The company further propose to establish large smelting works at Toronto with steel rail mill, car and locomotive shops, so as to turn out their own equipment in the future. The money to be spent aggregates several million dollars for the proposed plants and shops.

This company, it is said, has finished surveys and succeeded in getting a four-tenths grade through the Yellow Head Pass, Rocky Mountains. The Grand Trunk Pacific is also making surveys from Edmonton to the summit of the Yellowhead Pass, which are not yet completed. Both roads were having a race to get into and through the Pass.

Action will soon be taken by this company to secure an independent line into the Union Station at Toronto. The Canadian Pacific and the Grand Trunk have separate tracks into the Union Station from the east, and the Canadian Northern wishes to be placed on the same basis as the other roads.

Canadian Pacific.—An officer writes that the Darlingford extension from Darlingford, on the La Riviere division, south to Kaleida, Man., 7.2 miles, was finished some time ago. On the Weyburn branch, extending from Weyburn on the northwestern extension of the Souris branch east to Stoughton, on the Arcola-Regina extension of the Souris branch, 36 miles, the contract has been let and work is under way by J. T. Hargrave, of Winnipeg, for grading 30 miles from Stoughton west. On the Lauder extension of the Souris branch, from Lauder west to Kandahar, 28.5 miles, track has been laid to Johnson's Creek, 20.1 miles, and the balance is to be finished this fall. On the Stonewall branch a contract has been given to J. D. McArthur, of Winnipeg, for grading north from Toulon for a distance of 20 miles. The company will do the tracklaying. On the Moose Jaw branch, which is under construction from Moose Jaw north to Tuxford, thence northwest to Rutland, 30.2 miles, and beyond that point for an additional 20 miles, track has been laid for 15.3 miles to Tuxford. P. R. Lamb, of Winnipeg, has the grading contract. Work on the West Selkirk branch of the Winnipeg Beach extension, now under construction from Winnipeg Beach north to Gimli, 9.28 miles, will be completed this fall.

The Guelph & Goderich, which has been under construction from Guelph west to Goderich, 80 miles, was to have been put in operation October 15.

Chandler & Okmulgee.—This company has filed a charter in Oklahoma, with $1,200,000 capital, and is reported to be a project of the Frisco to build a connecting east and west line from Chandler to Okmulgee, Ind. T., about 60 miles. The office of the company is to be at Chandler, and the incorporators include: Lee Patrick, of Strand; H. B. Gilstrap, G. B. Rittenhouse and M. D. Owen, of Chandler. Surveys have all been completed and construction work is to be started soon.

Chicago, Joliet & Kansas City.—At a recent meeting of the stockholders of this company it is said that the capital stock was increased from $1,000,000 to $12,000,000 and an issue of $10,000,000 bonds authorized. The previous action taken by the directors in relation to awarding construction contracts was also ratified, and

the line is to be built from Chicago to Kansas City. New capital had been subscribed for by eastern banking interests. The company is to be an entirely new and independent project, and the construction work on the Illinois division is to be commenced before January 1 and completed by December, 1908. Terminals have been secured in Chicago and Kansas City. (Aug. 24, p. 50.)

CHICAGO, ROCK ISLAND & GULF.—This company has filed an amendment to its charter in Texas, providing for an extension from Irving north to Carrollton, 12 miles, in Dallas County. This extension is to connect the Fort Worth-Dallas, Rock Island line at Irving with the 'Frisco at Carrollton.

The directors at a recent meeting authorized the expenditure of a large sum during the coming year to lay heavy rails, for reballasting and putting in concrete work and new steel bridges on the Dallas line, also for laying new tracks in the Fort Worth yards.

CHICAGO, ROCK ISLAND & PACIFIC.—This company has bought land at Little Rock, Ark., on which it will build a new terminal to cost $1,000,000.

CORTLAND & AUBURN.—At the first meeting in Binghamton, N. Y., of the stockholders of this company, B. L. Webb, of Binghamton, was elected President; W. A. Bundy, of Philadelphia, Vice-President, and E. L. Stone, of Homer, Secretary. The company is to build a line from Binghamton, N. Y., northeast via Cortland to Auburn, about 75 miles. Right of way for nearly the entire distance has been secured and construction work is to begin next spring.

DULUTH, RAINY LAKE & WINNIPEG.—President W. H. Cook states that trains will be running over this road from Duluth to Winnipeg by the beginning of the next year. The road at present runs from Rainy Junction, Minn., where connection is made with the Duluth, Missabe & Northern north to Ashawa, 28 miles. Work has been under way for some time building an extension north to International Falls, where a bridge is to be built over the Rainy river to a connection with the Canadian Northern at Fort Francis. (See Construction Record.)

EDMONTON (ALBERTA) ROADS.—The city council has decided to build a municipal street railway. Address Mayor May.

GRAND TRUNK.—This company will shortly begin negotiations with the city of Montreal to consider the question of abolishing its grade crossings within the city limits

GRAND TRUNK PACIFIC.—A recent report of the engineers making surveys for the National Transcontinental Commission, it is said, shows that a route has been found between Quebec and Winnipeg, 400 miles shorter than the earlier estimates, and will mean a saving to the Canadian government, who is building the line, of $13,000,000. Four hundred miles are already under construction, and the letting of the proposed contracts early in December for 500 miles additional will mean 900 miles, or half the mileage of the whole line from Winnipeg to Moncton. (Oct. 12, p. 98.)

GREAT NORTHERN.—Surveyors have found a route through Hope Mountains, B. C., which had been looked upon as an insurmountable difficulty for the Vancouver, Victoria & Eastern, now under construction. Track laying has been completed to Molson and grading is completed as far as Keremeos. Additional grading contracts will shortly be let from Keremeos northwest to Princeton, about 40 miles. (Sept. 28, p. 84.)

Preliminary surveys are in progress by the engineering department of this road between Spokane and Newport, Wash., 70 miles, for the purpose of securing a more direct route and lighter grades on the line. The present route between Spokane and Newport is a roundabout one with steep grades. If a new route is decided upon it will probably be a year or more before actual work is begun.

GULF & SABINE RIVER.—Incorporated in Louisiana with $100,000 capital and office at Leesville to build a line from Leesville, La., on the Kansas City Southern southwest to Merryville, about 35 miles. The directors include: T. H. Fullerton, J. L. Reaves, G. W. Johnson, F. L. Feihen and C. S. Maillard.

HUNTINGTON RAILROAD (ELECTRIC).—This company has been authorized to build an electric line from Huntington, on the Long Island Railroad, southwest across Long Island to Amityville, about 15 miles. Work is to be started by April 1, 1907, and completed by October, 1908. The names of the directors are not given.

MARIANNA, BRINKLEY & WESTERN.—Surveys have been completed and right of way secured for this proposed road from Marianna, Ark., northwest to Brinkley, 30 miles. Contracts are to be let early next year for the work. G. W. L. Brown, of Marianna, is General Manager. (June 29, p. 189.)

MASON & OCEANA.—This company, which operates 27 miles of narrow gage road from Buttersville, Mich., southeast to Walkerville, according to a statement of President M. F. Butters, has made an agreement with Chicago capitalists to secure funds to change the gage to standard, and to extend the line from the southern terminus to Grand Rapids. Surveys are shortly to be started and right of way secured.

MORGANTOWN & SOUTHERN (ELECTRIC).—An officer writes that this company, which was recently incorporated in West Virginia, will probably let contracts next month for building its proposed line from Morgantown, W. Va., southwest to Fairmont, approximately 28 miles. J. W. Wiles is President and J. R. Johnson, Chief Engineer, both of Morgantown. (Oct. 5, p. 91.)

NORTH COAST.—Robert A. Strahorn, President of this company, says that the proposed line between Spokane and the Puget Sound country will form connections with the Chicago, Milwaukee & St. Paul on Cow creek, about 30 miles southwest from Spokane; the Union Pacific and the Northern Pacific to Connell, Wash., with the Chicago & North-Western via its Walla Walla line across the Snake river near the mouth of Salmon river, with the Spokane-International, a branch of the Canadian Pacific at Spokane, and with the Western Pacific by way of the Portland line. Construction work on the line is to be pushed westward. Financial arrangements have been completed through New York and Washington capitalists. J. G. White & Co., of New York, will be consulting engineers. (Aug. 3, p. 31.)

OREGON SHORT LINE.—A contract has been given to Corey Brothers, of Ogden, for extending the line from Twin Falls, Idaho, west to Buhl, 17 miles. Work is to be started at once and completed by next spring.

ROSCOE, SNYDER & PACIFIC.—Incorporated in Texas with $200,000 capital and office at Roscoe, in Nolan County. The incorporators propose to build a line from Roscoe, on the Texas & Pacific, northwest through Nolan, Fisher, Scurry, Borden, Garza, Lynn, Lubbock, Hockley, Cochran and Bailey counties to the New Mexico border, about 200 miles. F. W. James, W. G. Swenson, J. E. Will, of Abeline, Tex.; M. T. Reede, of Hutchinson, Kan., are interested.

ST. CLAIR TERMINAL.—Contracts have been given by this company to T. B. Murphy and the American Bridge Co., of Pittsburg, Pa., to build a connecting link 3,340 ft. long from the St. Clair Terminal Railroad, controlled by the United States Steel Corporation, to the West Side Belt at Clairton, which is part of the Wabash System. The line is completed for three-fourths of the distance and track laid for one-half. The work includes an expensive steel viaduct 1,000 ft. long to carry two tracks.

ST. JAMES BAY.—See Canadian Northern.

SPRINGFIELD RAILWAY (ELECTRIC).—This company has been granted a 25 year franchise for a two-mile extension of its system through the factory district of Springfield, Ohio.

TEMISKAMING & NORTHERN ONTARIO.—Contracts for clearing and grading new lines have been let by this company as follows:

Charlton branch, Englehart to Long Lake, eight miles, to the Canadian Construction Co., of Montreal.

Kerr Lake branch, Cobalt to Kerr Lake, four miles, to A. Spencer, of Niagara Falls, Ont.

Haileyburg spur, Haileyburg wharf to main line, 1.75 miles, to McQuigg & Hunt, of Arnprior, Ont.

TEXAS, OKLAHOMA & NORTHWESTERN.—This company, which was organized last year to build a line in Oklahoma, has completed some of the surveys, but has been unable to do any work for lack of funds. It is said the project has been taken over by new parties, including Patterson Bros., of Benton, Mich., and others of Taloga, and that work will soon be started on a line from Thomas, on the St. Louis & San Francisco, northwest to Taloga, 30 miles. It is intended to eventually continue the line in a northwest direction. (See Construction Record.)

TOLEDO & INDIANA (ELECTRIC).—This company, operating 56 miles of road from Toledo, Ohio, west to Bryan, according to Toledo reports, has made arrangements for the extension of its lines westward from Bryan to Waterloo, 25 miles. Such a line would fill in the last gap in a continuous system of electric lines between Chicago and Erie, Pa. It is expected that the line will be completed by the end of 1907. From Toledo eastward there is a chain of electric roads, including the Lake Shore Electric to Cleveland, and the Cleveland, Painesville & Eastern, from Cleveland to Erie, Pa. A new line is now under construction from Erie to Buffalo. When this line and the line between Bryan and Waterloo are completed a continuous system will exist between Buffalo and Chicago.

WESTERN PACIFIC.—Track has been laid by this company west from Salt Lake for about 70 miles, and the work is progressing steadily westward. It is understood that the right of way through Nevada, where much of the route is surveyed through lands owned by the Southern Pacific, will be adjusted satisfactorily. From Winnemucca to Wells and along the territory drained by the Humboldt river, the road is surveyed largely through Southern Pacific property. This, however, will probably not delay much longer the letting of contracts for the construction of the Western Pacific through Nevada. President E. T. Jeffrey says that it is expected

to have the road in operation from Salt Lake to San Francisco and Oakland by May, 1908. Only a continued shortage of labor would be likely to delay the opening. Over 6,000 men are now at work on the grade, but about 7,000 more are needed at once. The question of entering Sacramento, either by an overhead route or by a subway, has not been decided. There will be several points at which the numerous Southern Pacific tracks must be crossed. Work has been started on the long steel bridge across the American river at Sacramento.

## RAILROAD CORPORATION NEWS.

ALBANY & SUSQUEHANNA.—See Delaware & Hudson.

ATCHISON, TOPEKA & SANTA FE.—In an interview in connection with the recent raising of the annual dividend rate from 4 per cent. to 5 per cent., the president of this company gave the reasons for his opposition to a dividend higher than 5 per cent. He said that such work as double-tracking could properly be charged to capital account because it enlarged the capacity and earning power of the road, but there are always certain expenditures which must be made to provide better service and more safety, which do not bring in greater earnings and so must be met out of income. Reduction of grades and elimination of curves must go on indefinitely and, as they ultimately increase the earning power of the road, they can be regarded as an investment of the stockholders' money.

BALTIMORE TERMINAL CO.—See Baltimore, Washington & Annapolis.

CANADIAN NORTHERN.—The Western Estates, Ltd., has been incorporated in Canada to manage the Canadian Northern's lands. Of the land grant of 2,455,466 acres, about 1,500,000 were to be sold from time to time and the remainder were to be held as security for the account of the Manitoba Government in connection with guarantees and for the account of the Dominion Government as security for a mail contract subsidy. Two years ago it was said that the railroad had agreed to buy from Manitoba 256,000 acres of the Hudson's Bay land grant for $156 an acre.

CHICAGO, MILWAUKEE & ST. PAUL.—This company has asked the New York Stock Exchange to list $25,000,000 additional common stock, this being the amount offered to stockholders recently. The proceeds are to be used as follows:

| | |
|---|---|
| Additional equipment | $11,419,311.58 |
| Second track | 2,310,358.24 |
| Improvements—Milwaukee and other shops | 1,374,639.59 |
| Coal lands and shafts in Iowa and Illinois | 1,418,737.37 |
| Real estate | 251,553.42 |
| Other improvements | 1,333,743.66 |
| About 300 miles new road in Wisconsin, South Dakota, Minnesota and Illinois | 4,859,347.89 |
| Sidings, bridges and other improvements | 2,032,994.43 |
| Total | $25,000,686.18 |

It has been widely reported that at the annual meeting on September 29 increases of $75,000,000 in preferred stock and $75,000,000 in common stock were authorized. No official confirmation of this action is obtainable.

CHICAGO SOUTHERN.—This company is to issue $5,000,000 bonds for the purpose of refunding $4,000,000 outstanding 5 per cent. notes; the rest will be used to complete the 40-mile line between Chicago Heights, Ill., and Quaker Hill, Ind., which is the western terminus of the Southern Indiana, a road owned by the same interests. Twenty-two miles of this distance have been built and most of the grading on the remaining 18 miles has been done. When completed, the two roads together will extend from Westport, Ind., to Chicago, the entrance into Chicago having been arranged for by an agreement with the Chicago Terminal Transfer Company.

CINCINNATI, HAMILTON & DAYTON.—The gross earnings for the year ended June 30, 1906, were $8,398,418, an increase of $389,501; operating expenses increased $590,408, leaving net earnings of $1,486,983, a decrease of $200,907; the deficit after fixed charges was $1,352,401, which compares with a deficit of $503,294 in 1905 and a surplus of $404,292 in 1904. During the year the bonded indebtedness was increased $197,000, and $511,830 receivers' certificates were issued to pay interest due January 1, 1906, on bonds of a subsidiary company. The profit and loss surplus on June 30, 1906, was $1,769,031.

DELAWARE & HUDSON.—At a meeting of the stockholders of the Albany & Susquehanna on October 15, the retiring board of directors, representing Delaware & Hudson interests, were defeated for re-election by a group of independent stockholders. These stockholders have been opposing the plan of the Delaware & Hudson to refund the $10,000,000 A. & S. 7 and 6 per cent. bonds falling due on April 1, 1906, with an issue of 3½ per cent. bonds convertible up to 1916 into D. & H. capital stock at the rate of 5 shares of stock for $1,000 bonds. The A. & S. runs from Albany to Binghamton, N. Y., 142 miles, and forms this part of the main line of the Delaware & Hudson, which leased it in 1870 for an annual rental of 7 per cent. on its capital stock. The D. & H. also guaranteed the bonds of the other company. In July 1902, the rate paid by the D. & H. was increased to 9 per cent., this to continue until the expiration of the lease on April 19, 2001. The protective committee representing the stockholders who voted against the Delaware & Hudson interests declares that the lease provides that any saving in interest on the Albany & Susquehanna bonds shall be added to the annual rental. With the present refunding issue this saving amounts to $222,500 a year. For a number of years there has been a saving of $35,000 annually, but no claim has been made. It is announced that the new board will press these claims at once.

GRAND TRUNK.—At the semi-annual meeting, the president announced that it was expected that an increased dividend would be announced at the annual meeting, to be held next spring, on the $34,765,000 outstanding third preference four per cent. stock, on which one per cent. was paid in 1902, two per cent. in 1903, nothing in 1904, and two per cent. in 1905. He further stated that on account of the increase in taxes on imported rails, renewals would cost $1,250,000 more if the company continue to buy rails in the United States, and that under the same conditions there would be an increase of $4,000,000 in the estimated cost of building the Grand Trunk Pacific.

HOCKING VALLEY.—The attorney-general of Ohio has begun a quo warranto suit seeking to annul the franchise of this road. It is charged that the Hocking Valley and the Toledo & Ohio Central, which are parallel and competing roads, are owned by the same corporation. Both companies have lines from Toledo south to Athens, via Columbus, and in June, 1901, the Hocking Valley acquired all but $54,100 of the $6,500,000 common stock of the Toledo & Ohio Central, and all of the $3,708,000 preferred stock except $11,600.

GULF & SHIP ISLAND.—With an average mileage operated of 284, as compares with 275 in 1905, the gross earnings of this company for the year ended June 30, 1906, were $2,138,778, an increase of $261,381; net earnings, $631,667, an increase of $201,512. The surplus after charges was $401,275, an increase of $221,825.

LAKE ERIE & PITTSBURG.—As announced in our "Elections and Appointments" column this week, officers of the New York Central have been elected officers of the L. E. & P., although no official announcement has ever been made that New York Central interests were behind this new road. It has been completed from Lorain, Ohio, southeast to Berea, 13 miles, and it is to be extended from that point northeast to Cleveland. Contracts were recently given for extending the line from Metz to Youngstown, Ohio.

NEW YORK CENTRAL & HUDSON RIVER.—See Lake Erie & Pittsburg.

SOUTHERN INDIANA.—See Chicago Southern.

THOMASVILLE & DENTON.—This 15-mile road, which was recently completed between Thomasville, N. C., and Denton, has been sold to W. T. Van Brunt, New York City, and associates. It is proposed to extend the road.

TOLEDO & OHIO CENTRAL.—See Hocking Valley.

TONOPAH & GOLDFIELD.—Extra dividends of 10 per cent. on the $1,650,000 common stock and 10 per cent. on the $500,000 7 per cent. non-cumulative preferred stock of this company have been declared, payable November 1, 1906. Previous dividends on these stocks have been as follows: Dividends of 3½ per cent., which were declared on the common stock, payable May 1, 1906, and August 1, 1906; dividends of 3½ per cent. declared on the preferred stock, payable May 1, 1906, and November 1, 1906.

UNION PACIFIC.—Gross earnings for the month of August, 1906, were $6,283,775, an increase of $525,038; net earnings, $3,004,687, an increase of $32,496. Gross earnings for the two months ended August 31 were $12,573,528, an increase of $1,359,079; net earnings, $6,102,392, an increase of $751,311. The average mileage operated during the period was 5,578, an increase of 223 miles as compared with the same period in 1905.

WASHINGTON, BALTIMORE & ANNAPOLIS (ELECTRIC).—The stockholders of this company will meet on November 2 to authorize an increase in the capital stock from $4,000,000 to $5,250,000. The company is building an electric line from Baltimore to Washington, 31 miles, and it proposes to get its entrance into Baltimore through the Baltimore Terminal Company, which is building a line from a point near Clifford Junction on the route of the W., B. & A. north to Baltimore, and has a franchise and nearly all of the necessary right of way in that city. The new capital to be authorized by the W., B. & A. is to be used in connection with the terminal company.

# GENERAL NEWS SECTION

## NOTES.

Last Saturday night the last remaining cable railroad in Chicago ceased operations, an electric line taking its place.

An embargo has again been placed on freight shipments to San Francisco over the Southern Pacific. More than 3,500 cars are standing on the tracks there.

Press despatches of October 21 reported a strike of workmen in the car shops of the Boston & Albany at Allston, Mass., as a protest against the introduction of piece work.

It is announced in Chicago that the New York Central is to sell 1,000-mile tickets at $20, good for bearer, throughout its lines, which means from New York and Boston to Cincinnati, Chicago and St. Louis.

Philadelphia newspapers say that the Pennsylvania will henceforth give no free interstate rides to the personal or household servants of its officers or employees, such practice having been decided to be illegal.

The Federal Grand Jury at Nashville, Tenn., has returned three indictments against the Louisville & Nashville for discriminating or threatening to discriminate against an employee (telegraph operator) for belonging to a labor organization.

The Missouri Pacific Railway, in conjunction with the Missouri State Board of Agriculture, is running a special train to educate the farmers of Missouri in the art of raising poultry. Competent men will give lectures illustrated by incubators and patent feeds.

Press despatches from Washington say that the Department of Justice, at the instance of the Interstate Commerce Commission, is to prosecute the former president and former general manager of the Ann Arbor Railroad for paying rebates to the Toledo Ice Company.

The railroads of Ireland, it seems likely, will be taken over by the British government with a view to furnishing new transportation facilities required for developing agricultural resources. Private enterprise has failed to give Ireland the railroads which she needs.

According to Chicago newspapers the Chicago, Cincinnati & Louisville is to make local fares between all important points two cents a mile, beginning Nov. 1. If all of the "important points" are to have the benefit of this reduction how will the rates to the unimportant places be adjusted?

A press despatch from Seattle says that the Pacific Coast Lumber Manufacturers' Association is raising a fund of $8,000 to prosecute a complaint before the Interstate Commerce Commission against the Northern Pacific for discrimination in the distribution of cars to lumber shippers.

The New York State Railroad Commission has issued to the railroads of the state a circular calling their attention to the need of establishing the block system; also recommending that in view of the large number of stations in the state where the platforms are very low all passenger cars be equipped with "stepping stones," meaning, presumably, small wooden box steps such as are carried by porters of Pullman cars.

An officer of the New York Central says that 68 season ticket passengers who left the trains of that company to travel into New York City by the Subway, when it was opened, have all returned to the New York Central. It appears that these passengers all live at King's Bridge, which is the northern terminus of the Subway, about 12 miles from the City Hall. Three others who deserted the Central are still unaccounted for.

It is announced in Detroit that the Detroit United Railway, operating most of the street car lines of that city, will during five hours of the day sell 10 tickets for 25 cents and during the other 19 hours six for 25. There are a few lines in the city on which tickets are now sold at the rate of eight for 25 cents. This lowering of rates is spoken of as an experiment and also as a move in the company's campaign to secure an 18-year extension of its franchise.

At Minneapolis, October 23, according to a press despatch, seven men received an "immunity bath." It was in the United States Court before the special grand jury summoned to hear evidence regarding illegal freights. The men were C. S. Corl, of the Devereaux Grain Company; R. G. Kyle, agent for the Great Northern Railroad at Minneapolis Junction; George G. Ingraham, of the Great Northern freight claims department; F. E. Draper, Auditor of the Great Northern; R. W. Bryan, Superintendent of Transportation of the Great Northern; J. P. Dooley, Freight Agent of the Great Northern at Superior, Wis.; W. J. Bower, General Freight Agent of the Great Northern at Duluth. It is said that the evidence tended to show that a rebate of a half cent a bushel has been received by a big grain firm for all grain shipped over the Great Northern.

An Englishman who favors government ownership has hit upon a plan for the government's acquiring the railroads which rather surpasses the recently proposed plan in the Argentine Republic to buy the railroads out of the proceeds of a tax on their gross receipts. The proposal is to grant a life annuity to the shareholders and their widows, or orphan children until they reach the age of 21, with certain advantages to indigent relatives, at the death of the last of these beneficiaries the railroads to come into possession of the state. With such an arrangement, the average man on being married, instead of taking out an insurance policy, would buy railroad stock.

### Canadian Wheat Crop.

According to a statement made by the Ottawa Department of Trade and Commerce there are 4,500,000 acres of wheat fields under cultivation in western Canada and the yield will be 85,000,000 bushels. Unusual hot weather in August caused a large falling off. The quality of the grain, as estimated from the 6,000,000 bushels already shipped, is as follows: No. 1 hard, 25 per cent.; No. 1 northern, 40 per cent., and No. 2 northern, 50 per cent.

### Positions Open in New South Wales.

The New South Wales Railways & Tramways, operating 3,370 miles of steam railroads and 125 miles of street railways, have hitherto been managed by three commissioners appointed by the government, which owns the lines. This commission has been abolished and three new offices created. They are: Chief commissioner, with a salary of $15,000; assistant railway commissioner, $7,500, and tramway commissioner, $7,500. These positions are not yet filled and applications should be made in writing by Nov. 19 to T. A. Coghlan, agent-general for New South Wales, 125 Cannon street, London E. C., England. The New York representatives of the New South Wales government are R. W. Cameron & Co., 23 South William street. The gross earnings of the New South Wales Railways & Tramways for the year ended June 30, 1906, were $20,538,736; net earnings, $9,343,074.

### John Scott Medal.

The Franklin Institute of Philadelphia has awarded the John Scott legacy premium and medal to Max E. Schmidt, of New York, for "decided improvements which he has made with a view of bringing the moving platforms into daily practical use as a means of transportation in large cities." These improvements are covered chiefly by a United States patent issued in 1903. The committee on science and the arts of the Franklin Institute finds "that from an engineering standpoint a great improvement has been made, the construction required by the later patent being much more substantial than the original form. The flexible rail is entirely eliminated, and the greater part of the machinery is stationary and will permit inspection at any time. With the present construction much sharper curves for the alinement of the road are admissible. The construction is such that derailment or any other serious accident seems remote."

### Southern Pacific School for Shopmen.

Early in September the Southern Pacific reopened its technical school for shop employees at Sparks, Nevada. This year a day school has been started for the first and second year apprentices. Classes are held every Monday and Tuesday mornings from 7 to 8.50 o'clock, and during this period the apprentices who attend the school are paid as if they were at work in the shops. They are to be taught arithmetic, elementary mechanics, mechanical drawing, link motion and valve gears. There are classes in the evenings of these same days for the older apprentices and for all the men in the shops. Instruction is given by teachers of the Nevada University, but the work is under the direct supervision of the railroad company

### September Traffic Through the Soo Canals.

The vessel passages through both the United States and the Canadian canals at Sault Ste. Marie during September, 1906, were 2,912, with a registered tonnage of 5,625,883 net tons, as compared with 2,767 ships of 4,700,015 registered tonnage during the corresponding period in 1905. The eastbound freight tonnage was 5,865,015, an increase of 1,092,680 tons, and the westbound was 1,385,144 tons, an increase of 274,535 tons. Of the eastbound freight, the amounts of copper and of grain, other than wheat, carried decreased, there having been only 3,602,545 bushels of grain carried

this year as compared with 4,614,420 bushels last year. The amounts of other classes of freight carried in this direction increased, most important being wheat, 7,683,841 bushels, an increase of 2,363,013 bushels. All classes of westbound freight increased; the most noticeable gain was in the traffic in soft coal, which amounted to 1,070,495 tons, an increase of 301,070 tons.

### Dedication of University of Pennsylvania Engineering Building.

The University of Pennsylvania on October 19 dedicated its new engineering building. Its high architectural quality is likely to impress those who are in the habit of regarding engineering laboratories as necessarily shop-like in their appearance. Even the shop laboratories open from corridors which are lined with white marble. The advanced laboratories, especially those for steam engineering and materials testing are admirably equipped. The whole building, with its equipment, is said to have cost about $800,000; it is not only a notable addition to the facilities of the University, but in a larger sense an important contribution to the educational interests of the whole country.

The dedicatory exercises were attended by engineers and professors from many parts of the country. Formally appointed delegates were present, representing the governments of Mexico, France, Germany and the United States. In addition to the exchange of keys and the formal acts of dedication, the degree of Doctor of Science was conferred on a number of distinguished engineers. It was, of course, fitting that Professors Spangler and Marburg, whose efforts have counted so much in the design and equipment of the building should be thus honored, and readers of the *Railroad Gazette* will find interest in the fact that Mr. Samuel Vauclain was also among those chosen. Besides these, there were Prof. Frederick P. Stearns, whose service as an engineer of public works is generally known; Frederick Winslow Taylor, president of the American Society of Mechanical Engineers; Samuel Sheldon, president of the American Institute of Electrical Engineers; Mansfield Merriman, the long-time professor and masterful text-book writer; Charles Whiteside Rae, Engineer-in-Chief of the United States Navy; Alexander Mackenzie, colonel of United States Engineers and a member of the general staff; John Fritz, past-president of the American Society of Mechanical Engineers; William Phipps Blake, geologist, explorer and professor; Marie Michel Henri Vetillart, representative of the French Government at the dedication and expert engineer in harbor improvement and canal construction, and Ramon Ibarrola, Chief of the Hydrographic Commission of Mexico.

The engineer's work is not often spectacular and in many cases where service is performed, it is veiled in comparative obscurity, but in this case a great university in celebrating an achievement wrought for the upbuilding of its engineering departments was pleased to recall the important services of certain of the world's great engineers. It is perhaps safe to say that the friends of none of those who were thus honored will find greater pleasure in the event, than those of the vigorous, able and always inspiring Dr. Vauclain.

### New York Central Fined $114,000.

Judge Holt in the United States Circuit Court, New York City, last week fined the New York Central & Hudson River Railroad the sum of $108,000—$18,000 on each of six counts—for granting rebates on sugar, in the cases recently tried and reported in the *Railroad Gazette*. Frederick L. Pomeroy, Assistant Traffic Manager of the railroad, was fined $1,000 on each count, a total of $6,000. Motions to set aside the verdict and grant a new trial were based chiefly on the allegation that the court had erred in its denial of the request for a severance of the issues against the defendant corporation and Pomeroy. A stay of 60 days was granted in which to perfect an appeal.

"Such a violation of law," said Judge Holt in passing sentence, "is much more heinous than the ordinary common, vulgar crimes usually brought before the criminal courts. Those are crimes of sudden passion and temptation. These crimes were committed by men of education, business experience, and standing in the community. As such they should set an example of obedience to the law, on the maintenance of which the security of their property depends.

"This corporation received large and valuable public privileges. It was under the highest obligations to treat all citizens alike, and not to grant any unjust discriminations. This was a secret crime, the proof of which was difficult to obtain. The law was originally passed 20 years ago. The complaints of the granting of rebates by railroads were frequent and insistent. Congress passed amendatory legislation, but so difficult was the securing of the necessary proof that this is the first case brought in this court and, with the exception of one recently in Philadelphia, the only one in the east. But few have been tried in the west.

"Under these circumstances and for an offense so clearly flagrant, it is the duty of the court to impose a penalty commensurate with the gravity of the offense. Between the two defendants the principal penalty should be imposed upon the corporation. The individual defendant acted without advantage to himself, in accordance with what he deemed to be the policy and wishes of his employers.

"It is not too much to say," said Judge Holt, "that if the business had been carried on upon this basis and the discrimination continued in favor of one shipper it might have been that competitors would have been driven out of business."

On the trial the road claimed that in granting claims for over charges the railroad made no unlawful refunds, and that the Elkins law was unconstitutional in discriminating against the railroads by allowing a competing all-water route to carry sugar at about half the rate by rail. One of the principal counsel for the New York Central said: "There are many points in the Elkins law that have never been decided by the United States Supreme Court. One point is whether a corporation or its officers are guilty of an act charged, and another is whether on conviction in such cases both should be adjudged guilty under the same indictment if the alleged violation is solely by an officer and not by the corporation."

The failure of the railroad at the trial to put in any defence was at first supposed to mean that the case would go by default, but the railroad did technically put in a defence. The evidence was ready, but an understanding was reached with the United States District Attorney whereby the railroad acknowledged the acts complained of, and delay was thus avoided.

### Effect of Lions on Railroad Operation.

The lions of East Africa appear to be watching the progress of civilization with deep interest, and nothing has done more to arouse their curiosity and wonder than the trains on the Uganda Railroad. This road, from the Indian ocean to Victoria Nyanza, is 584 miles long, and between the terminal points are 39 stations. The line is managed on the system of the Indian railroads, and most of the men in the track, train and station service are East Indians. The Indian station agent is known as a babu, and he leads a lonesome life. Simba, for example, where the lions have been making a special study of the railroad system, has only a station building, a water tank for the engines and a side-track, this being one of the places where trains pass each other on the single-track road.

The trouble began at Simba about a year ago, when the traffic manager at Nairobi one morning received this astonishing telegram from the babu at Simba: "A lion has been bothering me for three nights. He comes up on the station platform and goes to sleep. Then he walks up and down, scratches on the wall and door and tries to get into the office. Please send cartridges for a Snider rifle by the first train for my protection. I have blank cartridges, but they are of no use against lions."

This profound observation has the earmarks of sober truth. Whether the lion desired to buy a ticket or whether a fellow-feeling for the lonesome babu induced him to try to cultivate his acquaintance is not known, but it is quite certain that blank cartridges were not appropriate ammunition, and that ball cartridges were in demand. It is to be supposed that they were promptly supplied, but, if so, they did not make a deep impression upon the pests, for in August another hair-raising telegram reached the traffic manager, as follows:

"August 17, 2.45 a.m.

"Urgent. To Traffic Manager:

"A lion is on the platform. Please instruct guard and engineer to proceed carefully, and to make no signals in the yard. Tell the guard to advise passengers not to get out here, and to be very careful himself when he comes into the office."

This distress signal from Simba had the immediate result of starting a British sportsman in that direction, who shot three lions, but was badly hurt before killing the third one. The poor babu was left again in the wilderness, but not exactly the monarch of all he surveyed. He told the train hands every day that he could not sleep at nights and his nerves were badly shaken. There was nothing doing, however, for several weeks after the great day when three lions had been laid low within a few rods of the station. Then came another nervous telegram.

"Extra urgent. Track hand was surrounded by two lions while returning from signal box. He climbed a telegraph pole near the water tank. He is up there yet. Order train to stop there and take him aboard. The Traffic Manager will please make necessary arrangements."

The track man succeeded in reaching the station before relief arrived. For several days the telegraph wire was burdened only with routine despatches. Then another episode was proclaimed in the following shape:

"To guard and driver of down train: Carriage of secretary in on the siding, where he shot a lion just now, and others are roaring on Makindu side. Driver must proceed without signals and stop engine opposite station. Guard must not get out of the brake van."

Later advices have not yet come to hand, but if any station master is finding life monotonous and longs to have a dull routine

peppered with incident and adventure, perhaps he may arrange to swap jobs with the babu at Simba.—*Railway Times (India)*.

### Lost Luggage.

Passengers arriving with luggage at a crowded London terminus are too often ignorant of the watchful care exercised over their belongings by carriage searchers. On the arrival of a train, not only is every carriage searched by these men for any parcels that may have been left there by hasty or careless passengers, but the platform itself is under strict observation. Anything found unattended is promptly carried off to the Lost Property Office, where the lawful owner can obtain it on giving satisfactory evidence of ownership. The removal is sometimes so prompt as to make a passenger wonder whither his property has vanished. An instance of this commendable promptness recently occurred at the Victoria station of the Brighton Railway. A piece of luggage from the van of an incoming train was left unattended for less than a minute on the platform by its owner. It was quickly missed on the owner's return, and as quickly found—after consultation with a porter—in the Lost Property Office.

### Record of 100,000 Tons Launched in One Day.

A record in launches was created on September 20, when shipping of no less than 100,000 gross tonnage was launched in the United Kingdom. The "Mauretania" on the Tyne, the "Adriatic" at Queen's Island, and H.M.S. "Shannon" on the Medway, together with a small boat launched by Messrs. Thornycroft, just about reached the above figure, which is about equal in amount to the record output of the leading British yard for 12 months. It is also interesting to note among the various comparisons which have been made, that the "Mauretania" is nearly as long as the House of Commons, rather broader than Northumberland avenue, and as heavy as the "Great Eastern" and H.M.S. "Dreadnought" put together, while two motor cars abreast were actually driven through its funnels before the launching ceremony on Thursday last.

## TRADE CATALOGUES.

*Graphite as a Lubricant.*—The Joseph Dixon Crucible Co. has published the tenth edition of "Graphite as a Lubricant." The pamphlet has been enlarged and brought up to date. It treats of the general subject of lubrication, but especially of the use of graphite, either alone or together with lubricating oil. The more technical part of the publication deals with the results of tests made to determine the value of graphite lubrication under different conditions.

*The State of Wyoming.*—The passenger department of the Union Pacific is distributing a folder entitled "Wyoming and Its Attractions." Many of the numerous photographs reproduced are unusual, but the folder is most noticeable in that all the space is not devoted to the Yellowstone Park. To many people it is almost new to learn that there is beautiful and bizarre scenery in the rest of the state.

*Brake-Beams.*—This is the title of a thirty-three page book issued by the Chicago Railway Equipment Company, Chicago. It contains a reprint of an article on "Brake-Beams and Foundation Rigging—The Requirements from the Standpoint of Safety and Emergency," by E. B. Leigh, President of the company, first published last spring. This article is followed by a reprint of the 1906 Master Car Builders' committee report on brake-beams.

*Electrical Equipment.*—Bulletins Nos. 4,456, 4,457 and 4,459 to 4,464, inclusive, of the General Electric Co. give, respectively, price lists of the following supplies: Wrought copper cable terminals; form "B" arc headlights; feeder regulators; form "3" d.c. enclosed arc lamps; type "G.E.-78" railway motors; variable speed d.c. motors with commutating poles; carrier bus arc panels, and polyphase induction motors.

*Electric Interlocking.*—The Union Switch & Signal Company, Swissvale, Pa., has issued an elaborate description, illustrated by large diagrams, printed in three colors, of the all-electric interlocking apparatus for switches and signals lately introduced by that company. It is called Bulletin No. 26. This interlocking system was described in the *Railroad Gazette* of May 11, 1906, page 481.

*Electric Motor Car Equipment.*—Bulletin No. 1,053 of the Allis-Chalmers Co. gives photographs and descriptions of several sizes of their type "R" electric motor. The company makes 35 h.p., 50 h.p. and 75 h.p. motors of this class. The same bulletin also illustrates and describes their type "S" controller for use with these motors.

*Draft Gear.*—The Farlow Draft Gear Co., Baltimore, Md., has reproduced in a small pamphlet a number of photographs of the underframe and draft gear of a badly wrecked steel underframe car fitted with Farlow attachments which were undamaged and in good condition for service. It is an object lesson in the strength of this device.

*Oil Burners.*—The Rockwell Engineering Co., New York, sends an illustrated catalogue of oil-burning appliances. Among the parts shown and described are high and low-pressure burners, oil pumps, pressure blowers and tanks.

### Manufacturing and Business.

The London office of the Kennicott Water Softener Co. has been changed from 29, Great St. Helens, to 18 and 19, Great St. Helens, London, E. C.

The Chicago Pneumatic Tool Co. is making an addition to its machine shop to increase the output of Franklin compressors from 55 to 70 per month.

Foster Crowell, Mem. Am. Soc. C. E., Consulting Engineer, 18 Broadway, New York, has been appointed Chief Consulting Engineer to the New Jersey Terminal, Dock & Improvement Company.

The Dayton Pneumatic Tool Co., Dayton, Ohio, at the annual meeting, on October 16, elected Wm. W. Price President and Treasurer, David O. Holbrook, Vice-President, and F. W. Buchanan, Secretary and General Manager. The capacity of the "Dayton" hammer plant has been doubled within the past six months and the company is now in a position to make prompt delivery on orders for any of its tools.

### Iron and Steel.

The Canadian Pacific has ordered 19,000 tons of structural steel for bridges from the Dominion Bridge Company and the Canada Foundry Company.

The New York Central has given an additional order for 82,600 tons of rails. The Texas & Pacific has ordered 30,000 tons, and the Guayaquil & Quito will soon order 30,000 tons. The Delaware & Hudson and the New York, New Haven & Hartford will place orders shortly.

Many orders are being placed by steam and electric roads for rails to be delivered during 1907. The Northern Pacific has given an order to the Lackawanna Steel Co. for 10,000 tons, and the Union Traction Co., of Kansas City, which has bought 1,400 tons, has contracted for an additional 10,000 tons. It is said that negotiations now pending for about 500,000 tons for domestic and foreign rails will be let during the coming month. Negotiations are also pending for about 300,000 tons of bridge material, of which the Northern Pacific is in want of about 7,000 tons of bridge steel.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### General Passenger Agents.

At the annual meeting of the American Association of General Passenger and Ticket Agents held at Atlantic City, N. J., last week, C. L. Stone, General Passenger Agent of the Louisville & Nashville, Louisville, Ky., was chosen President.

### American Association of Freight Traffic Officers.

At the annual meeting of this Association held in New York City October 17, D. M. Goodwyn, General Freight Agent of the Louisville & Nashville, Louisville, Ky., was chosen President. The next meeting is to be held in Chicago, October 10, 1907.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Chicago & Alton.*—H. E. R. Wood, Assistant Treasurer at Chicago, has been appointed Treasurer, with office at that place.

*Chicago & North-Western.*—Chauncey Keep has been elected a Director, succeeding Marshall Field, deceased.

*Chicago, Peoria & St. Louis.*—J. P. Ramsey, General Manager, has been elected also Vice-President.

*Philadelphia & Reading.*—C. K. Klink, Assistant Real Estate Agent, has been appointed Real Estate Agent, succeeding J. L. Loomis, deceased.

*Rock Island Company.*—J. F. Thompson, New York, has been elected a Director, succeeding H. C. Frick, who resigned several months ago.

*Wisconsin Central.*—Thomas H. Gill has been appointed General Counsel, succeeding Howard Morris.

### Operating Officers.

*Buffalo, Rochester & Pittsburg.*—Peter Fraser, trainmaster at DuBois, Pa., has been appointed Superintendent at that place.

*Detroit, Toledo & Ironton.*—J. H. Fraser, Assistant Superintendent, has been appointed Superintendent, with office at Springfield, Ohio, and the office of Assistant Superintendent has been abolished.

*Lehigh & Hudson River.*—L. W. Berry, formerly inspector of transportation of the Toledo, St. Louis & Western, has been appointed Superintendent of the L. & H. R., succeeding W. E. Baily, resigned on account of ill health.

*Mexican Central.*—J. H. Clegg, trainmaster at Aguascalientes, has been appointed Acting Superintendent at Silao, succeeding B. Collins, deceased.

*New York Central & Hudson River.*—William J. Fripp, who was recently appointed Superintendent of the River division, was born in New York state in 1863 and educated at the Albany High School. He began railroad work in 1880 as a yard clerk at West Albany, N. Y., on the New York Central. After five years he was made time keeper and chief clerk, and three years later was transferred to the office of the superintendent at Albany. Here he remained for four years and then returned to West Albany as general despatcher. The next year he was appointed freight trainmaster. In 1898 he was made passenger trainmaster, and in 1902 was appointed Assistant Superintendent of the Mohawk division, where he remained until his recent promotion.

W. J. Fripp.

Cornelius Christie, who was recently appointed Superintendent of the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River, was born in 1864 and began railroad work in 1881 as a telegraph operator on the New York, Susquehanna & Western. In 1883 he went to the West Shore, now the River division of the New York Central, as a telegraph operator. Five years later he was made train despatcher of the same road, and in 1895 was appointed trainmaster. In 1902 he was made Superintendent of the River division, where he remained until his recent transfer to the Rome, Watertown & Ogdensburg division.

C. Christie.

### Traffic Officers.

*Chicago, Peoria & St. Louis.*—C. W. Galligan, Assistant General Freight Agent, has been appointed General Freight Agent, succeeding W. M. Bushnell, resigned to go to the Chicago & Alton.

*Delaware, Lackawanna & Western.*—W. P. Colton, Industrial Agent, has resigned to go into other business.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe.*—See Atchison, Topeka & Santa Fe Coast Lines.

*Atchison, Topeka & Santa Fe Coast Lines.*—W. E. George, Master Mechanic at Needles, Cal., has been appointed Master Mechanic of the A., T. & S. F. at Winslow, Ariz., succeeding H. G. Wall, who takes Mr. George's place at Needles.

*Denver & Rio Grande.*—See Rio Grande Western.

*East Broad Top.*—A. E. Bachert has been appointed Chief Engineer, with office at Robertsdale, Pa.

*Erie.*—M. R. Strong, Engineer of Bridges and Buildings, has resigned to go into other business, and his former duties will be performed until further notice by F. A. Howard, Assistant Engineer.

*Missouri Pacific.*—William Donald, Master Mechanic of the Rio Grande Western at Salt Lake City, has been appointed Master Mechanic of the Missouri Pacific at Little Rock, Ark.

*Pennsylvania.*—F. A. Smock has been appointed Master Mechanic at Meadows, N. J., succeeding J. W. Sanford, retired.

*Pittsburg, Shawmut & Northern.*—Herbert Wilgus, formerly Engineer of the Brooklyn Heights Railroad, has been appointed Chief Engineer of the Pittsburg, Shawmut & Northern, with office at Olean, N. Y., succeeding A. G. McComb, resigned to go into other business.

*Rio Grande Western.*—E. G. Haskins, Acting Master Mechanic of the Denver & Rio Grande at Salida, Colo., has been appointed Master Mechanic of the Rio Grande Western at Salt Lake City, succeeding William Donald, resigned to go to the Missouri Pacific. See Missouri Pacific.

*St. Louis, Iron Mountain & Southern.*—J. W. Ruffner has been appointed Master Mechanic at Ferriday, La., succeeding J. B. Tennant.

*Union Pacific.*—G. H. Pickert has been appointed Master Mechanic at Pullman, Colo., succeeding George Thompson, resigned.

## LOCOMOTIVE BUILDING.

*The Southern* will not for the present place its order for 100 locomotives.

*The Grand Rapids & Indiana* has asked prices on four 10-wheel (4-6-0) locomotives.

*The Maine Central* has ordered two Pacific (4-6-2) locomotives from the American Locomotive Co., for April, 1907, delivery.

*The Buffalo, Rochester & Pittsburg* has ordered 20 heavy locomotives from the American Locomotive Co., to be built at the Dunkirk Works.

*The Canadian Pacific* has ordered 35 locomotives from the Locomotive & Machine Co., of Montreal, in addition to those reported in our issue of October 12.

*The Mobile & Ohio* has ordered 10 additional ten-wheel (4-6-0) freight locomotives from the Baldwin Locomotive Works, for December delivery. These locomotives are duplicates of the 10 ten-wheel passenger locomotives reported in our issue of June 15 last, with the exception of the diameter of the drivers, which are 62 in. for the freight locomotives.

*The Fort Worth & Denver City* has ordered two simple switching locomotives from the American Locomotive Co., for November 15 delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 145,000 lbs. |
| Diameter of drivers | 51 in. |
| Cylinders | 20 in. x 26 in. |
| Boiler, type | Straight top |
| " number of tubes | 311 |
| " tubes, make of | Shelby seamless |
| " diameter of tubes | 2 in. |
| " length of tubes | 11 ft. |
| Firebox, length | 108 3/16 in. |
| " width | 113 1/4 " |
| " material | Otis Steel Co. |
| Tank capacity | 4,500 gals. |
| Coal capacity | 8 tons |

*Special Equipment.*

| | |
|---|---|
| Boiler lagging | Keasbey & Mattison, sectional magnesia |
| Brake-beams | Sterlingworth |
| Couplers | Tower |
| Headlights | Star Headlight Co. |
| Piston rod packing | Jerome metallic |
| Sanding devices | Leach |
| Sight feed lubricators | Nathan |
| Springs | Railway Steel Springs Co. |

## CAR BUILDING.

*The St. Louis & San Francisco* is in the market for 400 ballast cars.

*The Chicago Great Western* is building 500 box cars at its South Park, Minn., shops.

*The Buffalo, Rochester & Pittsburg* has ordered 500 steel coal cars of 50 tons capacity.

*The Delaware, Lackawanna & Western* is in the market for a number of self-clearing hopper bottom gondolas.

*The Minneapolis, St. Paul & Sault Ste. Marie* is about to order four compartment cars with observation platform and buffet.

*The Chicago, Rock Island & Pacific*, as reported in our issue of October 12, has ordered 2,000 box cars of 80,000 lbs. capacity, for February to June, 1907, delivery; 400 furniture cars of 60,000 lbs. capacity, for February, 1907, delivery; 300 flat cars of 100,000 lbs. capacity, for April, 1907, delivery; 250 stock cars of 80,000 lbs. capacity, for May, 1907, delivery, and 250 hopper cars of 100,000 lbs. capacity, for March and April, 1907, delivery, all from the American Car & Foundry Co.; 650 dump cars of 100,000 lbs. capacity, for January and February, 1907, delivery, from the National Dump Car Co., and 100 ballast cars of 80,000 lbs. capacity from the Rodger Ballast Car Co., for February, 1907, delivery. The box cars will be 40 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The furniture cars will be 40 ft. long, 9 ft. wide and 10 ft. high, inside measurements. The flat cars will be 43 ft. long and 10 ft. wide, over all. The stock cars will be 36 ft. 6½ in. long, 8 ft. 9¾ in. wide and 7 ft. 1¼ in. high, inside measurements. The hopper cars will be 33 ft. 9 in. long and 8 ft. 9½ in. wide, inside measurements. The dump cars will be 41 ft. long, 9 ft. 7 in. wide and 44 in. high, inside measurements. The ballast cars will be 24 ft. long, 8 ft. 8 in. wide and 4 ft. high, inside measurements. The special equipment for all includes:

| | |
|---|---|
| Bolsters (for box, furniture, flat and stock) | Scullin-Gallagher |
| Bolsters (for hopper and dump) | General Castings Co. |
| Bolsters (for ballast) | Commonwealth Steel Co. |
| Brake-beams | Simplex |
| Brake-shoes | Streeter |
| Brasses | Hewitt |
| Couplers (1,500 box, furniture, flat, stock and ballast) | Monarch |
| Couplers (for 500 box, hopper and dump) | Major |
| Door fastenings (for box, furniture and stock) | Positive |
| Doors (for box, furniture and stock) | Climax |
| Draft rigging (for box, furniture and dump) | Miner |
| Draft rigging (for flat, stock and hopper) | Parlow |
| Draft rigging (for ballast) | Transon Draft Gear Co. |
| Journal boxes | Symington |
| Roofs (for box and furniture) | Murphy |
| Springs (for all but ballast) | Railway Steel Spring Co. |
| Trucks | Arch-bar |

## RAILROAD STRUCTURES.

ALBANY, GA.—The Albany & Northern, it is said, has arranged to pierce a tunnel 400 ft. long under Broad street at the western end of the river bridge.

BINGHAMTON, N. Y.—The Delaware & Hudson, according to reports, has bought a large tract of land at this place in the east section of the city as a site for large freight transfer sheds. The company, it is said, is planning also to build additional repair shops.

BUFFALO, N. Y.—The Grade Crossings Commission by a unanimous vote recently adopted the general plan which has been generally agreed to by the railroads interested, for the abolition of remaining grade crossings in this city. The plan was drawn up by Engineer Edward B. Guthrie, and provide for the abolition of grade crossings on the main line of the New York Central, the Belt Line, the Erie, Lehigh Valley, Lackawanna, Pennsylvania and Grand Trunk Railroads. The plan, as far as it is acceptable to the Commission and to the Central, provides for a viaduct at Bailey avenue from Stone to Stanley street; subways under Broadway on the main line, 80 ft. wide between abutments, extending from Ideal street to King street, the tracks being raised 12 ft. and the street to be sunk 3 ft., the pavement being widened 7 ft. between Curtis and Young street; Sycamore street, Belt Line, subway; Walden avenue, Belt Line, subway; Genesee street, Belt Line, subway, the tracks to be raised 11 ft. At Fougeron street, Urban street, French street, Box avenue, Ferry street, Northland avenue, Fillmore avenue and East Delavan avenue there are to be subways under the streets and the tracks to be raised. The plan for Kensington avenue calls for a viaduct; for Dewey avenue, viaduct; Le Roy avenue, viaduct; Jewett avenue, viaduct, the tracks being depressed 28 ft.; Amherst street, viaduct, with a clearance of 35 ft. and approaches from Starin avenue, Greenfield street and Central Park station. For Colvin street a subway is provided, also for Delaware avenue below the Belt Line and Erie. Subways are also provided for Elmwood avenue and the Military Road. Hertel avenue is to have a subway, also Amherst street at the New York Central cut-off. Elk street is to be carried over the tracks by a viaduct, the tracks to be lowered 11½ ft. Stairways will be provided on the north side of the viaduct from East and West Market street. Bailey avenue will be carried over the West Shore by a viaduct, the grade of the street to be 18 ft. above the rails, a street 50 ft. wide being opened up to Fay street. Amherst street will be carried under the Central, Erie and D., L. & W. by a subway. Parts of Tonawanda and Thompson streets are to be closed. Austin street will have a subway under the Central and Grand Trunk. Part of Pacific street will be closed. Subways are provided for Walden avenue and Ferry street, under the Erie, also at East Delavan avenue, all under the Erie and D., L. & W. Kensington avenue will have a subway under the Erie and Lackawanna roads. East Amherst street crosses the Erie and Lackawanna by a viaduct. Walden avenue, Main street, Colvin street and Delaware avenue go under the Erie and Lackawanna by subways. The Black Rock crossing of the Erie will be a subway. Walden avenue, Genesee street and Bailey avenue will have subways under the D., L. & W. The deferred plans for the Niagara street crossing at the Grand Trunk were taken up. The plans call for a subway. The Bailey avenue crossing at the Lehigh, Pennsylvania and D., L. & W. Railroads call for a subway. Walter P. Cooke appeared as attorney for the Lehigh to protest against the plan and ask that it be deferred. The plans for Bailey avenue at the Erie call for a viaduct. Parkside avenue will have a subway under the New York Central Belt Line. The only objections to the plans were that the Erie wants a subway at Bailey avenue, and the Grand Trunk wants its tracks at Niagara street to remain at the present level.

FLUSHING, L. I.—The new Scherzer rolling lift bridge, 169 ft. long and 52 ft. wide, carrying two tracks for street cars with two driveways and 8-ft. sidewalks over the Flushing creek, recently completed, at a cost of $400,000, has been opened for traffic.

HENDERSON, TENN.—The city officials have given contracts to John D. Keith and to E. A. Moffitt, of Jackson, for building a bridge over the Mobile & Ohio tracks.

MEMPHIS, TENN.—According to local reports the new union passenger station to be built here will be located at Broadway, La Rose, Dadie and Long avenues. Plans for the work will be completed shortly.

MEXICO CITY, MEX.—The recent floods in the Manzanillo district swept away 15 bridges, including three steel structures, on the new line of the Mexican Central. A large portion of the new roadbed and track was also washed away.

OMAHA, NEB.—The Union Pacific, it is said, has arranged to buy land at the northeast corner of Fifteenth and Dodge streets as a site for its general headquarters building.

RALEIGH, N. C.—The Seaboard Air Line, it is said, will put up a large warehouse, to cost about $40,000, at this place.

ST. LOUIS, MO.—At the meeting of the Terminal Railroad Association to be held in November, the question of making terminal improvements at a cost of about $6,000,000 will be considered. This represents the cost of improvements proposed in the report given in the *Railroad Gazette* of September 21, page 249.

SAN ANGELO, TEX.—The Atchison, Topeka & Santa Fe is making surveys for a new roundhouse to be built here.

SHARON, PA.—A steel bridge is proposed to be built over the Shenango river, about 200 ft. long, to cost $25,000.

TENARKANA, TEX.—The Kansas City Southern, it is said, will put up a new station also general office buildings to replace the structures destroyed by fire.

VICKSBURG, MISS.—Arrangements, it is said, have been made by the Yazoo & Mississippi Valley to put up a new station.

WILKESBARRE, PA.—The Lehigh Valley, it is reported, will contribute $20,000 towards the erection of a bridge to be built between East End and North Wilkesbarre.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ALASKA CENTRAL.—Work on this road is being pushed as fast as possible. A force of 700 men is now at work. Grading is expected to be completed and track laid to milepost 70 from Seward this year. There are seven tunnels between mileposts 49 and 54. Grading from milepost 7 to milepost 105 is mostly completed, and the line definitely located to milepost 185. At this point the Matanooska coal fields are located. The road, it is thought, will be in operation as far as these fields by the close of next year. The most difficult work, crossing the coast range of mountains, has been completed, and the balance of the work is easy.

AMERICAN ELECTRIC.—This company has completed its organization in Iowa, with office in Des Moines, and capital stock of $20,000. The company proposes to build an electric line across the state of Iowa, midway between the Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy. The line is from Davenport west via Muscatine, Winterset and Greenfield to Council Bluffs, about 270 miles air line. The officers are: C. W. Baker, President; J. D. Pollard, Vice-President and Treasurer, and Charles F. Castleman, Secretary, all of Des Moines.

ARKANSAS PACIFIC.—Incorporation has been asked for in Oklahoma under this name by George D. Locke, of Jerseyville, Ill.; T. D. Kinman and T. D. Kinman, Jr., of Newport, Ark.; Morris Locke,

Abilene, Tex., Wm. J. Gates, St. Louis; John H. Blackburn, James Gates, David R. Locke, Thomas M. Robinson, Mangum, Okla., for a company with $40,000,000 capital and office in Mangum. The company proposes to build a line from Mangum, Okla., on the Chicago, Rock Island & Pacific, east through Greer, Kiowa and Comanche counties in Oklahoma, and through the Chickasaw and Choctaw Nations in Indian Territory to Fort Smith, Ark., thence through the counties of Sebastian, Franklin, Logan, Yell, Pope, Conway, Faulkner, White, Woodruff, Cross and Crittenden to Memphis, with branch lines to Abilene, Tex., via Denison, and to Tulsa, Ind. T., to Clarksville, Ark., to Pine Bluff and Newport, a total length of 1,500 miles.

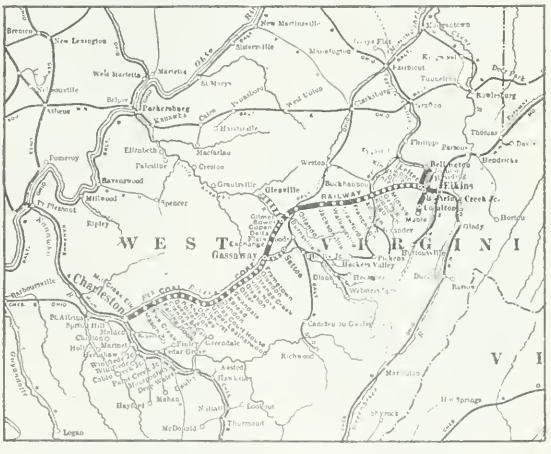
Boston & Maine.—This company has decided to double-track its road from Johnsonville, N. Y., southwest to Troy, 16 miles, and to put in automatic block signals. The double-tracking will begin early next spring.

Charleston & Summerville (Electric).—This single-phase line, which is to run from Charleston, S. C., northwest to Summerville, 27 miles, is to be built by D. E. Baxter & Co., of New York, who have the contract. (See Construction Record.)

Chicago & North-Western.—The Wyoming & North Western was opened for traffic Oct. 15th from Arapahoe to Lander, Wyo., 16 miles, completing the line from Casper to Lander, 148.1 miles.

Cleveland, Cincinnati, Chicago & St. Louis.—An officer writes that this company has incorporated in Indiana the Evansville, Mt. Carmel & Northern to build a line, for which contracts will be let within 30 days, from Evansville, Ind., north to a connection with the C., C., C & St. L. at Mt. Carmel, Ill., about 35 miles. Maximum grades are to be three-tenths of one per cent. southbound and five-tenths of one per cent. northbound. There is to be a steel bridge 1,200 ft. long over the Washington river. W. C. Brown, Senior Vice-President of the New York Central & Hudson River, is President, and W. M. Duane is Chief Engineer, Cincinnati, Ohio. (Oct. 5, p. 90.)

Coal & Coke.—This West Virginia road, which was built largely through the efforts of its President, Senator Henry G. Davis, by its connections with existing lines forms an important through line. Although the road was put in operation some time ago it was not




Coal & Coke Railway.

formally opened until last week. Traffic arrangements have been made with the Kanawha & Michigan and with the Chesapeake & Ohio at its western terminal at Charleston, W. Va. As its name suggests, the road was built to develop coal properties. The company owns 100,000 acres of coal lands in Randolph, Barbour, Upshur, Lewis, Gilmer and Braxton Counties. There are some 800,000 acres of coal lands along its line. The road crosses and partly parallels the Middle Fork, Buckhannon, Little Kanawha and Elk rivers, from which source large traffic in both coal and timber may be developed. It runs northeast for 175.2 miles to Elkins, where connection is made with the Western Maryland for the east. It also has a northern division from Elkins to Belington, 17.7 miles, where connection is made with the Baltimore & Ohio. Branches of the B. & O. are also crossed at Sago and at Orlando, and track connection with this company is made at Burnsville. Near its western end the road crosses the Kanawha & West Virginia at Blue Creek. This road, which operates 20 miles, is soon to be extended for 20 miles more. Connection is also made with the Meadville & Summerville, a five mile road, and at Dunden, near Clay, with the Buffalo Creek & Gauley, eight miles long. The company is planning to build extensions from Gassaway, which is about half way between its termini east up the Elk river to a short distance beyond Sutton, where connection is to be made with a branch of the B. & O.; also a line from Gilmer, east of Gassaway, up the Little Kanawha, 11 miles, to Glenville, the county seat of Gilmer County, at present without rail connection. Near the eastern end of the road a line is to be built by other interests about 30 miles long to develop timber lands. A number of other independent short lines are projected to connect with the Coal & Coke. At Gassaway, where the road crosses the Elk river, the company has built shops, employing about 300 men.

Colorado & Southern.—The Trinity & Brazos Valley division is practically completed, and as soon as the surfacing is completed through trains will be run between Denver, Colo., and Galveston by way of Fort Worth, from which point trackage rights have been obtained over the Gulf, Colorado & Santa Fe south to the Trinity & Brazos Valley at Cleburne, 28 miles. Trackage rights have also been secured from the same company from Houston to Galveston, 53 miles.

Columbus, Magnetic Springs & Delaware Interurban.—Incorporated in Ohio, with $400,000 capital, to build electric railroads. The officers are: W. M. Galbraith, Pittsburg, Pa., is President; Chris McGee, Jr., Pittsburg, Pa., is Vice-President and Treasurer; W. N. Embert, Secretary. J. H. Leonard and J. L. Horn are Directors.

Denver, Northwestern & Pacific.—D. H. Moffat, President of this company, is reported as saying that the road will be built to Salt Lake City by Jan. 1, 1908. By April 1 next it will be completed to Steamboat Springs, and from that point westward the work of construction will not be difficult. The distance from Steamboat Springs to Salt Lake is about 300 miles. (See Construction Record.)

Elkhorn Southern.—Incorporated in Virginia with $25,000 capital and office at Bristol. It is proposed to build a line from the Virginia-Kentucky state line near the Big Sandy river in Dickerson or Buchanan counties, Va., 40 miles long, with branches through Dickerson, Buchanan and Russell counties. Geo. L. Carter is President, and J. C. Stone, Secretary and Treasurer, of Bristol, Va.

Evansville, Mt. Carmel & Northern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Hornell, Bath & Lake Keuka (Electric) Company.—Incorporated in New York, with a capital of $1,000,000, to operate an electric line from the Pittsburg, Shawmut & Northern in Hornellsville northeast to Jerusalem, Yates County, 46 miles. The directors are: John F. Turk and Charles G. Wheeler, of Hammondsport; Fred W. Hastings, Wilson R. Campbell, Moses Davison, Dr. W. H. Phillips, G. H. Parkhurst and Frank N. DeCamp, of Bath, and L. D. Whiting, of Canisteo.

Idaho Northern.—This company proposes to build from Kingston to Murray, Idaho, and to the Coeur d'Alene lead district near Murray. Plans are also being made to connect Murray with Wallace, continuing thence westward to Spokane. B. F. O'Neill, President of the State Bank of Commerce, Wallace, is President, and has associated with him J. W. Douglas, of New York City. The Big Bend Water Power Company is building a plant 28 miles down the Spokane river, where 20,000 h.p. will be developed, and branch lines to be operated by electricity will probably be built to connect with the Idaho Northern.

Indian Central.—Incorporated in Oklahoma with $15,000,000 capital and office at Oklahoma City. The promoters intend to build a line from Ponca, Okla., on the Atchison, Topeka & Santa Fe, east through Kay County, the Osage country and the Cherokee Nation to an intersection with the St. Louis, Iron Mountain & Southern; thence south through the Cherokee, Creek and Choctaw Nations, crossing the Red river into Lamar County, Texas; thence southeast to Paris, Tex., on the Gulf, Colorado & Santa Fe, St. Louis & San Francisco, Texas Midland and the Texas & Pacific. A branch line is also projected from a point where the main line crosses the Red river, northwest through the Choctaw and Chikasaw Nations and the counties of Pottawatomie, Cleveland and Oklahoma to Oklahoma City, a total of 460 miles, 120 miles of which will be in Oklahoma. The incorporators include Pleasant Porter, of Muscogee; E. T. Hathaway, O. D. Halsell, Ed. Overholser and William C. Reeves, of Oklahoma City.

Iowa & North Western.—This company has been incorporated in Iowa, with a capital of $100,000, to build 75 miles of railroad east from Waterloo. Stephen B. Howard is President; E. M. Rice, Vice-President, and E. C. Luther, Secretary and Treasurer, all of New York. The office of the company is to be at Waterloo. Sur-

veys will be made at once. There will be a bridge over the Cedar river to cost about $10,000.

JACKSON, PASCAGOULA & GULF.—Incorporation has been asked for by a company under this name in Mississippi to build a line from Jackson, on the Gulf & Ship Island, the Illinois Central and the Yazoo & Mississippi Valley, southeast to the deep water harbor at Pascagoula, 160 miles air line. The proposed route is through Smith county and thence by the most direct route to Pascagoula. Negotiations are under way with an eastern syndicate to finance the project. The incorporators include F. A. Lewis, of Scranton; Stone Deavours, of Laurel, and E. C. Jones, of Jackson.

KENTUCKY NORTH & SOUTH.—Incorporated in Kentucky with $250,000 capital and office at Covington. The incorporators, which include J. T. Fitzpatrick and L. E. Miles, of Springfield, Ohio; A. T. Noe, Pittsburg, Pa.; J. P. Purdun, Portsmouth, Ohio, and C. H. Hoglen, Dayton, Ohio, propose to build a line from Fullerton, Greenup County, Ky., on the Chesapeake & Ohio, south to Bristol, Sullivan County, Tenn., through the counties of Greenup, Carter, Elliott, Lawrence, Morgan, Johnson, Magoffin, Floyd, Knott and Letcher in Kentucky; Wise, Scott, Russell and Washington in Virginia, and Sullivan in Tennessee, approximately 200 miles.

LAKE SUPERIOR SOUTHERN.—Surveys have been completed by this company and contracts are reported let to the Eldenbell Construction Company for building this proposed line from Huron Bay, on Lake Superior, south to Madison, Wis., 290 miles. About 75 miles is to be in Michigan and 215 miles in Wisconsin. (See Construction Record.)

LAUREL RAILWAYS.—Incorporated in Virginia with $25,000 capital to build a line from Damascus, Washington County, south to the Virginia-Tennessee state line, about five miles. E. A. Mock is President; F. G. Clements, Vice-President, and J. I. Hurt, Secretary, all of Damascus.

MARIANNA, BRINKLEY & WESTERN.—An officer writes that contracts are to be let about the first of next year to build a line from Marianna, Ark., northwest to Brinkley, 28 miles. Maximum grades will be three-tenths of 1 per cent. and the maximum of curvature 2 degrees. (Oct. 19, p. 107.)

MEXICAN INTERNATIONAL.—Traffic on this road has become so heavy that it has been decided to double-track a portion of the line. The first portion to be double-tracked will be between Sabinas and Reata. The present single-track is insufficient to handle the coal and coke traffic out of Sabinas. When this section is finished work will be started on the division between Reata and Monterey.

NEW YORK CENTRAL LINES.—See Cleveland, Cincinnati, Chicago & St. Louis.

NEW YORK CITY SUBWAYS.—The Appellate Division of the New York Supreme Court has confirmed the favorable reports of the Commissioners appointed to report upon six different rapid transit routes. The routes are known as the Fourteenth street, Thirty-fourth street, Third avenue, Lexington avenue, Seventh and Eighth avenues and Gerard avenue routes.

NORTHERN ELECTRIC.—This company, which operates a line from Chico, Cal., to Orovilli, is making good progress between the latter point and Marysville. The entire 28 miles is graded and 12 miles of track is down. The extension from Marysville to Sacramento will be finished by April. The northern end of the Sacramento valley is to be covered by the Redding & Red Bluff, which will be operated partly by steam and partly by electric power.

NORTH SHORE & WESTERN (ELECTRIC).—Incorporated in Illinois with $50,000 capital to build a line from Elgin, Ill., west to Evanston, about 35 miles. Surveys have been made to within a few miles of Elgin and terminal arrangements have been completed in both cities. Geo. P. Merrick, 100 Washington street, Chicago, is attorney for the company. The incorporators and directors include: William C. McHenry, E. R. Fifer, George P. Merrick and William A. Love, of Chicago.

OKLAHOMA, TEXAS & WESTERN.—Incorporated in Oklahoma, with office at Cheyenne. The company proposes to build a line from Thomas southwest via Clinton to Elk City, thence northwest to Cheyenne, about 80 miles. The directors include L. L. Collins, A. C. Miller, L. W. Pate and R. V. Converse, of Cheyenne, and D. D. Fitzgerald, of New York.

POWELL'S RIVER.—Announcement is made that this company will build a branch from Blackwood, Va., to coal fields at the head of Powell's river, 10 miles. Surveys are being made. Charles Christy, Blackwood, Va., is Chief Engineer.

ROSWELL & EASTERN.—It is reported that this company, recently chartered in New Mexico, is a Gould project and that it will build the New Mexico link in the line which is to connect the Texas & Pacific system in Texas with the Denver & Rio Grande. The Roswell & Eastern is to be built from Torrence, N. Mex., south to a point on the boundary between Texas and New Mexico, about 200 miles. It will connect with the Santa Fe Central at Torrence and with the proposed extension of the Weatherford, Mineral Wells & Northwestern at the Texas-New Mexico border. The Weatherford & Mineral Wells road, connecting with the Texas & Pacific at Weatherford, is a Gould property. The incorporators of the Roswell & Eastern are: K. S. Woodruff, C. W. DeFrees, R. F. Barnett, George T. Veal and W. Wells, all of Roswell.

SAVANNAH, STATESBORO & WESTERN.—Under this name a company has been incorporated in Georgia with a capital of $1,000,000 to build a line from Statesboro, on the Central of Georgia and the Savannah & Statesboro, northwest to Atlanta, about 210 miles, through Bullock, Emanuel, Johnson, Washington, Baldwin, Jones, Jasper, Newton, Rockdale, DeKalb and Fulton counties. The incorporators include J. R. Anderson, T. F. Walsh, Jr., and W. E. O'Connor, of Savannah. This is thought to be a Seaboard Air Line project.

SHELBY COUNTY.—An officer writes that contracts will either be let in about 15 days for building this line or the work will be done by the company's men. The proposed route is from Shelbyville, Mo., south to Shelbina, eight miles. The work will not be difficult as the line is to be practically without curves, excepting near terminals. There are to be two bridges, one of about 120 ft. and the other 80 ft. (Oct. 5, p. 92.)

SIOUX FALLS & SIOUX CITY (ELECTRIC).—Articles of incorporation have been filed in Pierre, S. Dak., by a company under this name which proposes to built 60 miles of electric railroad paralleling the St. Paul road. Capital $1,000,000. The names of the incorporators are not given.

TOLEDO, PORT CLINTON & LAKE SIDE.—This company, operating 53 miles of electric road in Ohio from Toledo east to Marblehead, and which has been running cars from the Toledo city limits to Genoa, 10 miles, over the tracks of the Lake Shore Electric, has completed an independent entrance to Toledo over a private right of way from the present junction north to Curtice, thence to Booth and to the center of the city of Toledo. The new section, on which construction was begun about a year ago, is almost ready for operation. The work included an overhead crossing at Clay Center over the main line of the Lake Shore & Michigan Southern.

TRINITY & BRAZOS VALLEY.—See Colorado & Southern.

WESTERN MISSOURI INTERURBAN.—Incorporated in South Dakota with $3,000,000 capital and with offices at Clinton, Mo., and at Sioux Falls, S. Dak. The company proposes to build a line, to be operated either by electricity or other motive power, from Odessa, in Lafayette County, Mo., on the Chicago & Alton south through Lafayette, Johnson, Henry, St. Clair and Cedar counties to Greenfield, in Dade County, on the St. Louis & San Francisco, approximately 125 miles. The incorporators include D. J. Haugeberg, F. S. Gray, E. W. Campbell and S. S. Halliday, of Clinton, Mo., and others of South Dakota.

## RAILROAD CORPORATION NEWS.

BALTIMORE & OHIO.—See Washington Terminal.

CANADIAN NORTHERN.—See Canadian Northern Quebec.

CANADIAN NORTHERN QUEBEC.—Sperling & Co. have offered in London at 98 per cent. £1,000,000 ($4,850,000) 4 per cent. perpetual debenture stock guaranteed by the Canadian Northern. The stock was issued in exchange for securities of the Great Northern of Canada, the Chateauguay Northern and the Quebec, New Brunswick & Nova Scotia, which roads have been consolidated under the name Canadian Northern Quebec. (Oct. 5, p. 92.)

CHICAGO, CINCINNATI & LOUISVILLE.—It is announced that this company has made an agreement with the Illinois Central by which the C., C. & L. gets an entrance into Chicago by running over the Illinois Central tracks from Hammond, Ind. This gives the C., C. & L. a through line from Cincinnati to Chicago.

CINCINNATI, HAMILTON & DAYTON.—The *Commercial and Financial Chronicle* gives the following official list of receiver's certificates issued by the Receiver of the Cincinnati, Hamilton & Dayton and the Pere Marquette:

*Cincinnati, Hamilton & Dayton.*

| | |
|---|---|
| Jan. 1, 1906. 5½ per cent., payable one year after date and issued to pay interest due on bonds | $511,830 |
| July 2, 1906.—6 per cent., payable one year after date and issued to pay interest due on bonds | 511,830 |

*Pere Marquette.*

| | |
|---|---|
| Jan. 1, 1906.—5½ per cent., payable one year after date | $419,180 |
| May 5, 1906.—5½ per cent., payable in semi-annual instalments of $200,000 each, beginning Feb. 1, 1907, and issued to pay back taxes for the years 1902-1905, inclusive | 1,200,000 |
| July 2, 1906.—6 per cent., payable one year after date, and issued to pay interest on bonds | 419,180 |

CONSOLIDATED (N. Y., N. H. & H. ELECTRIC LINES).—The New York, New Haven & Hartford has offered to exchange, up to June 30,

1907, one share of its capital stock for each $200 face value in 20 year, 4 per cent. debentures of the Consolidated, of the issues of July, 1904, January, 1905, and January, 1906. Of the 1904 issue, $5,000,000 are outstanding, all being in the hands of the public. The N. Y., N. H. & H. holds $1,393,000 of the outstanding $3,995,000 issued in 1905 and $8,566,000 of the outstanding $10,000,000 issued in 1906. In April, 1905, $3,500,000 were issued; this amount is all held by the N. Y., N. H. & H.

Green Bay & St. Paul.—See Green Bay & Western.

Green Bay & Western.—A committee representing the $7,000,000 debenture "B" income bonds was formed about a year ago and a majority of the securities were deposited with it. According to the plan of the reorganization of the road in 1896 the debenture "B's" are entitled to the surplus earnings at the end of each year after 5 per cent. each has been paid on the $600,000 debenture "A's" and the $2,500,000 capital stock. These dividends were paid in 1905 and 1906, but so far no distribution of surplus has ever been made to the holders of the debenture "B's." The surplus after dividends on December 31, 1905, amounted to something less than 1 per cent. on the last named securities. A plan has now been made by the above mentioned committee for buying control of, or all of, the capital stock. It has been given an option on a majority of this stock and has issued a circular calling upon the debenture "B" holders to subscribe $400 for every $1,000 held to provide funds for this purchase. It is intended to reorganize the road under the name Green Bay & St. Paul, and extend it to St. Paul, 120 miles, giving it, in all, 330 miles of line from Green Bay, Wis. If the stock is bought, the 5 per cent. dividends on it will, pending the reorganization, be distributed among the holders of the committee certificates which have been issued in exchange for the debenture "B's" deposited. The time during which deposits of the securities could be made was to have expired on October 25th. After the reorganization, first mortgage 4½ per cent. bonds of the new company, limited to $25,000 per mile of line, are to be given to subscribers at 90 per cent. of their face value, in exchange for the subscriptions mentioned above, and not less than $600,000 of these bonds are to be set aside to take up the $600,000 "A" debentures. The subscribers are also to receive, in exchange for their debenture "B" bonds, one-half of the par value of the bonds in 4 per cent. non-cumulative preferred stock and one-half in common stock of the new company. The committee consists of J. H. Davis, Rudolf Kleybolte, G. M. Pynchon, J. M. Levy, W. E. D. Stokes and Martin Van Buren. L. M. Ogden, New York, is Secretary.

Illinois Central.—Stuyvesant Fish, President of this company, has resigned as Vice-President and Director of the Railroad Securities Company, a holding company for 94,730 shares of the 950,400 outstanding shares of Illinois Central stock. One-third of these shares were owned by Mr. Fish; the rest by E. H. Harriman and Kuhn, Loeb & Co. Mr. Fish is said to have transferred his holdings, which could be voted against him according to the agreement under which they were deposited in the Railroad Securities Company, to Mr. Harriman for half the amount in cash and half in stock.

See Chicago, Cincinnati & Louisville.

Kansas City Southern.—Gross earnings for the three months ended September 30, 1906, were $2,064,951, an increase of $417,471; net earnings, $721,757, an increase of $389,362.

Louisiana & Arkansas.—The gross earnings of this company for the year ended June 30, 1906, were $1,057,526, an increase of $212,990; net earnings $371,334, an increase of $48,520. The surplus after charges was $238,659, an increase of $37,137. The road runs from Hope, Ark., to Jena, 187 miles, and has a branch from Packton to Alexandria, 36 miles.

New York, New Haven & Hartford.—See Consolidated.

Norfolk & Southern.—The stockholders of the Norfolk & Southern Railroad Company and of the Virginia & Carolina Coast have confirmed the consolidation of the two companies under the name Norfolk & Southern Railway Co. The Pamlico Oriental & Western, which is under construction from New Bern, N. C., to Goose Creek, 38 miles, and was some time ago acquired by the Virginia & Carolina Coast, has been sold to the Atlantic & North Carolina. The Norfolk & Southern Railway owns and operates 300 miles of road from Columbia, N. C., to Suffolk, Va. It leases the Atlantic & North Carolina, which runs from Goldsboro, N. C., to Morehead City, 95 miles. The new company also owns all the capital stock of the John L. Roper Lumber Company, which owns over 600,000 acres of timber land, and has timber rights on about 200,000 acres more. The capital stock of the new railroad company is $20,000,000 common and $5,000,000 five per cent. non-cumulative preferred. There have been authorized $25,000,000 first mortgage and refunding five per cent. 50-year bonds, of which $3,500,000 are reserved to retire all outstanding liens and $14,000,000 have been issued to provide in part for acquisition of other property and to provide for extensions. The remainder of the funds used in the acquisition of property and for other expenses of consolidation were provided by the issue of $4,800,000 preferred stock and $12,700,000 common stock.

Norfolk & Western.—A semi-annual dividend of 2½ per cent. has been declared on the $64,169,200 outstanding common stock payable December 21 to stockholders of record November 5. Previous dividends have been as follows: 2 per cent. in 1901, 2½ per cent. in 1902, 3 per cent. in 1903, 3 per cent. in 1904, 3½ per cent. in 1905 and 2 per cent. in June, 1906.

Pennsylvania.—See Washington Terminal.

Pere Marquette.—The gross earnings for the year ended June 30, 1906, were $13,430,169, an increase of $762,749. The taxes were nearly $1,200,000, an increase of $745,000, because of the back payments made necessary by the decision of the United States Supreme Court, last April, sustaining the law passed by the Michigan legislature in 1901 providing for a tax on gross earnings. The net earnings of the Pere Marquette after deducting taxes were $2,300,158, a decrease of $36,822; the deficit after charges was $860,947, which compares with a deficit of $22,431 in 1905.

See Cincinnati, Hamilton & Dayton.

Railroad Securities Company.—See Illinois Central.

Santa Fe, Raton & Des Moines.—See Santa Fe, Raton & Eastern.

Santa Fe, Raton & Eastern.—A semi-annual dividend of 2½ per cent. on the $300,000 capital stock was paid on October 18th. The road runs from Raton, N. Mex., to Yankee, 12 miles, and this dividend is the first paid since the lease of the road to the Santa Fe, Raton & Des Moines, which guarantees 5 per cent. on the stock and the principal and interest of the $300,000 5 per cent. first mortgage bonds of 1935. The Santa Fe, Raton & Des Moines is under construction from Carrisbrook, on the S. F., R. & E., to Des Moines on the Colorado & Southern, 41 miles, and has outstanding $1,000,000 5 per cent. first mortgage bonds of 1936.

Southern Pacific—Gross earnings for the month of August were $9,711,055, an increase of $1,119,114. Net earnings after taxes $3,571,457, an increase of $701,172. The gross earnings for the two months ended August 31, 1906, were $18,957,476, an increase of $2,176,358; net earnings after taxes $5,941,126, an increase of $1,478,546.

Velasco, Brazos & Northern.—The sale of this road to H. C. Alexander, Dallas, Tex., for $80,000 has been affirmed by the court. The road was sold under foreclosure to Mr. Alexander early in July, but the purchaser failed to complete his bid and the sale was set aside. The road runs from Houston, Tex., to Velasco, 20 miles, and was sold to satisfy an indebtedness of $236,000.

Virginia & Carolina Coast.—See Norfolk & Southern.

Wabash.—At a special meeting of the stockholders and debenture bondholders on October 22, the following plan for the retirement of the debentures was approved: An issue of $200,000,000 seven per cent. non-cumulative preferred stock is to be made and the proceeds used to refund the outstanding bonds and for betterments, extensions and equipment. The $24,000,000 seven per cent. non-cumulative preferred stock is to be increased by $16,500,000 and the $38,000,000 outstanding common stock ($78,000,000 authorized) is to be increased by $81,500,000. The issue of $16,500,000 of each class of stock is authorized to be exchanged for debenture bonds. The $3,500,000 debenture "A" six per cent. bonds are to be exchanged for new securities as follows: For each $1,000 in bonds $775 in new bonds and $560 par value of preferred stock and $560 in common stock. Each $1,000 in bonds of the $26,500,000 six per cent. non-cumulative debenture "B's" is to be exchanged for $700 par value new bonds, $500 par value preferred stock and $500 common stock. Full interest was paid on the debenture "A" bonds from 1900 to July, 1904, inclusive, but no interest has been paid since then. No interest has ever been paid on the debenture "B" bonds.

Washington Terminal.—According to the annual report of the Baltimore & Ohio, $9,364,949 had been spent up to June 30, 1906, by the Washington Terminal Company, which is building a union passenger station at Washington, D. C., for the Baltimore & Ohio and the Philadelphia, Baltimore & Washington, the last named road being a subsidiary of the Pennsylvania. All the foundation work for the station building has been finished and about 60 per cent. of the steel work and of the granite masonry has been erected. Work is under way on the power house foundation; the filling and bridge work on the approaches are nearly done. It is expected that the terminal will be in operation some time during the present fiscal year.

# GENERAL NEWS SECTION

## NOTES.

The Baltimore & Ohio announces the reduction of all passenger fares on the Philadelphia division Nov. 1 to the basis of 2½ cents a mile.

The new steel steamer "Snyder" arrived at Buffalo from Fort William Oct. 27 with 380,262 bushels of wheat, the largest cargo ever brought to that port.

It is announced in Chicago that the Pennsylvania and the Erie have agreed not to sell their $20 mileage ticket, good for bearer, in the territory west of Pittsburg and Greenville, Pa.

The Enterprise Transportation Company, running steamboats between New York and Fall River, announces that it is to put on an additional line, to run between New York and Providence.

It is announced that the Boston & Maine will about January 1st make a general reduction of passenger rates in Massachusetts to 2 cents a mile; and on the lines farther north, a reduction of 5 mills from the present rates, some of which are more than 2½ cents.

Fifty seven conductors on the Montreal, Portland, Toronto and Chicago divisions of the Grand Trunk have been discharged. No reason is given officially, but the newspapers say that one conductor was found to be worth $100,000 and another to be the owner of six grocery stores.

According to press despatches, the Pullman Company is not going to publish, post or file its tariffs or send them to the Interstate Commerce Commission. The company takes the ground that it is not a common carrier; that its services are the same as those performed by hotels.

Chicago newspapers report that the railroads of Illinois are revising their freight tariffs, to make them comply with the long and short haul law of that state, which it is said has always been ignored. Now, it is said, the railroads are threatened with a large number of suits for damages.

Officials of the Atchison, Topeka & Santa Fe at San Francisco deny the press reports that more than $10,000 has been remitted by persons to whom the company gave free transportation out of San Francisco at the time of the disaster of April 18. They say that not even the price of a single fare has yet been received.

The press agent of the Baltimore & Ohio announces that the superintendent of motive power of that road has issued new instructions to enginemen and firemen covering the firing of locomotives. The work must be done with the utmost care, and the emission of black smoke from the stack must be reduced to the minimum.

Press despatches of Oct. 26 state that J. M. Stoudt, Superintendent of Interlocking of the C., C., C. & St. L., was killed, and M. F. Potter, Supervisor of Bridges and Buildings at Springfield, Ohio, was fatally injured near Milford, Ohio, by a collision between the second section of a passenger train and the motor car on which they were inspecting bridges.

The Atchison, Topeka & Santa Fe has notified telegraph operators who send and receive messages for the Western Union Telegraph Company, that they are to be paid 10 per cent. of the revenue derived from this commercial business. This, with an advance of pay which was made about two months ago, will increase the payrolls of operators on the road about $65,000.

An Association of Railroad Industrial Agents has been formed to meet twice a year. The next meeting is to be held at Chicago on the second Tuesday in January. W. H. Manss, of the Chicago, Burlington & Quincy, is President; W. E. Moyer, of the Delaware & Hudson, Vice-President; R. E. Wilson, of the Atchison, Topeka & Santa Fe, Secretary, and D. E. King, of the Missouri Pacific, Treasurer.

J. N. Seale, Superintendent of Transportation of the Southern Railway, who has been convicted a second time of violation of the law of the state of Georgia, prohibiting the running of freight trains on Sunday, has appealed to the Supreme Court of the state, on the ground that the law is a restraint on Interstate Commerce, and also that the state has no right to designate a particular day as the Sabbath.

At Omaha last week Interstate Commerce Commissioners Lane and Clark heard testimony concerning the conduct of the grain trade in Nebraska. The manager of the Farmers' Grain Company, composed of 300 farmers along the line of the Union Pacific, said that formerly his company had had difficulty in securing suitable facilities for loading grain into cars, but later had been treated with perfect fairness.

In a suit filed at Des Moines, Iowa, last week by the Agar Packing Company against the Chicago, Rock Island & Pacific, it is alleged that other shippers, by secret agreement, have been able to ship hogs from various points to Valley Junction, three miles west of Des Moines, without the payment of any freight whatever; this on condition that the hogs should be re-shipped over the Rock Island road to Chicago.

According to a Paris newspaper a competent authority estimates that the yearly cost to the railroads of France of giving their employees a day off each week will be from $6,000,000 to $8,000,000. It will be remembered that the Sunday rest law, recently passed, exempted the railroads from its provisions, the intention being, apparently, to take up the needs of railroad employees at a later time; but the railroads conferred with each other and agreed to grant the seventh day rest voluntarily.

Governor Franz of Oklahoma has begun proceedings against the railroads doing business in that territory to compel them to observe the law. Suits are being brought in every county, and special attorneys are being employed to assist the attorney general in the prosecution. The roads against which offenses are being charged include the Missouri, Kansas & Texas, the St. Louis & San Francisco, the Rock Island and the Atchison, Topeka & Santa Fe. The roads are accused of charging higher rates than those set forth in their original charters; of operating as members of a combination to fix the price of the various commodities carried by them; and of combining to charge a fixed rate on corn, wheat and other crops for local distance haul and not for export trade. On shipments of export grain the roads are charged with discriminating against Oklahoma and in favor of Kansas and other southwestern states. It is alleged, for example, that the roads charge 5 cents per 100 lbs. less for hauling corn from Nebraska points to Galveston than the rate charged for the same service from Enid, Oklahoma. It further is charged that grain can be shipped from Kansas City to Galveston for 2 cents per 100 lbs. less than it can be shipped from Enid.

### A Year's Rate Reductions on the Great Northern.

The annual report of the Great Northern issued October 31st sums up the rate reductions made during the past year as follows:

"The report for last year referred to a voluntary reduction in grain rates effective Sept. 1, 1905. This reduction amounted to about $750,000 for the nine months ended June 30, 1906.

"The following changes in rates were made during the year or were announced since the close of the fiscal year:

"Distributing rates were put into effect from Sauk Centre, Minn., July 1, 1905, and from Thief River Falls, Minn., on Sept. 1, 1905. A new distance tariff was put into effect in Montana, Aug. 15, 1906, reducing the rates named in the former distance tariff by about 10 per cent. On Aug. 15, 1906, new class rates were made from Eastern terminals to Montana points, which were about 10 per cent. lower than former rates. Sept. 1, 1906, rates on grain from stations in Minnesota, North and South Dakota, Iowa and Nebraska to Eastern terminals were reduced something more than 10 per cent. Sept. 10, 1906, class rates from far Western points to Montana points were reduced about 10 per cent. Oct. 22, 1906, rates on hard and soft coal from Duluth, Minn.; Superior, Wis.; St. Paul, Minn., and Minneapolis, Minn., to stations in Minnesota, North and South Dakota, Iowa and Nebraska will be reduced from 5 cents to 81 per ton. The greater reduction is made on soft coal, which is more largely used."

### Applied Science in Kentucky.

A press despatch from Louisville, Ky., says that, on October 28, rival track laying gangs of the Louisville & Nashville and of the Louisville & Eastern met at Beards, 20 miles east of Louisville. At this point 100 Louisville & Eastern men attempted to lay track for their electric road over the Louisville & Nashville tracks; when the work was partly finished, 300 L. & N. men appeared and started tearing up the rails. The contestants first tried to settle the dispute with picks, shovels and fists, but the Louisville & Eastern people soon became dissatisfied with these crude methods and connected the rails they had laid with a charged trolley wire. The "Ellen N." men were at the time at work on the rails with crowbars * * * They were resuscitated just in time to greet the county officers, who solved the difficulty by arresting two dozen men from each side.

### How the Pennsylvania Declares Its Dividend.

In view of the criticism of the dividend declarations in August of the Union Pacific and Southern Pacific, the following official statement of the way in which the Pennsylvania Railroad declares its dividends is of interest:

For many years it has been the fixed policy of the road for the directors to refuse to discuss the question of the dividend until the statements and earnings and expenses for the preceding six months have been completed and are ready for submission to the Board.

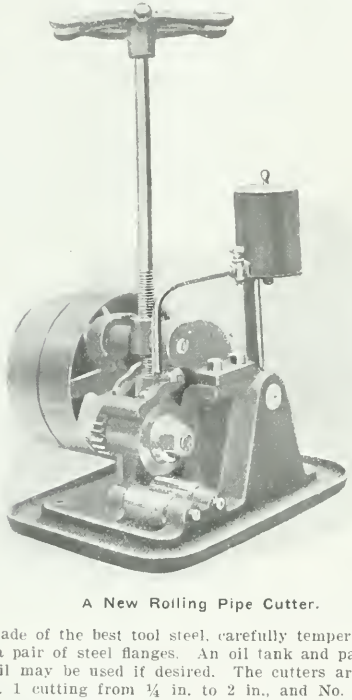
When these figures have been made up, meetings of the Finance Committee and of the Board are called. The former meets at 11 o'clock, goes carefully over the statements, and determines upon its recommendation to the Board as to the rate of the dividend to be paid, based upon the earnings of the previous six months. This committee continues in session until 12 o'clock, when, without leaving the room, the members appear before the Board of Directors, which meets at that hour. The report is then considered and the necessary action is taken by the Board in declaring the dividend. The announcement is given to the public immediately after the adjournment of the Board.

### Sale of the Mallory Line to C. W. Morse.

The Mallory Line, which operates 11 steamers between Galveston, Tex., and New York, as well as between points in Georgia and Florida and between Galveston and Mobile, has been sold to C. W. Morse, who controls the Clyde Line, the Hudson River Navigation Co., the Citizens Steamboat Co., of Troy, the Metropolitan Line and the Eastern Steamship Company. These companies own, altogether, about 50 steamboats.

### A New Rolling Pipe Cutter.

An improved design of pipe and tube cutter is shown herewith. The cutter shaft is driven direct from the driving shaft by cut gears and the cutter is raised or lowered by a screw working in a steel nut. The rollers are of large diameter, which reduces the speed, and they run on hardened steel pins. The cutter



A New Rolling Pipe Cutter.

disc is made of the best tool steel, carefully tempered, and is stiffened by a pair of steel flanges. An oil tank and pan are provided so that oil may be used if desired. The cutters are made in two sizes, No. 1 cutting from ⅛ in. to 2 in., and No. 2 cutting from 1 in. to 4 in. They are made by the Bignall & Keeler Manufacturing Co., Edwardsville, Ill.

### Ventilation of New York Subway.

The New York City Rapid Transit Commission is so well satisfied with the ventilating and cooling apparatus which has been put in at the Brooklyn Bridge station that it is proposed to provide the same improvement at a number of other stations before next summer. In the section between 33d and 42d streets, where the line is far below the surface and where the northbound tracks are in a separate tunnel from that carrying the southbound tracks, it is proposed to erect partitions with a view to securing effective ventilation by the movement of trains.

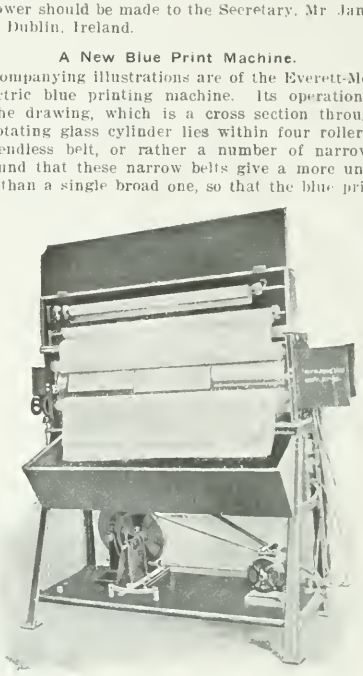
Plans are being made for the elimination of the grade crossing at the junction north of 96th street.

### Ireland's International Exhibition.

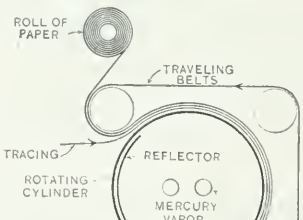
Ireland is to have an International Exhibition from May to October, 1907. The Machinery Building is already finished and all the buildings will be ready some months before the opening day. Exhibits will be classified in 19 sections, of which three are Engineering and Shipbuilding, Civil Engineering and Transportation, and Electricity. In the transportation and machinery departments there will be represented the Great Southern & Western Railway of Ireland, the Dublin Wicklow & Wexford, the Great Western Railway of England, the White Star Line, the Cunard Steamship Co., the Royal Pacific Steam Packet Co., and the British Westinghouse Company. The exhibition is to be held in Herbert Park, in the residential quarter of Dublin about one and a half miles from the business center. The charge for space will be $1 per sq. ft., with a decreasing sliding scale for large exhibitors. Application for space and power should be made to the Secretary, Mr. James Shaw, Ballsbridge, Dublin, Ireland.

### A New Blue Print Machine.

The accompanying illustrations are of the Everett-McAdam continuous electric blue printing machine. Its operation is clearly shown in the drawing, which is a cross section through the machine. A rotating glass cylinder lies within four rollers on which travels an endless belt, or rather a number of narrow belts. It has been found that these narrow belts give a more uniform bearing surface than a single broad one, so that the blue print is



Everett-McAdam Blue Printing Machine.




Cross Section.

points held firmly against the tracing. The tracings are carried between the outer surface of the cylinder and the blue print paper which unwinds from a roll at the top of the machine. Light is furnished inside of the cylinder by four mercury vapor lamps which give out only actinic rays. With this machine it is possible to make prints 5 ft. wide and of any length, but it is equally convenient to make a number of small prints from one long sheet of paper as from separate sheets. As the tracings go in and come out on the same side of the machine, the edge of the outgoing tracing may be started back into the machine before the trailing edge comes out; thus when a number of prints are to be made from one tracing no part of the blue print paper need be left blank. 12 prints from one six foot tracing have been made on a single sheet of paper 72 ft. long without stopping the machine. The machine requires a space 2 ft. x 5 ft., and is operated by a variable speed motor. It is built by the Revolute Machine Co., New York.

### New Standard Steel Car Company Plant.

The Standard Steel Car Co., Butler, Pa., has let contract to the McClintic-Marshall Construction Co., of Pittsburg, for a new building plant at Hammond, Ind., to cost over $2,500,000. The site covers 320 acres. It is expected to have the new plant in operation by next spring.

### The Traffic Club of New York.

The second regular meeting of the Traffic Club of New York was held on October 30 at the Hotel Astor, New York City. An increase of over 60 members was reported, bringing the total membership of the club, resident and non-resident, up to nearly

Short speeches were made by representatives, each of the shipping, railroad and steamship interests, emphasizing the advantages to be obtained from co-operation and acquaintanceship afforded by the club for men in these different but inter-related lines of work. The evening was closed with refreshments and a vaudeville production.

### Dr. Vauclain.

At the dedication exercises of the new engineering building of the University of Pennsylvania, the following remarks were made in presenting S. M. Vauclain, General Superintendent of the Baldwin Locomotive Works, as a candidate for the degree of Doctor of Science:

We ask you to confer the degree on Samuel Mathews Vauclain. A vigorous mind and body combined with vast energy and endurance have enabled him to accomplish the work of more than one man in a short span of years. Courageous and resourceful, asking nothing of his fellows which he would not willingly perform himself, he has become a leader of men and a guiding spirit in an enterprise which directly supports a hundred thousand souls. Prolific in invention, far seeing, equally capable of grasping great projects and their smallest details, he has in large measure helped to build up an industry which will be a monument to his sagacity for a generation yet to come. His contributions to the development of the steam locomotive have caused his name to be familiarly known wherever that useful pioneer of civilization has pushed its cheerful way.

### 1907 Conventions A. R. M. M. and M. C. B. Associations.

At a meeting of committees of the American Railway Master Mechanics' and Master Car Builders' Associations at the Manhattan Hotel, New York City, Oct. 29, it was decided to hold the 1907 conventions at Atlantic City, N. J. The Master Mechanics' Convention will be held June 12-14, and the Master Car Builders' Convention June 17-19. The Marlborough-Blenheim was selected for convention headquarters. The exhibits will be placed on the steel pier—the same as last year. The list of hotels and rates has not yet been completed, but it will be about the same as last year, except that a few hotels will be omitted, and some minor changes in rates are to be announced. Applications for exhibit space should be made to Bruce V. Crandall, Secretary of the Supply Men's Association, 510 Security Building, Chicago, Ill.

## TRADE CATALOGUES.

*London & North Western.*—The New York office of the London & North Western (England) is distributing copies of a "Diamond Jubilee Album," which contains interesting illustrations and descriptions comparing the present cars, engines, tracks and buildings of the road with those of 1846. The same office also sends a copy of the August issue of the *Railway Magazine*, containing a full detailed and interesting description of the road. Many of the pictures are of scenes familiar to readers of L. & N. W. publications; but others are quite rare.

*Hunting in the South.*—This is the title of a pamphlet issued by the Passenger Department of the Southern Railway. It is not only a good advertisement, but is well arranged and will be valuable to sportsmen. Each of the states is taken up separately; the game laws are quoted and a table is given showing hotels, guides, kinds of game to be found and whether or not the land in the region is posted.

*Ideal Power.*—The October number of this magazine has articles on "Application of Electric Drills," with half-tone illustrations; "The Cook County Court House," being a reprint of an article describing the new court house being built in Chicago; "Air Motors for Locomotive Turntables"; "Lucas Hammer Die for Heading Staybolts," and other articles of interest in its field.

*Steam Traps.*—The Joseph Dixon Crucible Co., Jersey City, N. J., is distributing a reprint of an article on steam traps, by W. H. Wakeman, which originally appeared in *Graphite*. A number of types of traps are illustrated and described and their comparative values discussed.

*Locomotives.*—The Baldwin Locomotive Works has issued pamphlet No. 59 in its series of "Records of Recent Construction." This latest issue illustrates and describes, both in French and English, 14 locomotives of eight different types.

*Catalogue of Technical Books.*—Munn & Co., New York, publishers of the *Scientific American*, have issued their 1906-1907 catalogue of scientific and technical books published or sold by them. This catalogue may be had on request.

### Manufacturing and Business.

The annual convention of the sales managers of the Westinghouse Electric & Mfg. Co. was held at the East Pittsburg Works last week.

R. J. Gross, Vice-President of the American Locomotive Co., has been elected also to the Board of Directors, succeeding E. C. Converse, resigned.

The Draper Manufacturing Co., Port Huron, Mich., has shipped three McGrath pneumatic turntable motors to the Swedish State Railways for turntables at Svarbo, Kiruna and Ricksgransen, Sweden.

It is reported that the United States Steel Corporation has bought 72,000 acres of timber lands, together with a saw-mill and other property, in Menominee County, Mich., from the Cedar River Land Company. It is said that this timber will supply the Menominee Range mines of the steel corporation for 30 years.

The Chicago Pneumatic Tool Co., Chicago, reports that up to October 25, the number of orders booked had exceeded by 47 per cent. orders for the first 25 days of October, 1905, being also an increase of 37 per cent. over September, 1906. The amount of business for the first nine months of the current year increased 27 per cent. over the corresponding period of 1905. The company had on its books at the close of 1905 more than 8,000 active customers, and has added over 1,500 to this list during the current year.

The Muscle Shoals Hydro-Electric Power Company has been incorporated in Alabama with $1,000,000 capital stock. The company proposes to dam the Tennessee river with two 60-ft. dams, one at the foot of Little Muscle Shoals and the other at Florence, Ala. Locks are to be built in the dams. It is expected that 100,000 h.p. will be developed, and a power house for generating electricity will be built below each dam. Transmission lines will be built to points within 100 miles, among them being Nashville, Huntsville, Decatur and Birmingham. The incorporators are: Frank S. Washburn, Nashville, Tenn.; Charles H. Baker, New York City; William H. Lindsey, Nashville, Tenn.; J. W. Worthington, Sheffield, Ala., and Massey Wilson, Montgomery, Ala.

### Iron and Steel.

The Tremont & Gulf has ordered 1,000 tons for 1907 delivery, and the Chicago, Lake Shore & South Bend 8,300 tons.

The Delaware & Hudson is in the market for 15,000 tons of standard rails and for 6,000 tons of light sections for 1907 delivery.

The Detroit River Tunnel Company has ordered 6,000 tons of structural steel. The Northern Pacific has increased its order for bridge material to 17,000 tons.

The New York, New Haven & Hartford has ordered 35,000 tons of rails, and the Atlantic Coast Line 20,000 tons from the Pennsylvania Steel Co. for early delivery.

## OBITUARY NOTICES.

J. W. Tedford, formerly General Freight Agent of the Gulf, Colorado & Santa Fe, died recently at Sharon, Pa.

J. P. Amsden, President of the Louisville & Atlantic, died of pneumonia at Versailles, Ky., on October 30. Mr. Amsden was 60 years old.

A. M. Hawkins, Superintendent of the Pamlico division of the Norfolk & Southern, died on October 19th. Mr. Hawkins had been on the N. & S. for 25 years.

George R. Knox, General Freight Agent of the Nashville, Chattanooga & St. Louis, died at Nashville, Tenn., on October 26th, being 62 years old. Mr. Knox had been on the N. C. & St. L. since 1860; he was appointed General Freight Agent in 1879.

James D. Yeomans, formerly a member of the Interstate Commerce Commission, died in Washington October 31 of a complication of diseases, at the age of 61. Mr. Yeomans was born in Wyoming County, New York, in 1845. He entered railroad service early in life, became General Superintendent of the Buffalo, New York & Philadelphia, was identified with other railroad interests, and later became General Superintendent of the Olean, Bradford & Warren. Subsequently he engaged in railroad building in New York, Pennsylvania and Michigan. Mr. Yeomans had private business interests in Washington, to which he devoted himself after his retirement from public.

F. T. Robertson, General Manager of the Montana Railroad, died recently at Kansas City, Mo. Mr. Robertson began railroad work as a rodman on the Northern Pacific in 1881. After graduating from the Missouri School of Mines, he served until 1897 as resident engineer on construction on the Union Pacific, Atchison, Topeka & Santa Fe, Northern Pacific, Missouri, Kansas & Texas, and Kansas City, Pittsburg & Gulf, now the Kansas City Southern. He was then appointed Assistant Engineer of Maintenance of Way on the K. C., P. & G., and later Engineer of Maintenance of Way of its Texas lines. After working on the Clearwater extension on the Northern Pacific, he was, in 1900, appointed Superintendent of the Montana Railroad; later in the same year he was made also Chief Engineer, and in 1904 was appointed General Superintendent

and Chief Engineer. From November, 1905, until his death he acted as General Manager and Chief Engineer.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Franklin Institute.

At a stated meeting of the sections November 1 the subject for discussion was "The Direct Leakage of Steam Through Steam Valves," by J. V. Stanford, of the University of Pennsylvania.

### Canadian Society of Civil Engineers.

At a meeting of the Mechanical Section of this society in Montreal Nov. 1 a lecture on "Dynamometer Car Experiments on the Boston & Maine" was given by H. O. Keay, illustrated by lantern slides.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Chicago, Rock Island & Pacific.*—E. B. Pierce has been appointed Commerce Counsel of this road and of the St. Louis & San Francisco, with office at Chicago. Mr. Pierce will have charge of dealings with the Interstate Commerce Commission and the state railroad commissions.

*St. Louis & San Francisco.*—See Chicago, Rock Island & Pacific.

### Operating Officers.

*Atlanta & Birmingham Air Line.*—J. M. Shea, trainmaster of the Seaboard Air Line at Richmond, Va., has been appointed Superintendent of the A. & B. Air Line, with office at Birmingham, Ala., succeeding L. B. Parsons, resigned.

*Canadian Pacific.*—G. E. Graham, Superintendent of Terminals at Winnipeg, Man., has been appointed Superintendent at Brandon, Man., succeeding J. J. Scully, transferred.

*Central of Georgia.*—R. J. Harlan, Assistant Superintendent of the St. Louis & San Francisco at Birmingham, Ala., has been appointed Superintendent of the Macon division of the Central of Georgia, with office at Macon, Ga.

*Chicago, Indianapolis & Louisville.*—See Detroit, Toledo & Ironton.

*Detroit, Toledo & Ironton.*—G. K. Lowell, General Superintendent of the Chicago, Indianapolis & Louisville, has been appointed General Manager of the D., T. & I.

*New Orleans & Northwestern.*—W. C. Morse, trainmaster of the Valley division, has been appointed Superintendent, with office at Ferriday, La., succeeding A. E. Wyatt, resigned.

*Pennsylvania Lines West.*—J. W. Coneys, Superintendent at Logansport, Ind., has been appointed Superintendent at Indianapolis, Ind., succeeding M. W. Mansfield, who has been made Assistant Chief Engineer. I. W. Geer, Superintendent of the Vandalia at Logansport, Ind., succeeds Mr. Coneys.

*Pittsburg, Shawmut & Northern.*—Herbert S. Wilgus, who was recently appointed Engineer of Maintenance of Way, was born in New York state in 1876 and graduated from Cornell in 1901. He began railroad work at once in an engineering corps of the C., C., C. & St. L. In the latter part of 1902 he was Assistant Engineer in charge of track elevation at Allegheny, Pa., on the Pittsburg, Fort Wayne & Chicago. During the next year he was in charge of the reconstruction of the Conway yards at Pittsburg, Pa., on the same road, and in September, 1903, was appointed Principal Assistant Engineer of the Brooklyn Heights Railroad; he was later made Engineer of Way and Structures and then Engineer of Surface Lines on this road. He left the last named position to go to the Pittsburg, Shawmut & Northern.

*St. Louis & San Francisco.*—See Central of Georgia.

*Trinity & Brazos Valley.*—H. S. Bottoms has been appointed Car Accountant.

*Union Pacific.*—W. H. Peterson, Acting Superintendent at Ellis, Kan., having resigned to go to another company, the office is abolished and the authority of A. T. Palmer, Assistant Superintendent at Kansas City, Mo., is extended over the Western district and branches. See Chicago, Rock Island & Pacific under Engineering and Rolling Stock officers.

*Vandalia.*—See Pennsylvania Lines West.

### Traffic Officers.

*Illinois Southern.*—H. P. Radley has been appointed General Freight and Passenger Agent, with office at Chicago, Ill. succeeding A. N. East, resigned.

*New York Central & Hudson River.* H. W. Henry, General Coal Agent, has resigned to go into other business.

### Engineering and Rolling Stock Officers.

*Chicago & North-Western.*—W. C. Armstrong, Bridge Engineer of the Chicago, Rock Island & Pacific, has been appointed Terminal Engineer of the C. & N.-W., in charge of new passenger terminal work at Chicago.

*Chicago, Rock Island & Pacific.*—W. H. Peterson, Acting Superintendent of the Union Pacific at Ellis, Kan., has been appointed Bridge Engineer of the C., R. I. & P., succeeding W. C. Armstrong, resigned to go to another company. See Chicago & North-Western.

*Detroit, Toledo & Ironton.*—J. B. Ball, formerly Superintendent of Motive Power of the Toledo, St. Louis & Western, has been appointed Superintendent of Motive Power of the D., T. & I., with office at Jackson, Ohio.

*Illinois Southern.*—M. W. Fitzgerald has been appointed Master Mechanic, with office at Sparta, Ill., succeeding G. A. Gallagher, resigned to go to another company. See Southern Indiana.

*New York Central Lines.*—R. D. Smith, formerly Superintendent of Motive Power of the Chicago, Burlington & Quincy Lines West of the Missouri River, has been appointed Mechanical Expert of the New York Central Lines West of Buffalo, with office at Chicago.

*Northern Pacific.*—R. M. Crosby, superintendent of shops at South Tacoma, Wash., has been appointed General Master Mechanic at Tacoma, succeeding William Moir, promoted.

*Pennsylvania Lines West.*—M. W. Mansfield, Superintendent at Indianapolis, Ind., has been appointed Assistant Chief Engineer, with office at Pittsburg, Pa.

*St. Louis, Iron Mountain & Southern.*—W. L. Calvert has been appointed Master Mechanic at McGehee, Ark., succeeding R. G. Long, resigned.

*Southern Indiana.*—G. A. Gallagher, Master Mechanic of the Illinois Southern, has been appointed Master Mechanic of the Southern Indiana, with office at Bedford, Ind., succeeding W. C. Walsh, resigned.

### Special Officers.

*Wabash.*—G. M. Hart, Inspector, Commissary Department, has been appointed Acting Superintendent of the Commissary Department, succeeding F. C. Roberts, resigned.

## LOCOMOTIVE BUILDING.

*The Pennsylvania* has reserved space with the Baldwin Locomotive Works for over 100 locomotives. They will probably be heavy consolidation (2-8-0) type freight locomotives.

*The Buffalo, Rochester & Pittsburg* has ordered 14 simple consolidation (2-8-0) type locomotives from the American Locomotive Co., for June and July, 1907, delivery. General dimensions are as follows:

| | |
|---|---|
| Weight on drivers | 164,000 lbs. |
| Total weight | 184,000 lbs. |
| Diameter of cylinders | 21 in. |
| Stroke of pistons | 28 " |
| Diameter of drivers | 57 " |
| Type of boiler | Extended wagon-top |
| Working steam pressure | 210 lbs. |
| Heating surface, total | 2,862 sq. ft. |
| Tubes—number | 354 |
| " material | Charcoal iron |
| " outside diameter | 2 in. |
| " length | 14 ft. 6⅜ " |
| Firebox, length | 108 " |
| " width | 74 " |
| Grate area | 44 sq. ft. |
| Tank capacity | 6,000 gals. |
| Coal capacity | 12 tons |

*The Illinois Central* has ordered for the Indianapolis Southern eight simple Consolidation (2-8-0) type locomotives from the American Locomotive Co., for March, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Consolidation (2-8-0) |
| Weight, total | 205,500 lbs. |
| Weight, on drivers | 181,000 lbs. |
| Diameter of drivers | 63 in. |
| Cylinders | 22 in. x 30 in. |
| Boiler, type | Extended wagon-top |
| Working steam pressure | 200 lbs. |
| Tubes, number | 344 |
| " material | Charcoal iron |
| " diameter | 2 in. |
| " length | 15 ft. 6 in. |
| Firebox length | 107 in. |
| Firebox, width | 67¼ in. |
| Grate area | 50 sq. ft. |
| Total heating surface | 2,946 sq. ft. |
| Tank capacity | 7,000 gals. |
| Coal capacity | 15 tons |

*The North Eastern Cuba Railroad Company* has ordered two

80-ton Prairie (2-6-2) locomotives from the Baldwin Locomotive Works. The executive offices of the company are in New York City.

*The Atchison, Topeka & Santa Fe* has ordered 23 compound Atlantic (4-4-2) locomotives from the Baldwin Locomotive Works, for January and February, 1907, delivery. These locomotives are to be almost duplicates of the balanced Atlantic type engines which the company now has in service.

*The Grand Rapids & Indiana*, as reported in our issue of October 26, has ordered four simple 10-wheel (4-6-0) locomotives from the American Locomotive Co., for May, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Ten-wheel |
| Weight, total | 165,000 lbs. |
| Weight, on drivers | 126,000 lbs. |
| Diameter of drivers | 68 in. |
| Cylinders | 20 in. x 26 in. |
| Boiler, type | Belpaire |
| " working steam pressure | 200 lbs. |
| " number of tubes | 330 |
| " tubes, material | Wrought iron |
| " diameter of tubes | 2 in. |
| " length of tubes | 15 ft. |
| Firebox, length | 102 in. |
| " width | 65½ " |
| " material | Steel to Penn. R. R. requirements |
| " grate area | 46 sq. ft. |
| Heating surface, total | 2,600 sq. ft |
| Tank capacity | 6,000 gals. |
| Coal capacity | 12 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse American |
| Axles | Steel to Penn. R. R. requirements |
| Bell ringer | "Little Giant" |
| Boiler lagging | Keasbey & Mattison |
| Brake-beams | National-Hollow |
| Brake-shoes | Company standard |
| Couplers | Kelso |
| Headlights | Star |
| Injectors | Nathan and Simplex |
| Journal bearings | Phosphor bronze |
| Piston rod packings | United States |
| Valve rod packings | American Locomotive Co |
| Safety valve | Kunkle |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan |
| Springs | Union Spring Co |
| Steam gages | Crosby |
| Steam heat equipment | Company's standard |
| Tires, tender wheels | Schoen steel |
| Tires, driving and truck wheels | Standard |
| Wheel centers | Steel |

*The Delaware, Lackawanna & Western* is in the market for five simple switching engines and ten simple ten-wheel (4-6-0) locomotives for May, 1907, delivery. Three of the ten-wheelers will have 73-in. drivers, a total heating surface of 3,521 sq. ft., and tubes 15 ft. 9 in. long; otherwise their general dimensions are the same as for the other ten-wheelers as given below:

*General Dimensions.*

| | Switching. | Ten-wheel. |
|---|---|---|
| Weight on drivers | 132,000 lbs. | 154,000 lbs |
| Weight, total | 132,000 lbs. | 201,000 lbs. |
| Diameter of cylinders | 19 in. | 22½ in |
| Stroke of pistons | 24 " | 26 in |
| Diameter of drivers | 51 " | 69 " |
| Type of boiler | Wire firebox | |
| Working steam pressure | 180 lbs. | 215 lbs. |
| Heating surface, total | 1,863 sq. ft. | 3,380 sq. ft |
| Tubes, number | 270 | 398 |
| " material | Charcoal iron | Charcoal iron |
| " outside diameter | 2 in. | 2 in. |
| " length | 12 ft. | 15 ft. 3 in |
| Firebox, length | 8 ft. 6 in. | 11 ft. 3 in. |
| " width | 8 ft. | 9 ft. |
| Grate area | 68 sq. ft. | 102¼ sq. ft |
| Tank capacity | 3,300 gals. | 6,500 gals |
| Coal capacity | 6 tons. | 10 tons. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Midvale |
| Bell ringer | Snow |
| Boiler lagging | Johns-Manville |
| Brake-beam, switching | Sterlingworth-Warden |
| Brake-beams, ten-wheelers | Westinghouse |
| Brake-shoes | American Brake-Shoe & Foundry Co. |
| Draft gear | Gould-Sessions |
| Headlights | Dressel |
| Injector | Hancock |
| Journal bearings | Magnus Metal Co. |
| Piston rod packings | United States |
| Valve rod packings | United States |
| Safety valve | Consolidated |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan |
| Springs | Railway Steel Spring Co. |
| Steam gages | Ashcroft |
| Steam heat equipment | Gold |
| Tires—Driving wheels | Midvale |
| " —truck wheels | Midvale |
| " —tender wheels | Midvale |
| Wheel centers, switching | Steel and cast iron |
| Wheel centers, ten-wheelers | Cast steel |

## CAR BUILDING.

*The Vandalia*, It is reported, has ordered from the Interstate Car Co. 100 hopper coal cars of 100,000 lbs. capacity.

*The Maine Central* has ordered 1,000 box cars from the Western Steel Car & Foundry Co. for January, 1907, delivery.

*The Chesapeake & Ohio*, as reported in our issue of October 19, has ordered 2,000 hopper cars from the Standard Steel Car Co.

*The Western of Havana* has ordered 10 passenger cars from the American Car & Foundry Co. L. J. Buckley & Co., New York, are the purchasing agents.

*The Kanawha & West Virginia* has ordered 244 gondolas of 80,000 lbs. capacity from the Hicks Locomotive & Car Works, deliveries to begin in December, 1906.

*The St. Louis & San Francisco*, as reported in our issue of October 26, has ordered 150 Rodger ballast cars of 80,000 lbs. capacity, and 250 Williamson ballast cars, all of which are to be built by the American Car & Foundry Co.

*The Duluth & Iron Range* has ordered 80 36-ft. flat and 20 box cars, all of 60,000 lbs. capacity, from the Western Steel Car & Foundry Co., for April, 1907, delivery. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The special equipment for both includes:

| | |
|---|---|
| Brake-beams | National-Hollow |
| Brake-shoes | Streeter |
| Brakes | Westinghouse |
| Draft rigging | Bryan |
| Journal boxes | McCord |

*The Boston & Maine* has ordered from the Pressed Steel Car Co. 500 box cars of 60,000 lbs. capacity to be built by the Western Steel Car & Foundry Co. at Hegeswich, Ill., for June, 1907, delivery. These cars will weigh 32,700 lbs. and will measure 36 ft. long, 8 ft 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 8¼ in. long, 9 ft. 7 in. wide and 13 ft. 11⅝ in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

| | |
|---|---|
| Axles | Hammered wrought iron |
| Bolsters | Pressed steel |
| Brake beams | Metal |
| Brake-shoes | Steel back, American Brake-Shoe & Fdy. Co. |
| Brakes | Westinghouse Automatic |
| Brasses | Magnus |
| Couplers | Gould |
| Door fastenings | Seal locks |
| Doors | Sheathing doors |
| Draft rigging | Miner tandem |
| Dust guards | Flexible |
| Paint | Company's standard |
| Roofs | Murphy |
| Springs | Crucible steel |
| Trucks | Fox pressed steel, pedestal type |
| Wheels, make of | Griffin |

*The Delaware, Lackawanna & Western* is in the market for 500 double hopper bottom steel cars of 80,000 lbs. capacity and 200 gondola cars of 80,000 lbs. capacity, both for 1907 delivery. The hopper cars will weigh about 36,000 lbs. and will measure 33 ft. 6½ in. long, 10 ft. wide and 10 ft. 3⅜ in. high, over all, and 30 ft. ¼ in. long and 9 ft. 5⅝ in. wide, inside measurements. Bodies and underframes will be of steel. The gondolas will weigh about 42,000 lbs. and will measure 44 ft. 3¾ in. long, 9 ft. 11½ in. wide and 7 ft. 5⅜ in. high, over all, and 40 ft. long, 8 ft. 7 in. wide and 3 ft. high, inside measurements. Bodies will be of wood and underframes of steel. The special equipment for both includes:

| | |
|---|---|
| Bolsters, body | Built-up type |
| Bolsters, truck | Simplex |
| Brake-shoes | Lappin steel back |
| Brakes | Westinghouse |
| Brasses | Magnus Metal Co. |
| Couplers | Gould |
| Doors | Dunham |
| Draft rigging | Miner tandem |
| Dust guards | Wooden |
| Journal boxes | M. C. B. malleable iron |
| Springs | Railway Steel Springs Co. |
| Trucks | Arch-bar Barber Roller Bearing |

*The Mexican Central*, as reported in our issue of August 31, has ordered 750 40-ft. box cars of 80,000 lbs. capacity, 150 stock cars of 60,000 lbs. capacity, 100 flat cars of 80,000 lbs. capacity and 180 tank cars of 9,800 gallons capacity from the Standard Steel Car Co., all for January to March, 1907, delivery. The company has also ordered 11 express and four combination baggage, mail and express cars from Barney & Smith, for November and December delivery. The stock cars will be 33 ft. 10 in. long, 8 ft. 7 in. wide and 7 ft. 4 in. high, inside measurements. The flat cars will be 34 ft. 10 in. long and 8 ft. 10 in. wide, over all. The tank cars will be 36 ft. 10 in. long, 7 ft. 2¾ in. wide and 12 ft. 1¼ in. high, over all. The express and combination cars will be 59 ft. ¼ in. long, 8 ft. 10¼ in. wide and 6 ft. 8 in. high, inside measurements. The special equipment for all includes:

| | |
|---|---|
| Brake-beams | National-Hollow |
| Brake-shoes (for passenger cars) | Christie |
| Brakes | Westinghouse |
| Couplers (for freight cars) | Janney |
| Couplers (for passenger cars) | National |
| Draft rigging | Westinghouse friction |
| Journal boxes | Symington |
| Light (for passenger cars) | Pintsch gas |
| Paint (for freight cars) | Detroit graphite |
| Paint (for passenger cars) | Valentine and Detroit graphite |
| Trucks | Mexican Central standard |
| Vestibules (for passenger cars) | Pullman plain dummy |

*The Illinois Central* has ordered 1,100 drop bottom gondolas of 100,000 lbs. capacity from the Cambria Steel Co., for delivery December 15, and 300 flat cars of 100,000 lbs. capacity from the Stan-

Car Co. for February 15, 1907, delivery. Of the gondolas, 400 are for the Indianapolis Southern and 200 of the flat cars are also for the last named road.

## RAILROAD STRUCTURES.

ATLANTA, GA.—The Southern has given contracts to the Oliver Sollitt Co., of Chicago, and work has been started on new car sheds. There is to be an incoming freight shed 700 ft. long, and one for outgoing freight 650 ft. long, both to be of brick and steel construction, two stories high, to be equipped with freight elevators. The company proposes on the completion of this work to put up a large office building, eight stories high, to cost $300,000.

BELLEFONTAINE, OHIO.—The Cleveland, Cincinnati, Chicago & St. Louis, it is said, will spend about $600,000 enlarging its shops at this place. The shops now give employment to about 500 men.

CLARKSVILLE, TENN.—The Louisville & Nashville is planning important changes in this city by which the grade of its track from Academy avenue to Eleventh street will be lowered. The location of the station will probably be changed.

CLINTON, IOWA.—The Chicago & North-Western has bought land 50 ft. x 578 ft. as a site for new shops.

FT. WAYNE, IND.—The Fort Wayne & Wabash Valley Traction Co. has bought land as a site for a passenger station.

HATTIESBURG, MISS.—The New Orleans & Northeastern is planning to put up a new passenger station, also a freight house here.

LINCOLN, ILL.—An ordinance has been introduced granting certain privileges to the Chicago & Alton and providing for the building of a new passenger station here to cost $25,000.

LOS ANGELES, CAL.—The Los Angeles Pacific Railroad Company is negotiating to buy the Masonic Temple Building, which is to be removed and the site used for a new passenger station.

MASON CITY, IOWA.—The Chicago, Milwaukee & St. Paul is making plans for enlarging its roundhouse at this division point; also at McGregor and at Sanborn.

MONTREAL, QUE.—The Canadian Pacific has plans ready for putting up a paint shop at its Angus shops to cost $70,000.

NORTH YAKIMA, WASH.—The new Northern Pacific freight house recently completed has been put in use. It is a brick building one story high, 50 ft. wide and 368 ft. long.

OTTAWA, ONT.—The Department of Railways and Canals is having plans prepared for a new steel bridge over the Rideau canal at Main street.

PADUCAH, KY.—The Nashville, Chattanooga & St. Louis has bought land at this place as a site for a large grain elevator to have a capacity of 150,000 bushels.

PHILADELPHIA, PA.—The Pennsylvania has asked bids for putting up an ice plant here.

QUEBEC, QUE.—The Dominion Government has decided to subsidize extensive docks and railroad terminals here in connection with the new bridge and the Grand Trunk Pacific Railway. These new docks will be extended over an area of four miles.

ST. CHARLES-DE-BELLECHASSE, QUE.—Bids are wanted by the Intercolonial Railway for construction of steel superstructure for the bridge over Boyer river.

VERA CRUZ, MEX.—Plans for the railroad and port terminals on which work has already been commenced at this place will shortly be completed by Rudolf Wiesner, of Mexico City. The organization of the Vera Cruz Terminal Company has already been completed.

VICTORIA, B. C.—Estimates for bridge work on the Esquimalt & Nanaimo, amounting to $132,000, have been made. The work includes the replacing of seven wooden structures with steel structures.

WINNIPEG, MAN.—The Civic Bridge Committee has passed a resolution recommending the securing of legislation to provide for a steel bridge at McDermott avenue. An agreement has been reached between the city council and the Canadian Northern by which the latter is to build a subway at Pembina street.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ALABAMA GREAT SOUTHERN.—Plans are being made by this company to build a line from Wauhatchie, Tenn., to a connection near Lookout tunnel on the line now under construction by the Southern from Stevenson, Ala., to Chattanooga.

ALABAMA, TENNESSEE & NORTHERN. This company which is the successor of the Carrollton Short Line, operating 21 miles of road from Reform, Ala., on the Montgomery division of the Mobile & Ohio, south to Aliceville, has issued bonds to secure funds for extending the road 29 miles south from Aliceville. The work includes a steel bridge over the Tombigbee river at a cost of about $40,000.

AMERICAN ELECTRIC.—An officer writes that work will shortly be started on this proposed line projected to run from Davenport, Iowa, west across Iowa to Council Bluffs. The first section from Des Moines west to Greenfield, 65 miles, is to be built this year. Contracts are to be let early next spring for the Muscatine division. Some of the work will be heavy, and will include seven steel bridges and nine trestles. The road will be laid with 60-lb. rails. (Oct. 26, p. 113.)

BALTIMORE & OHIO.—Under the name of the Patapsco & Susquehanna, this company, it is said, has commenced the construction of a line from its main line near Gorsuch station, in Carroll County, Md., northeast to a point near Sewell station, on the Philadelphia line, about 40 miles. The new line, which will have light grades, is to be used as a cut-off for east and westbound freight to avoid passing through Baltimore, where trains must either ferry across the Patapsco river or run through the tunnel. It also shortens the distance about 13½ miles.

BIG CREEK & TRINITY VALLEY.—Incorporation has been asked for by a company under this name in Texas with a capital of $10,000. The incorporators include J. H. Steele, I. H. Kemper, M. O. Kopperl and others, of Galveston, and S. T. Swinford and B. D. Brown, of Houston. They propose to build a line from Big Creek, in Liberty County, to Egypt, in San Jacinto County, about 10 miles.

CHESAPEAKE & OHIO.—At the recent annual meeting of this company the Board of Directors was authorized to complete the construction of the Potts Creek branch, a distance of 25 miles, for which $1,000,000 bonds will be issued.

CHICAGO & NORTH-WESTERN.—This company announces that its new line from Manitowoc, Wis., northwest to Green Bay, 37.3 miles, has been completed; and it was put in operation Oct. 21. (Aug. 10, p. 38.)

This company, in addition to the extension which it is building from Eland, Wis., on the Ashland line, east to the Peninsula line, near Green Bay, has practically completed a new cut-off from the latter place northwest to Gillett, giving Milwaukee direct connection with the new line.

COLORADO & NORTHERN.—Under this name a company has been incorporated in Wyoming to build a line from the proposed extension of the Denver, Northwestern & Pacific, near Hayden, Colo., north to coal fields about 20 miles; the line eventually is to be extended to Hahns Peak, Colo., and to Encampment, Wyo. It is also to be extended from Hayden southwest to Pallos. B. L. Dorsey is President; A. A. Johnson, Vice-President and General Manager, and M. E. Johnson, Secretary and Treasurer. This is supposed to be a Denver, Northwestern & Pacific project.

COVINGTON & SOUTHWESTERN.—Incorporated in Indiana with $75,000 capital by W. G. Ruhl, of Chicago; C. W. Winkler and M. H. Campbell to build a line from Covington, Fountain County, on the Cleveland, Cincinnati, Chicago & St. Louis and the Wabash, southwest via Coal Creek to Kingman, in Parke County, approximately 22 miles.

DELAWARE & HUDSON.—This company is planning to at once double-track its line from Scranton, Pa., to Carbondale, 16 miles, and to build new yards in the western part of Wilkesbarre. In addition a new double-track line is to be built from the present road between Moosic and Avoca through Pittston and Plainsville, Pa., about 11 miles, to a connection with the Plymouth branch, which runs from Wilkesbarre, crossing the Susquehanna river, to Plymouth Junction and through the valley to Larksville. Surveys have been made for three different routes. As soon as the choice is made work will be started.

DELAWARE SUBWAY.—Under this name a company in Pennsylvania with $10,000 capital has been granted a charter to build a line along the Delaware river one mile long. One of the termini will be at Front and Market streets, Philadelphia. W. P. Brockermann, 620 Fairmont avenue, Philadelphia, is President.

DEMOPOLIS & LINDEN.—Incorporated in Alabama with $50,000 capital by F. M. Abbott, of Selma, and H. McDaniel and B. G. Wilson, of Demopolis, to build railroads.

DENVER, NORTHWESTERN & PACIFIC.—See Colorado & Northern.

DULUTH, RAINY LAKE & WINNIPEG.—This company, it is said, has completed surveys for extending its road from the present southern terminus at Rainy Junction, Minn., south to Duluth. The line from Virginia to Duluth, about 60 miles, is to be almost an air line. It is said that the Wisconsin Central will permit the company to use its track and terminals in Duluth. Work is now under way

extending the road from its northern terminus at Ashawa north to the Canadian border. (Oct. 19, p. 107.)

FALMOUTH.—Incorporated in Virginia with $25,000 capital to build a line from a point in Stafford County west of Falmouth east to tidewater on the Rappahannock or Potomac rivers, through the counties of Stafford, Spotsylvania, Caroline and King George, about 25 miles. W. E. Grant is President; T. S. Armistead, Treasurer, and A. M. Yonge, Secretary and Manager.

FLORIDA ROADS (ELECTRIC).—A franchise has been granted to the William H. Evers Engineering Company to build an electric line from Tampa, Fla., east via Plant City, Mulberry and Lakeland, to Bartow, about 45 miles.

GREAT NORTHERN.—The report of this company recently issued shows that work is being pushed on the line being built by the Washington & Great Northern and the Vancouver, Victoria & Eastern from Midway to Keremeos, B. C. Grading was nearly completed and track laying was commenced on June 29. On the Brandon, Saskatchewan & Hudson's Bay, from a connection at the international boundary with the Dakota & Great Northern company's extension from St. John, N. Dak., to Brandon, Man., 69.45 miles is completed. The Midland of Manitoba, which the report shows is a subsidiary of this company, is to be completed by November 15 from a connection with the Great Northern at Neche, N. Dak., on the international boundary, north to Portage la Prairie, 77.01 miles.

HUNTSVILLE & BIRMINGHAM (ELECTRIC).—Incorporated in Alabama to build an electric road from Huntsville south through Marshall, Cullman and Blount counties to Birmingham, about 80 miles. C. T. Briggs, of Joppa, is President; L. J. Hanners, of Cullman, Vice-President; T. W. Riddle, of Holly Pond, Secretary, and F. T. Petty, of Huntsville, Treasurer and Attorney. The office of the company will be in Huntsville.

IOWA CENTRAL.—According to reports from Minneapolis, this company and the Minneapolis & St. Louis are planning extensions which will give them a through line over their own tracks from Chicago to Minneapolis. They now use the tracks of the Illinois Central from Albert Lea to Chicago, and when the new line is completed this agreement will end.

KANSAS CITY, MEXICO & ORIENT.—This company has been paid an additional installment of $1,000,000 as subsidy by the Mexican Government. This covers 62 miles of track completed from Minaca, state of Chihuahua west.

MEXICAN ROADS.—President Diaz in his recent message to Congress briefly reviewed railroad construction in Mexico as follows: The railroads under the Federal jurisdiction have built between April and September 15th, 172 miles of new track. The length of railroads in the Republic now aggregates 10,840 miles of track, which, added to 2,588 miles of lines under the jurisdiction of the state governments and the private lines, make the grand total 13,428 miles.

Andres Bermejillo & Company, bankers, of Mexico City, are planning to build a railroad to reach a number of important points in the states of Guanajuanato and Michoacan. The Federal government has granted the necessary concession for the project, which require that the entire road shall be completed within five years, and as soon as the surveys are finished the work of construction will be commenced.

MINNEAPOLIS & ST. LOUIS.—See Iowa Central.

MISSISSIPPI CENTRAL.—This company, operating 83 miles of road in Mississippi from Brookhaven southeast to Hattiesburg, which recently completed a 10-mile extension from its southern terminus, announces that contracts have been let to build an additional 10 miles from the present southern terminus south to near the Harrison County line. Work is also being pushed on the extension from Brookhaven west to Natchez.

MISSISSIPPI ROADS.—The Edward Hines Lumber Co., which owns large tracts of timber lands in Mississippi, is making surveys for a line from Poplarville, Miss., on the New Orleans & North-eastern, southeast to Gulfport, about 50 miles. Work is to be started at once. Right of way through the latter city has been secured. Capt. J. T. Jones, Gulfport, President of the Gulf & Ship Island, is said to be interested in the new project.

W. Denny & Co., of Moss Point, are reported as preparing to at once build a 12-mile extension of their logging road.

MISSOURI & NORTH ARKANSAS.—Announcement is made that this company will make Helena, Ark., its southern terminus. Helena is on the St. Louis, Iron Mountain & Southern. The Railroad Commissioners have extended the time for completion of the road. Contracts for clearing and grubbing, grading, masonry and pile and trestle bridges on the first 75 miles of the southeast extension of this road have been let to Dowling & McGunnigle, St. Louis, Mo., and work will begin at once. The contract calls for the completion of the work in 16 months. Contracts for a 40-mile extension from Seligman, Mo., northwest towards Joplin, Mo., will probably be let within 30 days.

MISSOURI, OKLAHOMA & GULF.—President W. P. Dewar, of this company, has announced that the road, which is already built from Wagner, Indian Territory, to Duston, will be extended at once south to Dennison, Tex.

NATIONAL OF MEXICO.—The main line track between Monterey and Vanegas, 186 miles, is to be relaid with 85-lb. rails. The 70-lb. rails to be removed are to be used to replace lighter rails on the narrow gage portion between Acambaro and Gonzalez, 54 miles, which will later be changed to standard gage.

NEW ORLEANS GREAT NORTHERN.—Contracts have been given by this company to C. D. Smith & Co., for extending its road from Smith Ferry, La., to Jackson, about 50 miles. Work is under way from Bogalusa to Smith Ferry. The company has engineers in the field surveying several branch lines through South Mississippi and North Louisiana.

NEW YORK, NEW HAVEN & HARTFORD.—A contract has been given to Lathrop & Shea, of Brooklyn, for double-tracking the Highland division between Danbury and Hawleyville, 5.6 miles. This work is expected to be completed by June 1 next. The second track west from Danbury to Hopewell, 34.6 miles, has been finished. Several grade crossings on this section between Brewster and Stormville are to be abolished. Contracts for this work have been let to C. W. Blakeslee & Son, of New Haven.

NORTHERN MICHIGAN (ELECTRIC).—Incorporated in Michigan to build an electric line from Manistee, Mich., northeast via Traverse City, Charlevoix and Petoskey to Cheboygan, about 220 miles. Surveys are under way. The project, it is said, is backed by Cleveland capitalists, represented by F. O. Olsen, of Traverse City. The cost of the line will be about $7,000,000.

OCEAN SHORE (ELECTRIC).—This company has resumed work on its 83-mile double-track electric line from San Francisco, Cal., to Santa Cruz, which was suspended after the disaster of April 18th. After some changes in the personnel of the management, arrangements were made to sell enough of the bonds, of which $5,000,000 were authorized, to resume active construction. The road is to run from Army street to Santa Cruz. Twelve miles of track are completed at the Santa Cruz end of the road. Willets & Burr, who have been given a grading contract beyond Ocean Bluffs, near Mussel Rock, will begin work at once. Antonelli & Bandmann have the contract for the completion of the tunnel through the mountain at Point San Pedro.

PATAPSCO & SUSQUEHANNA.—See Baltimore & Ohio.

PENINSULAR (ELECTRIC).—This new line is understood to be a Harriman project, to serve as a feeder to the Southern Pacific's Coast Line. Rights of way have been secured during the past year and large quantities of rails and other materials bought for the speedy construction of the line. It is to be a high-speed electric road from the Twenty-fifth and Valencia street station in San Francisco down the Peninsula and the Santa Clara Valley.

PENOBSCOT BAY.—Incorporated in Maine with $180,000 capital by M. S. Bird, E. S. Bird and H. I. Hix, of Rockland; H. L. Shepard, of Rockport; A. Pierce, of Frankfort; C. Wood, of Camden, and others to build a line from a point on the Maine Central at Rockland, in Knox County, north to a connection with the same road; also to connect with the Northern Maine Seaport at Belfast, in Waldo County, the latter to run via Rockland, Rockport and Camden in Knox County, and Lincolnville and Northport in Waldo County; approximate length of both lines 30 miles.

PHILADELPHIA & READING.—This company, it is said, is considering the question of electrifying its line from Philadelphia to Atlantic City.

PITTSBURG & LAKE ERIE.—See Wabash.

SALEM-MEHAMA (ELECTRIC).—An officer writes that the route of this proposed line is from Salem, Oregon, southeast via Turner and Stayton to Mehama, about 24 miles. Rights of way have been secured and contracts for ties, poles, etc., will be let early next spring. The project is to be financed by A. Welch, of Portland. Surveys and rights of way were made under the direction of Walters Bros., Salem, Oregon. (Oct. 12, p. 99.)

SOUTH & WESTERN.—A contract has been given by this company to the Patton-Richardson Construction Co., Newport News, Va., for a tunnel half a mile long through the mountains near Marion, N. C. The work, which is to be started shortly, will cost about $2,000,000.

SOUTHERN PACIFIC.—The city council of Oakland, Cal., has postponed for three weeks final action on the matter of granting this company an exclusive franchise for a belt line traversing the eastern portion of the city and following the north shore of the tidal

canal. Residents ask that all railroads be given the right to operate trains on the proposed road and have offered to organize within three weeks a new company to build such a line.

This company, it is understood, is trying to buy land necessary for a right of way for the proposed two-mile extension along north beach into the Presidio, at San Francisco. The company has made plans to build a branch line connecting with the belt line, owned by the state, which furnishes switching facilities along the main water front of the city, and been granted a franchise for the two-mile extension needed to reach the Presidio. The new tracks, as surveyed, run through Fort Mason, where Black Point will probably be pierced by a tunnel. The government is preparing to build a supply station at this point with docks and warehouses costing over $1,000,000. Additional land along this right of way that has been partly reclaimed from the bay near the foot of Fillmore street would be valuable for yards and ferry slips.

Trans-Alaska-Siberian.—This company has been incorporated in New Jersey, with $6,000,000 capital, by Loicq de Lobel, of No. 11-bis Rue d'Edinbourg, Paris; J. A. L. Waddell, of Kansas City; John J. Healy, of Seattle, Wash.; William H. Black, of No. 11 Wall street, New York, and John R. Turner, of the Corporation Trust Company, of No. 15 Exchange place, Jersey City. Mr. de Lobel is the general delegate of the French and Russian and American syndicate of the company. Mr. Waddell is the delegate of the advisory board of consulting engineers, and Mr. Healy is the delegate of the western syndicate. The company proposes to build a line between Alaska and Siberia, with a tunnel under the Behring Straits. The line across Alaska, and its branch lines, and a part of the tunnel to the Great Dromede Island, are to be built in accordance with the contract established between the special Imperial commission and the company. The proposed western terminus is Kansk, on the Siberian Railway. The line of the proposed road runs thence easterly to the boundary line of the province of Amur to 123 deg. longitude east of Paris; thence direct to a point between Yakoungsk and Okhotsk; then to Behring Straits. The estimated length of the main line is 3,750 miles, and the branches 2,250 miles. On the American side the line is to run from Cape Prince of Wales east along the Tanana river, thence to the Alaska-Canada boundary.

Wabash.—Announcement is made that this company and the Pittsburg & Lake Erie will jointly build a new yard at Sawmill Run, Allegheny County, Pa., which is to be used by both roads. The joint work is also to include the rebuilding of the Little Sawmill Run Railroad, a short Wabash property.

President George J. Gould is quoted as saying that part of the recent issue of bonds is to be used to pay for double-tracking the line between St. Louis and Chicago. One-third of this work has been completed.

Washington, Patuxent & Drum Point.—Incorporated in Maryland to build a double-track line from a point on the Chesapeake Beach Railway, southeast to Drum Point and Solomon's Island, on Chesapeake Bay, about 30 miles. Traffic arrangements will be made with the Chesapeake Beach, with the Pennsylvania at Deanwood, D. C., and with the Baltimore & Ohio at Hyattsville. The names of the incorporators are not given, but it is supposed that George Gould is planning a connecting link from the Western Maryland at Baltimore through Calvert County to Drums Point.

West Shore Traction.—This company has been incorporated in New York with $250,000 capital to operate a street surface line from Orangeburg, Rockland County, north via Piermont, Grand View, South Nyack, Nyack, Upper Nyack and Congress to Haverstraw. The directors are Frank J. Whan, A. J. Whan, E. J. Welsh, N. E. Heine, G. P. Fall, G. S. Fulton, of New York City; A. S. Brown, Brooklyn; E. G. Roff, Jr., Orange, N. J., and E. A. Hilton, Paterson, N. J.

## RAILROAD CORPORATION NEWS.

Albany & Susquehanna.—See Delaware & Hudson.

Atchison, Topeka & Santa Fe.—The gross earnings for the three months ended Sept. 30, 1906, were $21,293,596, an increase of $2,598,151; net earnings, $8,255,805, an increase of $1,415,984.

Bangor & Aroostook.—The gross earnings of this company for the year ended June 30, 1906, were $2,496,546, an increase of $337,475; net earnings $951,877, an increase of $169,528; the surplus, after charges and 4 per cent. dividends on the $1,550,000 capital stock, was $72,931, an increase of $1,182. According to the annual report, the Northern Maine Seaport Railroad & Terminal has been operated by the Bangor & Aroostook since November 4, 1905, although the final ballasting and ditching was not finished until last summer. This road, which is leased to the Bangor & Aroostook, runs from La Grange, Me., south to Searsport, 54 miles. It gives the last named road a terminal on the Atlantic ocean at Cape Jellison, where dock and yard facilities are now almost finished.

Buffalo & Susquehanna.—According to the annual report just issued, it is expected that through traffic from Belfast, N. Y., to Buffalo will be begun on January 1st. The southern extension to Sagamore, Pa., has been finished, and with it the company will have nearly 370 miles of road. With an average mileage operated of 243 miles, an increase of 71 miles, the gross earnings for the year ended June 30, 1906, were $1,522,740, an increase of $392,875; net earnings $535,213, an increase of $158,593. Other income decreased while interest on funded debt and other deductions increased, so that the net income was $246,506, a decrease of $77,508, out of which were paid dividends of 4 per cent. on the $4,000,000 outstanding preferred stock and 5 per cent. on the $4,456,900 outstanding common stock.

Canadian Pacific.—The gross earnings of this company for the month of September, 1906, were $6,152,767, an increase of $1,216,000; net earnings $2,437,932, a gain of $661,992. Gross earnings for the three months ended September 30 were $18,291,187, an increase of $4,028,511; net earnings $7,272,322, an increase of $2,066,958.

Chesapeake & Ohio.—This company has sold to Brown Bros. and the Guarantee Trust Company, New York, jointly, $1,600,000 4 per cent. equipment notes secured on 1,000 steel gondolas and 40 locomotives. They are payable in 20 equal semi-annual instalments beginning April 15, 1907.

Delaware & Hudson.—The demurrer filed by this company in answer to the bill in equity filed by the stockholders of the Albany & Susquehanna asking for increased rental has been overruled in the United States Circuit Court. It is expected that a civil action will now be instituted by the committee. If the Albany & Susquehanna protective committee and the new directors who are acting with it are successful, the D. & H. will have to pay 3½ per cent. additional rental on the $2,500,000 A. & S. stock, a total of 12½ per cent., and also back rentals amounting to about 25 per cent. on the stock. (Oct. 19, p. 108.)

Georgia Southern & Florida.—A semi-annual dividend of 2½ per cent. on the $1,084,000 outstanding 5 per cent. second preferred stock has been declared. Since 1900 the annual rate on this stock has been 4 per cent.

Mexican Railway.—This company owns 264 miles of road from Mexico City to Vera Cruz and has 57 miles of branch lines. A dividend of 3¾ per cent. has been declared on the $4,908,000 second preferred stock; this dividend is the first paid on this stock since 1897. The stock is entitled to 6 per cent. annually, but no dividends could be paid until 8 per cent. on the $12,377,385 first preferred had been paid.

New England Investment & Security Co.—Mackay & Co., New York, are offering to exchange 4 per cent. preferred stock of this company for stock of the Worcester Railways & Investment Co. at the rate of 21 shares N. E. I. & S. stock for 20 shares of Worcester Railways & Investment. The New England Investment & Security Company is the new holding company for the New York, New Haven & Hartford electric lines in Massachusetts, and its $10,000,000 4 per cent. cumulative preferred stock is guaranteed by the Consolidated Railway. (Sept. 21, p. 76.)

Pacific Mail Steamship Company.—The report for the year ended April 30, 1906, of this company, which is controlled by the Harriman interests, shows receipts of $5,724,337, a decrease of $51,446; net income of $828,981, a decrease of $466,031. The decrease in earnings was due to the lessening of traffic after the close of the Russian-Japanese war, the Chinese boycott of American goods, the opening of competitive lines and the resumption of service by a Japanese line in November, 1905.

Texas Central.—The Texas Railroad Commission has announced that it intends to order on November 20th the immediate cancellation of $650,000 outstanding Texas Central bonds; these are declared illegal, the commission having refused consent to their issue on the ground that the value of the road, including extensions, for which the bonds were issued, is less than the outstanding capital stock.

Wabash.—According to the plan for the retirement of the debenture "A" and "B" debenture bonds the securities must be deposited with the United States Mortgage & Trust Co., New York, on or before November 30, 1906. The railroad company reserves the right to declare the plan inoperative unless 95 per cent. of the "B" debentures are deposited. (Oct. 26, p. 116.)

Worcester Railways & Investment Co.—See New England Investment & Securities Co.

# GENERAL NEWS SECTION

## NOTES.

At Altoona, Pa., two suits have been begun by State food inspectors against the Pullman company for selling on dining cars milk and cream containing formaldehyde.

Cleveland at last has a street railroad on which passengers are carried for a three cent fare. The company has 13 miles of road in operation. On Sunday last 8,000 passengers were carried.

On Saturday, October 20, the Empire State Express was run from Utica to a point near Syracuse, 54 miles, in 45 minutes. This run was made by Engineman G. W. Gilbert with Engine No. 3865.

A Chicago newspaper, discussing the scarcity of laborers, estimates that in the territory west of Chicago the number wanted for new railroad construction at the present time is not less than 50,000.

At Wilkesbarre, Pa., Nov. 1, the conductor and the engineman of a Pennsylvania express train were arrested and fined $5 each for violating the city speed limit in running over a crossing at 35 miles an hour.

The fare between New York and Boston by the Fall River steamers is now $2.65. This rate is 35c. less than the former winter rate, all fares having been reduced on the railroad between Fall River and Boston.

A press despatch from Topeka, Kan., says that the railroads of that state, contrary to their former custom, are granting no free passes to employees of the State and to students of colleges to go home to vote.

The New York Central now serves meals by the card in its dining cars on all trains, at all times, except on the Twentieth Century Limited, the Lake Shore Limited and South Western Limited. On these trains the rate of $1 a meal is continued.

The striking machinists of the Southern Railway returned to work on November 5, under an agreement which has been reached at conferences of the railroad and brotherhood officers with Mr. Seth Low and Mr. Donnelly, of the National Civic Federation.

The Southern Pacific and the Atchison, Topeka & Santa Fe have announced that when they unload from the cars freight which takes the carload rate, a charge of 20 cents or more a ton will be made for the service, this being necessary to comply with the law forbidding discrimination.

Announcement is made that a bill is being prepared for the next New York Legislature to provide for the abolition of 203 grade crossings of streets with the Long Island Railroad in Queens Borough, New York. The work is to be extended over six years and the estimated cost is $12,000,000.

The Boston & Maine has awarded its annual premiums for the floral displays, around its stations, and the first prize goes to Hill Crossing. The agent at this station has received the first prize before. The second prize goes to Brattle, Mass., and two third prizes go to Lake City and West Lebanon.

The Bessemer & Lake Erie has sent to the Interstate Commerce Commission and to all the railroads of the country a formal notice concurring, in advance, in all joint passenger tariffs issued by common carriers naming prices over that road, except in cases where the B. & L. E. gives the Commission notice to the contrary.

The Rock Island now runs a train from Chicago to Denver connecting with the 18-hour trains from New York to Chicago so that the mail is delivered in Denver at 11:25 a. m. on the second morning after it leaves New York, or in about 44 hours, apparent time. The connection is made at Englewood, about 6 miles south of Chicago, at 8:30 a. m.

The Brooklyn Rapid Transit Company, operating the surface street railways in Brooklyn, New York, has ordered conductors to strictly limit free transfers to 15 minutes, the use of transfers having increased enormously. It is said that the number issued is now 75 per cent. greater than it was one year ago, successive transfers being now given on one fare-payment.

The New York Central, recently fined a large sum for making unlawful rates on sugar from New York to Detroit, has been summoned to appear in court and defend similar charges concerning shipments from New York to Cleveland. The shipments were made in 1902 and 1903, and rebates from 4c. to 6c. per 100 lbs. are said to have been given to the amount of $26,000. The American Sugar Refining Co. is also summoned.

A press despatch from St. Paul says that President Stickney, of the Chicago Great Western, has undertaken the task of making a freight tariff to apply throughout the country, with the expectation that he will be able to show that uniform classification of freight is practicable. As the railroads are never able to agree on this point unanimously, Mr. Stickney thinks that Congress should empower the Interstate Commerce Commission to make a uniform classification.

A press report from Gallup, N. Mex., Nov. 6, says that a passenger train of the Atchison, Topeka & Santa Fe was robbed near that place on that day by three armed men who went through the passenger cars while the train was standing on a side track, all of the trainmen being in the dining car at the time. One of the robbers walked backward and with his pistol covered the passengers after they had been robbed, and the three escaped in the darkness before the trainmen knew what was going on.

The Territory of Oklahoma in further pursuance of its campaign against the railroads has entered with the Interstate Commerce Commission complaints against sixteen companies operating mainly in the direction of Galveston. The complaint alleges that the charges for transportation of wheat in carload lots to Galveston for export are "unlawful, illegal, unjust, unreasonable and extortional," that a reasonable charge should not be more than 5 mills per ton mile; that every charge made for wheat for export to Galveston is more than 7.75 mills per ton mile. It is stated that the cost of operation of the roads from points in Oklahoma to Galveston is relatively low and does not exceed 2.5 mills per ton mile, and the cost of maintenance is also relatively low; that the transportation of wheat is very profitable relative to other traffic on those lines; that the cost of construction, fixed indebtedness, taxes and public charges are very low, and that there is a profitable return traffic. The complaint further alleges the importance of the wheat crop and the financial limitations of the people. It is stated that the charges from Oklahoma points are greater than those from points relatively distant in Nebraska, Iowa, Missouri and other surrounding territory.

### Exhibition of Safety Devices.

The American Institute of Social Service, 287 Fourth avenue, New York City, Josiah Strong, president, announces that it will hold an exposition of safety devices in New York City, beginning January 28, 1907, and to extend to February 9.

### A New Departure in Train Sheds.

The Commissioners of the District of Columbia have decided to adopt the "umbrella" type of train shed in the new Washington Union Station. . . . This "umbrella" type derives its name from the fact that it is portable and opens and shuts after the fashion of an ordinary umbrella.—*Washington Star.*

### Washington Conference on Tariff Forms.

The Interstate Commerce Commission has set November 12 as the day for its conference with railroad officers relative to the publishing of uniform tariffs. The railroad representatives are: Lincoln Green, freight traffic manager of the Southern Railway; Joseph Richardson, Southeastern Passenger Association; G. D. Dixon, freight traffic manager Pennsylvania Railroad; C. F. Daly, passenger traffic manager New York Central; N. S. Kentfield, assistant general freight agent New York, New Haven & Hartford; C. M. Burt, general passenger agent Boston & Maine; Hudson Fitch, general freight agent Toledo & Ohio Central; James Webster, general freight agent New York, Chicago & St. Louis; F. C. Donald, commissioner Central Passenger Association; Elmer H. Wood, general freight agent Union Pacific; George C. Sommers, assistant to first vice-president Chicago, Burlington & Quincy; F. A. Leland, assistant general freight agent Missouri, Kansas & Texas; W. G. Gardiner, Southern Pacific; W. J. Cannon, assistant general passenger agent Chicago, Milwaukee & St. Paul; Y. B. Jones, Western Passenger Association.

### Government Meat Inspection.

The Department of Agriculture has issued supplementary regulations for the inspection of meat designed for interstate transportation. The rule regulating the procedure when a shipment is to be diverted from its original destination is modified so that in case of a wreck or other extraordinary emergency the carrier may divert without waiting for a new certificate; but in all such cases full information must be promptly sent to the Bureau of Animal Industry.

The transportation of meat or meat food products from one point in a state or territory to another point in the same state or territory when, in course of shipment, the meat or meat food product is taken through another state or territory, is declared to be interstate commerce, and the said transportation comes under the meat inspection law and regulations. In the decision of the case of Hanley against the Kansas City Southern, January 5, 1903,

the Supreme Court of the United States, in a decision by Justice Holmes, held that such transportation as this is interstate traffic, declaring that the Pennsylvania case, on a similar subject, and applying only to a question of taxation, does not govern.

This question of the status of shipments passing from one state into another and back into the same state in which they originated may affect competitive conditions on many routes, notably those between Buffalo and New York City, three of the four lines between these cities traversing parts of Pennsylvania or New Jersey or both.

The question of federal inspection of meat has also arisen in connection with wagon traffic on the Hudson river ferries at New York City, which is interstate. Farmers, exempt from the inspection law, also cross these ferries.

### New Car Ferry Steamer for St. Lawrence River.

The Canadian Pacific Car & Passenger Transfer Co., which operates a car ferry running between Ogdensburg, N. Y., and Prescott, Ont., has ordered from the Polson Iron Works, Toronto, Ont., a car ferry steamer to be delivered by October, 1907. The boat will be 280 ft. long, 40 ft. wide and will draw 12 ft. when loaded with 10 cars (her maximum capacity). Twin screws will be driven by two compound engines developing, at a working steam pressure of 185 lbs., while running 125 revolutions a minute, 1,000 h.p. each. There will be four single ended Scotch type boilers operated under Howden's system of forced draft. The boat is strongly built and heavily sheathed to protect it against the ice in the river, which is sometimes 2½ ft. thick. It will be lighted by electricity and will carry 100 passengers besides its load of cars.

### Rules for Trains in Eleventh Avenue.

The railroad of the New York Central in Eleventh avenue, New York City, used almost wholly for freight and only at very low speeds by both passenger and freight trains, has been made the subject of a stringent order by the New York State Railroad Commission. The order says:

First—That freight trains on Eleventh avenue, New York City, between Thirtieth and Sixtieth streets, shall not consist of more than twenty cars.

Second—That no freight train shall be started from the Sixtieth street yard for the Thirtieth street yard until it is known at the Sixtieth street yard that there is a space in the Thirtieth street yard for the reception of said train; also that no freight train be started from the Thirtieth street yard for the Sixtieth street yard until it is known at the Thirtieth street yard that there is space in the Sixtieth street for the reception of said train. This recommendation is to be considered as being imperative when the conditions, strictly construed, render compliance practicable.

Third—That between the hours of 6:45 and 7:15 a. m., 8:30 and 9 a. m., 12 noon and 1 p. m., 3 to 3:20 and 4:45 to 5:15 p. m., no freight trains shall be operated on Eleventh avenue.

## TRADE CATALOGUES.

*Rail Joints and Tie Preservation.*—Max Barschall, 31 Nassau street, New York City, is distributing an illustrated pamphlet devoted to rail joints and tie preservation and their importance in maintenance work. The pamphlet contains a reprint of an article by Mr. Barschall on the necessity for track improvement, from the *Railroad Gazette;* an article on wheel carrying rail joints and tie preservation from the bulletin of the International Railway Congress Association, September, 1906, as well as some interesting correspondence between Mr. Barschall and the general secretary of the permanent committee of the International Railway Congress Association.

*Rock Drills.*—Ingersoll-Rand Co., New York, sends catalogue No. 45B describing Ingersoll-Sergeant rock drills for mining, quarrying and general rock excavation. The matter is quite complete, showing the different machines in operation and their parts, and describing the kind of work each class of drill is best fitted for.

*Signal Tower Oil Outfits.*—Bulletin No. 57 of S. F. Bowser & Co., Ft. Wayne, Ind., shows the Bowser system applied to signal towers. The method of application and its advantages are described and illustrated in detail. One illustration shows an oil supply car equipped with this system.

*Roofing.*—The Standard Paint Company, New York, is sending samples of ruberoid roofing taken from a roof on which it was put 14 years ago, the remainder of the roofing being still in service.

### Manufacturing and Business.

The output of the Pressed Steel Car Co. for the month of October was at the rate of 125 cars for each working day.

The Link-Belt Company recently opened an office at 913 Missouri Trust Building, St. Louis. E. C. Berghoeffer, who has been for some time in the Chicago house of the company, is in charge.

### Iron and Steel.

The Delaware, Lackawanna & Western, the New York, New Haven & Hartford, and the Chicago, Rock Island & Pacific are negotiating for bridge material aggregating about 23,000 tons.

Contracts recently let for about 7,500 tons of rails for delivery next year, include 1,400 tons for the Puget Sound Electric, 1,000 for the Detroit & Mackinac, 500 for the Prescott & North-Western, 500 for the Brooklyn Heights, 1,000 for the Cuba Eastern, and 600 for the Coast Line Electric; also 1,800 tons for the Alabama Great Southern.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Roadmasters' and Maintenance of Way Association.

The Roadmasters' and Maintenance of Way Association will hold its annual meeting at Chicago, beginning November 13. C. E. Jones (C., B. & Q.) Beardstown, Ill., is Secretary.

### American Portland Cement Manufacturers.

The fourth annual meeting of this Association is to be held in New York City December 11 and 12, at the Hotel Astor, Forty-fifth street and Broadway. Many important subjects will be presented for discussion.

### Franklin Institute.

At a stated meeting of the Section, November 8, the programme included a discussion on "The Physical Meaning of Power Factor and the Significance of a Power Factor Less Than Unity Without Phase Difference," by Prof. Albert F. Ganz, of Stevens Institute, Hoboken, N. J.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Cincinnati, New Orleans & Texas Pacific.*—See Seaboard Air Line.

*Coahuila & Zacatecas.*—J. F. Lynch has been elected Vice-President, with office at Saltillo, Mex.

*Detroit & Charlevoix.*—W. P. Squier has been appointed Acting Auditor.

*Illinois Central.*—J. T. Harahan, Second Vice-President, has been elected President, succeeding Stuyvesant Fish.

*Kentucky & Indiana Bridge & Railroad.*—T. C. Powell, Vice-President, has been elected President, with office at St. Louis, Mo., succeeding W. M. Greene. W. H. McDoel succeeds Mr. Powell, with office at Chicago, Ill.

*Manistique, Marquette & Northern.*—W. C. J. Bienemann has been appointed Auditor, with office at Manistique, Mich.

*Mobile & Ohio.*—See Southern.

*Ohio River & Columbus.*—E. H. Blair, General Freight and Passenger Agent, has been elected also Vice-President. C. J. Finger, Auditor, has been elected also Secretary and Treasurer.

*Seaboard Air Line.*—William A. Garrett, General Manager of the Cincinnati, New Orleans & Texas Pacific, has been elected First Vice-President of the Seaboard Air Line, with office at Norfolk, Va., effective November 20th. Mr. Garrett was born in Mississippi in 1861 and began railroad work in 1876 as a messenger boy on the Ohio & Mississippi, now part of the Baltimore & Ohio Southwestern. He then went to the St. Louis Union Depot and worked his way up until appointed Assistant Superintendent. In 1893 he was appointed Superintendent of the Terminal Railroad Association of St. Louis, acting at the same time as Terminal Superintendent at that place of the Wabash. In 1894 he was made also Superintendent of the St. Louis Merchants Bridge Terminal. In 1896 he was appointed Superintendent

W. A. Garrett.

of the Western division of the Wabash, and a year later was transferred to the Middle division. In 1899 he went to the Philadelphia & Reading as Superintendent of the Philadelphia division. In 1900 he was made Superintendent of the New York division, and was promoted to General Superintendent in 1902. In 1903 he went to the Cincinnati, New Orleans & Texas Pacific as General Manager, which position he now holds.

*Southern.*—E. L. Russell, Vice-President and General Counsel of the Mobile & Ohio, has been elected Vice-President of the Southern, with office at Mobile, Ala.

*Temiskaming & Northern Ontario.*—J. L. Englehart has been appointed Chairman of the Commission, succeeding C. D. Smith, resigned to go into other business.

### Operating Officers.

*Atchison, Topeka & Santa Fe.*—The new Arkansas river division consists of the line from Dodge City, Kan., to La Junta, Colo. The Western division, of which this once was a part, now extends from Newton, Kan., to Dodge City. E. A. Austin, Superintendent of the Panhandle division, has been appointed Superintendent of the Arkansas river division, with office at LaJunta.

*Brockville, Westport & Northwest.*—Carsten Heilshorn, Secretary, has been also appointed Manager.

*Central Vermont.*—Edwin D. Nash, who was recently appointed Superintendent of the Southern division, was born in Massachusetts in 1852. He began railroad work in 1868 as a brakeman on the Vermont & Massachusetts, now part of the Boston & Maine. In 1871 he went to the Central Vermont, where he has been ever since. He was appointed trainmaster in 1888, and in 1900 was made Assistant Superintendent of the Southern division, where he remained until his recent promotion.

*Chicago, Lake Shore & Eastern.*—J. Kirk, Assistant Superintendent, has been appointed Superintendent.

*Coahuila & Zacatecas.*—W. J. Browning has been appointed General Manager, with office at Saltillo, Mex.

*Cumberland Valley.*—J. H. Tonge, freight trainmaster, has been appointed Superintendent, with office at Chambersburg, Pa., succeeding G. W. Martin, resigned.

*Denver & Rio Grande.*—Hugh Wilson has been appointed Assistant Superintendent of the Second division, with office at Salida, Colo., succeeding William Edgar.

*Hawkinsville & Florida Central.*—S. D. Mandeville has been appointed Car Accountant, with office at Hawkinsville, Ga., succeeding R. A. Wood, resigned to go to another company.

*Illinois Southern.*—F. H. Van Etten has been appointed Superintendent of Telegraph, with office at Chicago.

*Kingston & Pembroke.*—F. Conway, General Freight and Passenger Agent, has been appointed Acting General Superintendent, succeeding F. A. Folger, Jr., heretofore General Superintendent.

*Litchfield & Madison.*—J. J. Reardon has been appointed Superintendent, with office at Edwardsville, Ill., succeeding L. P. Atwood.

*Manistique, Marquette & Northern.*—J. A. Robinson has been appointed Superintendent, with office at Manistique, Mich.

*Minneapolis, St. Paul & Sault Ste. Marie.*—W. A. Cole has been appointed Assistant Superintendent at Enderlin, N. Dak.

*Montana.*—Hugh Spencer has been appointed Superintendent, with office at Helena, Mont.

*National of Mexico.*—H. H. Allison, who was recently appointed Superintendent of Terminals at Monterey and also Superintendent of the Matamoras Branch, was born in Tennessee in 1867 and graduated from the University of Tennessee in 1885. He began railroad work, after leaving college, as a telegraph operator on the Richmond & Danville, now part of the Southern. After working up to train despatcher he went to the Central of Georgia in 1890 as assistant yardmaster. Two years later he was made chief despatcher and trainmaster of the Knoxville, Cumberland Gap & Louisville, now part of the Southern, and in 1894 went to the Mexican National as chief clerk to the Superintendent of Motive Power. He has been in the service of that company, and its successor, the National of Mexico, ever since, acting as chief clerk to the Superintendent, train despatcher, chief train despatcher and trainmaster.

*New York, Chicago & St. Louis.*—William L. Blair, who was recently appointed Superintendent of Transportation, was born in Ohio in 1858. After a high school education he began railroad work in 1872 as telegraph operator on the Cincinnati, Hamilton & Dayton. Six years later he was made chief clerk to the General Superintendent of that road, and in 1881 went to the New York, Chicago & St. Louis as chief clerk to the General Superintendent. He was appointed Superintendent of the Eastern division in 1893, and in 1901 was appointed Superintendent of Telegraph. In 1905 he was again made Superintendent of the Eastern division, where he remained until his recent promotion.

*Panama.*—W. G. Bierd, Superintendent, has been appointed General Manager, with office at Colon.

*St. Louis & San Francisco.*—H. D. Teed has been appointed Superintendent of Telegraph and H. C. Sprague has been appointed Assistant Superintendent of Telegraph, both with offices at St. Louis, Mo.

*Southern Indiana.*—M. E. Sebree has been appointed Superintendent, with office at Terre Haute, Ind., succeeding F. S. Lewis, resigned.

*Tehuantepec National.*—J. J. Lewis has been appointed Superintendent of Terminals at Coatzacoalcos, Mex., succeeding G. L. Hatley, resigned.

*Wabash.*—J. E. Stumpf, Superintendent at Springfield, Ill., has been appointed Superintendent at Moberley, Mo., succeeding Richard Doyle, resigned. C. E. Brown, trainmaster at Decatur, Ill., succeeds Mr. Stumpf.

### Traffic Officers.

*Galveston, Harrisburg & San Antonio.*—J. R. Christian, Assistant General Freight Agent, has been appointed General Freight Agent, with office at Houston, Tex., succeeding C. K. Dunlap, promoted. H. C. Reese, Assistant General Freight Agent of the Houston & Texas Central, succeeds Mr. Christian, with office at Houston, Tex.

*Houston & Texas Central.*—See Galveston, Harrisburg & San Antonio.

*Mobile & Ohio.*—W. K. Vandiver has been appointed Assistant General Freight Agent, with office at St. Louis, Mo.

*Nashville, Chattanooga & St. Louis.*—Charles Barham, Assistant General Freight Agent, has been appointed General Freight Agent, succeeding G. R. Knox, deceased.

### Engineering and Rolling Stock Officers.

*Atchison, Topeka & Santa Fe.*—M. J. Drury, Master Mechanic at Raton, N. M., has been appointed Mechanical Superintendent of the Western grand division, with office at La Junta, Colo., succeeding C. M. Taylor.

*Canadian Pacific.*—R. F. Tyne, locomotive foreman at Brandon, Man., has been appointed Master Mechanic at Moosejaw, Sask.

*Chicago, Rock Island & Pacific.*—J. B. Kilpatrick has been appointed Superintendent of Motive Power, with office at Chicago, succeeding L. W. Harrison, Acting Superintendent of Motive Power.

*Colorado & Southern.*—F. M. Mahl, Mechanical Engineer of the Southern Pacific, has been appointed Mechanical Engineer and Purchasing Agent of the Colorado & Southern, effective November 15th.

*Montana.*—J. A. Green has been appointed Acting Chief Engineer, with office at Helena, Mont., succeeding F. T. Robinson.

*New York Central & Hudson River.*—The organization for electric zone improvements has been revised as follows: E. B. Katte, Electrical Engineer, has been appointed Chief Engineer of Electric Traction, with office at New York city. G. A. Harwood, Terminal Engineer, has been appointed Chief Engineer of Electric Zone Improvements, including electric traction and signals. J. D. Keiley has been appointed Electrical Engineer. Carl Schwartz has been appointed Engineer of Power Stations. W. H. Knowlton, Principal Assistant Engineer, has direct charge of all construction work under contract and right of way matters from the south bank of the Harlem river north to Peekskill and Northern White Plains. Resident engineers in this territory report to him. J. L. Holst, Engineer of Bridges, has been appointed Engineer of Structures in charge of the design and erection of all steel work in the electric zone, excepting the erection in the Grand Central Terminal; he will also have charge of the design of all buildings not in charge of the Associated Architects, the design of all structures north of the south bank of the Harlem river. W. F. Jordan has been appointed Terminal Engineer in charge of the design and building of the Grand Central Terminal, and other electric zone improvement work south of the south bank of the Harlem river, except structural steel design and work in charge of the Associated Architects. L. H. Byam is appointed Engineer of Company Forces, succeeding G. A. Berry, resigned to go into other business. Mr. Byam reports to the Principal Assistant Engineer.

*Southern Pacific.*—See Colorado & Southern.

## LOCOMOTIVE BUILDING.

*The Mexican Railway* will shortly be in the market for several oil burning locomotives.

*The Pennsylvania* is building at its Juniata shops 25 heavy freight engines for delivery this winter.

*The Western of Havana* is about to order one locomotive. L. J. Buckley & Co., New York, are the purchasing agents.

*The Norfolk & Western*, as reported in our issue of October 19, has ordered 15 Pacific (4-6-2) type locomotives from the Baldwin Locomotive Works.

*The Krawjewski-Pesant Co.*, 32 Broadway, New York, has ordered three 60-ton locomotives from the Baldwin Locomotive Works for use on the Central Andreita and other Cuban sugar plantation railroads.

*The Grand Trunk* has ordered 30 Richmond compound consolidation (2-8-0) type locomotives from the Locomotive & Machine Co. of Montreal, and 14 six-wheel switching (0-6-0) locomotives from the American Locomotive Co.

*The Oliver Iron Mining Co.*, Duluth, Minn., has ordered 27 simple six-wheel switching (0-6-0) locomotives from the American Locomotive Co. and 22 simple six-wheel switching (0-6-0) locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | | |
|---|---|---|
| Type of locomotive | Switching. | |
| No. from each company | 27 | 22 |
| Weight, total | 121,200 lbs. | 86,000 lbs. |
| Diameter of drivers | 50 in. | |
| Cylinders | 19 in. x 26 in. | 17 in. x 24 in. |
| Boiler, type | Straight top. | |
| " wkg steam pressure | 180 lbs. | |
| " No. of tubes | 190 | 134 |
| " tubes, material | Shelby steel. | |
| " diam. of tubes | 2¼ in. | 2 in. |
| " length of tubes | 10 ft. 6 in. | 13 ft. 6 in. |
| Firebox, grate area | 22.16 sq. ft. | 14.4 sq. ft. |
| Heating surface, total | 1,309.0 sq. ft. | 1,015.0 sq. ft. |
| Tank capacity | 4,000 gals. | 3,000 gals. |
| Coal capacity | 6 tons. | 5 tons. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Boiler lagging | Magnesia |
| Couplers (for 27 locomotives) | Climax |
| Headlights (for 22 locomotives) | Dressel |
| Injectors | Nathau |
| Piston rod packings | Metallic-Reliance |
| Valve rod packings | Metallic-Reliance |
| Safety valves | Crosby |
| Sanding devices (for 27 locomotives) | Leach |
| Sight-feed lubricators | Nathan |
| Steam gages (for 22 locomotives) | Ashcroft |

## CAR BUILDING.

*The Great Northern* has ordered 3,000 box cars from Haskell & Barker.

*The Southern Pacific* is reported to be in the market for 50 refrigerator cars.

*The Atchison, Topeka & Santa Fe* has ordered 15 chair cars, 17 baggage and five postal cars.

*The Chicago Terminal Transfer* is asking bids on 300 dump cars of 100,000 lbs. capacity.

*The St. Louis & San Francisco* has ordered 250 gondolas from the American Car & Foundry Co.

*The Northern Pacific* has ordered 500 Hart convertible Rodger ballast cars of 80,000 lbs. capacity.

*The Boston & Maine* has ordered 100 Hart convertible Rodger ballast cars of 80,000 lbs. capacity.

*The Denver, Northwestern & Pacific* has reserved space with the Pullman Co. for passenger equipment.

*The Lake Shore Electric* has ordered eight Hart convertible Rodger ballast cars of 80,000 lbs. capacity.

*The Atchison, Topeka & Santa Fe* has ordered 400 Hart convertible Rodger ballast cars of 100,000 lbs. capacity.

*The Tonopah & Goldfield* has ordered 15 box cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The Seaboard Air Line*, as reported in our issue of October 12, has ordered 1,000 box cars from the Pressed Steel Car Co.

*The Barrett Manufacturing Company*, Chicago, has ordered 30 steel tank cars of 10,000 gallons capacity from the American Car & Foundry Co.

*The Wabash* is in the market for 3,000 steel underframe box cars of 80,000 lbs. capacity and 4,000 hopper bottom steel gondolas of 100,000 lbs. capacity.

*The Krawjewski-Pesant Co.*, 32 Broadway, New York, has ordered from the Ramapo Iron Works 20 cars for a Cuban sugar plantation railroad in the Cienfuegos district.

*The Norfolk & Western*, as reported in our issue of October 19, has ordered 25 coaches and 10 express cars from the Hicks Locomotive & Car Works, and four combination passenger and baggage cars from the Harlan & Hollingsworth Co. The specifications for these cars were published in our issue of October 19.

*The Chesapeake & Ohio*, as reported in our issue of October 5, has ordered 421 box cars, 148 flat cars and 77 stock cars, all of 80,000 lbs. capacity, from the American Car & Foundry Co., for January and February, 1907, delivery. The specifications for the box cars were published in our issue of October 5. The flat cars will be 38 ft. 5½ in. long and 9 ft. 6 in. wide, over all. The stock cars will be 37 ft. 10½ in. long, 8 ft. 11½ in. wide and 13 ft. 1¾ in. high, over all. The special equipment for the flat and stock cars includes:

| | |
|---|---|
| Brakes | Westinghouse |
| Brake-beams | Monarch |
| Brake-shoes | American Brake Shoe & Fdy. Co. |
| Brasses | Ches. & Ohio standard |
| Door fastenings (for stock cars) | Security |
| Draft rigging | Miner |
| Paint | Ches. & Ohio standard |
| Roofs (for stock cars) | Murphy |
| Trucks | Ches. & Ohio standard |
| Wheels | American Car & Foundry Co. |

## RAILROAD STRUCTURES.

Birmingham, Ala.—Announcement is made that the Louisville & Nashville has purchased land in Talladega at a cost of $25,000 as a site for better terminal facilities.

Duluth, Minn.—The Northern Pacific and the Terminal Railroad Companies will jointly spend about $85,000 for building an extension of the Belknap street viaduct next spring. The proposed structure will connect with the viaduct over the Great Northern tracks almost as far as Oakes avenue, also over all the tracks of the various roads at Belknap street between Elmira and Oakes avenues.

Kansas City, Mo.—The Chicago, Rock Island & Pacific, it is said, has bought a large plot of ground in Armourdale, probably for new shops.

Medina, N. Y.—The New York Central & Hudson River has given a contract to Mallison & Soucie for putting up a new brick and stone passenger station, 53 ft. x 93 ft., to cost approximately $50,000. The new station is to be located east and north of the present structure.

Omaha, Neb.—The Chicago & North-Western has ordered the construction of a new freight house here and will make other improvements to cost about $600,000.

The Union Pacific has been granted a building permit to put up new shops at a cost of $150,000. Bids are being received for a brick paint shop one and a half stories, 60 ft. x 300 ft.

Philadelphia, Pa.—For the storage of export freight routed through Philadelphia, the Pennsylvania will build, at Girard Point, a big storehouse pier, with a capacity of at least 250 carloads, and possibly double that amount.

Youngstown, Ohio.—The Youngstown & Southern has been granted a permit to put up a brick and stone combined passenger and freight station on Front street to cost about $15,000.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Arkansas, Oklahoma & Western.—Incorporated in Oklahoma with $4,000,000 capital, with offices at Blackburn, Okla., Fayetteville, Ark., and Caney, Kan. The promoters propose to build a line from Fayetteville, Ark., northwest through the Cherokee Indian Nation to Caney, 160 miles, with a branch from Vinita, Ind. T., to Pawnee, Okla., an additional 100 miles. The cost of construction is estimated at $25,000 per mile. The incorporators include: B. F. Campbell and J. R. Harris, of Fayetteville; W. C. Meeks and G. H. Work, of Caney; Z. T. Conley, of Siloam Springs, Ark.; F. Rush, of Blackburn; J. A. Orendorff, of Vinita; F. Hudson and C. E. Vandervoort, of Pawnee.

Arkansas Pacific.—An officer writes that this company, which was recently incorporated in Oklahoma to build about 1,500 miles of road, has completed preliminary surveys and is now making location surveys. Contracts for some of the work are to be let about February 1st of next year. George D. Locke, St. Louis, is President; T. D. Kinman, Newport, Ark., Vice-President, and James Gates, St. Louis, Secretary and Treasurer. (Oct. 26, p. 113.)

Atlanta, Griffin & Macon (Electric).—This company has com-

leted surveys for its proposed line from Atlanta, Ga., to Macon, bout 90 miles, and expects to have the line in operation in about ne year. Surveys will shortly be started from Macon south to lbany, about 100 miles. This part of the work is to be carried ut by the Interurban Construction Co. W. J. Kincaid, of Griffin, a., is President of the Atlanta and Macon line, and Joseph S. Davis resident of the Macon and Albany line.

Beaumont & Great Northern.—This company has opened its oad for business from Trinity, Tex., south to Onalaska, 20 miles.

Bering, Kiam & Southern.—Incorporated in Texas with $75,000 apital by Conrad Bering, R. B. Landrum, W. C. Bevan, F. C. Bering, f Houston; James E. Hill, of Lexington; C. H. Mason, of Bering, nd others. The company has been formed to build a line from Bering, in Polk County, on the Houston East & West Texas, southast to Kiam, in the same county, about 15 miles.

Birmingham & Mississippi Southern.—Incorporated at New Orleans to build a line from Baton Rouge, La., northeast to Birmingham, Ala., about 250 miles. The company proposes to secure n entrance into New Orleans over an existing road. The plans lso include the building of a branch line from Waynesboro, Miss., n the Mobile & Ohio south to Scranton, an additional 100 miles. Arrangements have been made to start preliminary surveys at once. The incorporators are principally New Orleans and Mississippi capialists. William A. Aaron, an attorney of Hattiesburg, Miss., was he chief organizer of the company.

Buffalo & Susquehanna.—This company has completed track aying on its new line from Wellsville, N. Y., northwest to Buffalo, 0 miles. At Landon Brook much trouble was experienced because f the continuous slipping of the heavy fill at that point. The line s laid with 80-lb. rails, and all bridges and culverts are of heavy oncrete and steel construction. The line has low grades and easy urvatures. Passenger service has been in operation for some time rom Springville south, and recently from Boston to Blaisdell, near he northern end of the line. It is expected to have the entire road pened for both passenger and freight service before the close of his year.

Chicago, Joliet & Kansas City.—This company, which was reently incorporated in Chicago with $12,000,000 capital, is said to e a Harriman project. Surveys are said to have been made via oliet, Peoria and Beardstown, crossing the Mississippi river at uincy. The line will have a total length of 450 miles between hicago and Kansas City. J. C. Eden is President; B. F. Hardesty, hief Engineer, and C. A. Denham, Construction Engineer, 608 ector Building, Chicago. (Oct. 19, p. 106.)

Cleveland, Cincinnati, Chicago & St. Louis.—The stockholders ave agreed to increase the common stock $10,000,000 to provide nds for double-tracking and to make other improvements and for ew equipment.

Coffeyville & Memphis.—Incorporated in Oklahoma with $500,00 capital to build a line from Coffeyville, Kan., on the Atchison, opeka & Santa Fe, the Missouri, Kansas & Texas, and the Missuri Pacific, southeast through Oklahoma via Centralia and Afton the Arkansas state line, thence in Arkansas through the counties f Benton, Madison, Newton, Searcy, Vanburen, Cleburne, White, rairie, Monroe, St. Francis and Crittenden to the Mississippi river, bout 375 miles, with a branch 150 miles long southwest from a point n the main line to Shawnee, Okla. The incorporators include J. O. all, W. P. Brown, E. A. Rosser, P. H. Grahon, E. C. Kiddoo, George . Gabbler, J. E. McClunry, A. J. Yoke and W. C. Hall, all of Coffeyille; J. I. Lehman, of Centralia, Kan.; C. E. Bennett and O. N. elby, of Oklahoma City.

Duluth, Rainy Lake & Winnipeg.—This company has extended s road from Ashawa, Minn., north to Gheen, 11 miles.

East St. Louis, Columbia & Waterloo.—This company, which roposes to build a line from East St. Louis, Ill., south to Waterloo, 3 miles, has completed surveys and secured rights of way for part f the distance, and will probably let contracts for the work early ext year. Negotiations are now pending to finance the road. E. . Schoening, of Columbia, Ill., is President. (Sept. 21, p. 75.)

Georgia, Florida & Alabama.—Contracts have been given by his company to Hardaway & Money to build an extension of its oad from the College street terminal to the Depot street terminal Cuthbert, Ga. Work will be started at once. On the completon of this work contracts will probably be let for extending the ne north to Columbus.

Glenville & Kanawha.—Surveys are being made by this comany for building about 30 miles of road. R. L. Ruddell, of Glenille, W. Va., is General Manager.

Grand Trunk.—This company has made application to the Canaian Government for authority to build its projected short line rom Kingston to Ottawa via Smith's Falls. The company has seured the rights of the Kingston, Smith's Falls & Ottawa, whose charter has lapsed, and has secured the bonus promised by Ottawa; also bonuses from other towns interested in the construction of the line.

Great Northern Coal & Coke.—This Chicago company, it is said, is making plans to build a line about 100 miles long from Ashland, Ky., to the coal fields which it owns in the Big Sandy basin. Eugene Zimmerman is interested in the project.

Louisiana Railway & Navigation Co.—This company has completed its line to New Orleans, and expects next month to begin running passenger and freight trains between that city and Baton Rouge. Connection is to be made with the northern end of the road from this point by ferry a distance of about eight miles along the Mississippi river from Angola to Watertown. The main line from Shreveport southeast to New Orleans is about 315 miles long, and it is expected that through trains will be run over the entire line by the first of the year. It is reported that the Missouri, Kansas & Texas has made an agreement with the company to use the new section of the road. The company is also planning to build a branch from Hessamer, La., north to Marksville, about seven miles.

Louisville & Nashville.—This company is making surveys near Pineville, Ky., for a line up the right fork of Straight creek, seven miles, to coal fields recently bought by the North Jellico Coal Co.

Michigan Roads (Electric).—Plans are being made to organize a company with $2,500,000 capital to build an electric line to traverse the northern part of Muskegon County, Mich. The line will pass through the fruit belt, touching Hart, and thence run north via Pentwater, with a terminus at Ludington. The company will take over the rights of the Western Michigan Interurban, projected some time ago, and for which franchise and right of way have been secured. E. R. Trowbridge, of Chicago and Detroit, is the chief promoter.

Minneapolis, St. Paul & Sault Ste. Marie.—This company has opened its Flaxton line for business from Flaxton, N. Dak., west to Ambrose, 50.4 miles. The company has also started a tri-weekly train service on the Egeland line of the Winnipeg division, from Egeland, N. Dak., to Armourdale, 21.6 miles.

Missouri Pacific.—The St. Louis, Iron Mountain & Southern, it is said, will build a 20-mile line from its main line at Henson, Mo., south to Hickman, Ky., using the Nashville, Chattanooga & St. Louis terminals at that place.

Munising Ry.—This company has extended its road from Little Lake, Mich., west to Princeton, seven miles.

Ocilla & Valdosta.—This company will extend its road from Ocilla, Ga., south to Allapaha, 17 miles, early next year. About six miles of grading has been finished.

Oklahoma, Texas & Western.—This company, which was recently incorporated in Oklahoma, to build about 80 miles of road, has let a contract to build a section of the proposed line, from Clinton northwest to Cheyenne, about 20 miles. Connection is to be made with the Kansas City, Mexico & Orient, also with the St. Louis & San Francisco at Clinton. Work is to be started as soon as the necessary franchise and rights of way are secured. (Oct. 26, p. 115.)

Orange & Keysville.—This company, it is said, is asking bids for its proposed line from Dillwyn, Va., on the Chesapeake & Ohio, south via Farmville to Keysville, 40 miles. Surveys have been made and grading is finished for 10 miles. R. T. Hubard, of Dillwyn, Va., is President.

Pacific & Eastern.—This company has been incorporated in the state of Washington with $150,000 capital by W. G. Hyman, of California; W. S. Cram and H. G. Shoemaker, of South Bend; T. H. Donovan, of Raymond, Wash., and others to build a line from South Bend, Wash., east to Chehalis, about 45 miles. Both of these places are on the Northern Pacific.

Pennsylvania Lines.—This company, according to reports from Hammond, Ind., will soon begin the construction of large yards in that city. Twelve miles of track will be laid at North Hammond to accommodate 1,000 cars, and at Fifty-sixth street there will be a yard with a capacity of 60 cars.

Prince Edward Island.—This company has opened a new line from a point on its road one mile from Cardigan, at Montague Junction to Montague, six miles.

Roscoe, Snyder & Pacific.—An officer writes that the projected route of this company's proposed line is from Roscoe, Tex., on the Texas & Pacific northwest via Snyder to the New Mexico state line, about 200 miles. Contracts for grading 30 miles have been let to Col. N. T. Reed, Armour, Tex., to be done within six months. The line will be almost straight, over a level section, and all the work will be easy. Contracts for rails have also been let, for delivery during next April. F. W. James, of Abilene, is President, and Martin Duval, of Roscoe, Chief Engineer. (Oct. 19, p. 107.)

St. Joseph Belt & Interurban.—Incorporated in Missouri with $1,500,000 capital, and office at Jefferson City, by capitalists of St. Joseph, including Dr. John S. Logan, J. J. Peter, J. Townsend, J. W. Brockett, J. E. Dolman, J. H. McCord and others. The company proposes to build a line from St. Joseph, Mo., north through Savannah to a point beyond that place, in the same general direction, not yet determined.

St. Louis & San Francisco.—A contract is reported let by this company to McCade & Steen, of Irving, to build a cut-off from Carrollton, Tex., to Irving, approximately 11 miles.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

St. Louis, Rocky Mountain & Pacific.—This company, which is building a line from Des Moines, N. Mex., on the Colorado & Southern, west via Moreno Valley to Farmington, San Juan County, about 300 miles, with a branch from the main line at Clifton House north to Raton, six miles, has more than 55 miles of road now in operation, has the grading about completed on a continuous section of 80 miles east of Ute Park, and well advanced on the remaining 30 miles east to Des Moines. Bridge construction is well advanced at all points. Grading on the Raton branch is also completed. (Oct. 5, p. 92.)

Silver Peak.—This company, it is reported, has begun running trains on its new road from Blair Junction, Nevada, to the new town of Blair.

Southern Indiana.—The Oolitic branch of this company has been extended north to Buff Ridge, and a new line, called the Chicago Extension, has been opened for business from a new station called McKeen, on the main line between Terre Haute and Spring Hill, 3.4 miles from Terre Haute, north to Humrick, 40 miles.

Southern Pacific.—This company has given a contract to Jose Soto, of Culiacan, state of Sinaloa, Mex., for 600,000 ties to be used on the Guymas-Guadalajara extension between Mazatlan and Tepic, Mexico. The company has also imported ties from Japan.

Tallulah Falls.—This company has extended its road from Dillards, Ga., north to Prentiss, N. C., 11 miles.

Temiskamino & Northern Ontario.—The Canadian Government, it is said, has decided to extend this road from Cobalt to Petersen Lake. Surveys are now being made from the La Rose mine via the O'Brien and the Colonial silver mines.

Tennessee & North Carolina.—This road has been extended from Waterville, N. C., to Mount Sterling, two miles.

Texas Central.—This company has completed an extension of its road from Stamford, Tex., west to Rotan, 43 miles.

Waycross, Baxley & Vidalia.—Incorporation is to be asked for in Georgia by C. W. Dean, of Baxley; J. S. Bailey, W. H. Buchanan, J. T. Myers, of Waycross, and others for a company to build a line from Waycross, Ga., north to Vidalia, about 65 miles. It is said that funds have been secured to complete the road for half of the proposed distance. (May 25, p. 156.)

Western & Gulf.—Incorporated in Georgia with $400,000 capital by Frank Lanier, Lee Parker, E. C. Allen and others, to build a line connecting Hawkinsville, Americus and Dawson, Ga., 85 miles.

## RAILROAD CORPORATION NEWS.

Canadian Northern.—Gross earnings for the year ended June 30, 1906, were $5,903,755, an increase of $1,713,544; net earnings $2,229,023, an increase of $683,541. The net income was $719,574, which is equal to 2 per cent. on the capital stock and is an increase of $302,871 as compared with 1905.

Chicago & Alton.—Spencer Trask & Co., New York, are offering at a price to yield 5 per cent. the unsold part of the issue of $2,260,000 Chicago & Alton Equipment Association, series D, 4 per cent. serial gold certificates guaranteed by the Chicago & Alton. These certificates are payable in 20 equal semi-annual installments beginning December 1, 1906, and were issued to pay for part of the cost of 25 locomotives and 2,000 freight cars.

Consolidated (New York, New Haven & Hartford Electric Lines).—It is reported that this company has bought, from the United Gas Improvement Company of Philadelphia, control of the Connecticut Railway & Lighting Company, which is a consolidation of a dozen street railways operating 198 miles of road in and between towns in the southwestern part of Connecticut. It has outstanding $9,191,000 common stock, $5,809,000 preferred stock, and $12,776,193 funded debt. Its gross earnings for the year ended June 30, 1906, were $2,121,044; net income $140,580.

Connecticut Railway & Lighting Co.—See Consolidated.

Hudson Companies.—Interests identified with the Hudson & Manhattan, which has built a double-track tunnel under the Hudson river from Jersey City to Christopher street, New York, and is a subsidiary of the Hudson Companies, have bought land in the block between Thirty-third street and Sixth avenue, Thirty-second street and Seventh avenue, for use in connection with its terminal at this point. It is said that existing leases on this property will not expire until 1909. (Oct. 12, p. 100.)

Illinois Central.—At a meeting of the directors on November 7, J. T. Harahan, Second Vice-President, was elected President, succeeding Stuyvesant Fish. The following voted for Mr. Harahan: J. W. Auchincloss, W. Luttgen, Robert W. Goelet, Cornelius Vanderbilt, J. T. Harahan, E. H. Harriman, J. J. Astor and Charles A. Peabody. Of the remaining five directors Governor Deneen, of Illinois, Charles M. Beach, Stuyvesant Fish and J. DeW. Cutting did not vote. J. C. Welling, Vice-President and a Director, was ill in Chicago.

Lake Shore Electric.—See Sandusky, Fremont & Southern.

Minneapolis, St. Paul & Sault Ste. Marie.—Gross earnings for the three months ended September 30, 1906, were $3,432,319, an increase of $590,115; net earnings $1,772,083, an increase of $198,928, the operating ratio having risen from 44.6 to 48.4.

New York, Ontario & Western.—Gross earnings for the three months ended September 30, 1906, were $2,368,642, an increase of $221,185; net earnings $924,786, an increase of $222,860. The operating ratio was 61 per cent., a decrease of 6.3 per cent.

Northampton & Hertford.—The property of this company, which owns nine miles of road from Bumbery, N. C., to Jackson, and also a mill and a tract of timber land, will be sold under foreclosure at Jackson, N. C., on November 12th.

Northern Pacific.—This company has acquired control of the Port Angeles & Peninsular, which was organized to build a 125-mile road from Quillayute, Wash., east through Port Angeles to Port Ludlow, from which point car ferry lines on Puget Sound are to connect with Seattle, 35 miles, and Everett, 26 miles. The Port Angeles & Olympia, which plans to build from Junction City, near Port Ludlow, south to Olympia, 97 miles, has also been bought by the Northern Pacific.

Ohio River & Western.—A meeting has been called for December 3 of the stockholders of this company, which owns 111 miles of road from Bellaire to Mill Run, Ohio, to authorize an increase in the capital stock from $1,200,000 to $4,000,000, and to authorize an issue of $4,000,000 5 per cent. mortgage bonds.

Pennsylvania.—A semi-annual dividend of 3½ per cent. has been declared on the $305,945,500 outstanding capital stock payable Nov. 30th to stockholders of record Nov. 5th. Since 1900 the annual dividend rate on this stock has been 6 per cent.

Peoria & Pekin Terminal.—W. T. Irwin, Peoria, Ill., has been appointed Receiver of this company on the petition of Gay & Co., Boston, who hold a judgment of $2,700 against the road. The company owns 21 miles of road, consisting of two lines, between Peoria, Ill., and Pekin, and has trackage rights over five miles of street railway in Peoria. It is operated by steam and electricity. There are outstanding $600,000 stock, $697,000 first mortgage 5 per cent. bonds of 1930, and $280,000 refunding mortgage 5 per cent. bonds of 1935. It is alleged that the company also has a floating indebtedness of $150,000, and has defaulted the July and August, 1906, interest on bonds.

Philadelphia & Reading.—Gross earnings for the three months ended September 30, 1906, were $10,055,677, a decrease of $44,741; net earnings, $3,943,045, a decrease of $401,470. R. & P. gross earnings of the Coal & Iron Company for the same period were $6,538,669, a decrease of $152,811; net earnings $60,596, a decrease of $183,901.

Port Angeles & Olympia.—See Northern Pacific.

Port Angeles & Peninsular.—See Northern Pacific.

Sandusky, Fremont & Southern (Electric).—Lomas & Nettleton, New Haven, Conn., are offering at par and interest $500,000 first mortgage 5 per cent. bonds of 1936, guaranteed by the Lake Shore Electric, which owns the entire $2,000,000 capital stock of the S., F. & S. The bonds, which are part of an authorized issue of $2,000,000, are secured by a mortgage on the 21 miles of line between Sandusky, Ohio, and Fremont, and on lines to be built from Fremont to Fostoria, 20 miles, and from Fremont to Tiffin, 20 miles.

Southern.—It is announced that this company has bought a majority of the $2,000,000 common stock of the Virginia & Southwestern, which runs from Mountain City, Tenn., via Bristol, Va., to Big Stone Gap, 130 miles.

Virginia & Southwestern.—See Southern.

# GENERAL NEWS SECTION

## NOTES.

It is announced in Springfield, Ill., that two sleeping cars have been ordered for use on the Illinois Traction (Electric) lines between Decatur and St. Louis.

The New York State Superintendent of Public Works announces that the Erie and other canals of the state will be closed November 28, unless sooner closed by ice.

The Merchants' & Travelers' Association, of Philadelphia, has established a Freight Complaint Bureau for the use of its members in collecting claims for loss and damage.

At Sioux Falls, S. Dak., November 7, the United States Court decided that express companies in that state are common carriers, and, therefore, subject to the authority of the State Railroad Commission.

Near Carlin, Nev., on the night of Nov. 11 a passenger train of the Southern Pacific was stopped by robbers and about $1,000 worth of property was taken from the passengers.

Near Slater, Mo., on the night of November 8 a passenger train of the Chicago & Alton was stopped by robbers and about $500 worth of jewelry and other valuables was taken from the passengers in a sleeping car.

The Wisconsin State Railroad Commission has issued a decision sustaining the right of the Wisconsin Central Railroad to carry at half the regular rates machinery and materials to be used in a new factory to be built on the line of the road.

Vice-President Thayer, of the Pennsylvania, denies the reports, published in Wall Street and elsewhere, that the company contemplates an advance in freight rates to make up for the increased expenses due to the raising of the pay of the employees.

On four trains of the Pennsylvania Railroad which have dining cars, orders for meals, with seats reserved at a fixed hour, are to be taken about an hour before meal time. This is an experiment, to be tried with a view to removing the annoyance of crowded tables.

In a large new freight house to be built by the Louisville & Nashville in Atlanta, Ga., to be ready for occupancy next spring, there will be large areas to be let to merchants and manufacturers. The building is to be five stories high, with eight large elevators.

Under a contract which has recently been made between the Mexican Central Railroad and the Government of Mexico a certain percentage of trainmen and office clerks of the road must be Mexicans. The amount of the percentage has not been made public, but it is understood to be 25.

At Pittsburg, November 9, the Grand Jury in the Federal Court indicted F. L. Emmet, James Dunn and Charles L. Close for conspiracy to defraud the government in furnishing 10,000 defective boiler tubes for war vessels. The three men named were employed in the Greenville shops of the Shelby Tube Company.

The Second Assistant Postmaster-General has ordered an investigation into mail bag catching and delivering apparatus with a view to selecting the best appliances of this kind for use in connection with trains moving at high speed. The commission to make the investigation is headed by C. M. Vickery, Superintendent of Railway Mail Service, Washington, D. C.

A press despatch from Columbus, Ohio, says that the Pennsylvania Lines West of Pittsburg will establish a school in which to train men for service as conductors of dining cars. Hitherto the company has sought men who have had experience in clubs or hotels, but has concluded that better service will be obtained by educating men who have seen service on the trains of the road.

At Iberia Parish, La., recently the sheriff destroyed by dynamite a bridge and a trestle of the Southern Pacific which were declared to interfere with drainage rights of certain adjacent owners. The District Court had ordered the railroad to remove a portion of its track, but the order had not been obeyed. The sheriff had with him a force of 25 deputies and there were 1,000 spectators.

From Chicago, the fountain head of everything authentic in the way of railroad news, it is reported that President Roosevelt, in his annual message to Congress, will recommend two changes in the Interstate Commerce law: first, the legalization of railroad traffic associations, and second the enlargement of the Commission, making the number of members ten instead of seven.

The Pennsylvania Railroad has issued an order that all brakemen, Pullman conductors and porters must call out "all aboard" exactly two minutes before the train leaves a division terminal station. At towns where trains stop several minutes, passengers have a way of leaving and strolling up and down the platform and are apt to wait until the minute of starting to re-enter the train.

The Secretary of the Pennsylvania State Board of Trade announces that 70 per cent. of the men who have been elected to the next legislature of that state are pledged in favor of a law limiting passenger fares throughout the state to two cents a mile, and another authorizing the transportation of freight on street car lines. The Board of Trade wrote to every candidate before the election.

The Railroad Commissioners of Texas propose to issue an order requiring all railroads to run sleeping cars in any or all trains which the commissioners may specify, and also an order prescribing rates for berths 20 per cent. less than those now in force; and the railroads and all persons interested are notified to present their views on the subject on or before November 27, when a hearing will be held at Austin.

A press despatch from Omaha says that the Chicago, Burlington & Quincy has notified its clerks to keep out of labor unions. An organizer has been in Omaha and it was understood that arrangements were being made to form a clerks' union. In Texas recently large numbers of clerks in railroad offices have received increased pay and other favorable changes as a result, it is said, of the aggressive work of the leaders of a clerks' union.

At Minneapolis, November 8, the Grand Jury in the Federal Court returned indictments against the following railroads, railroad officers and shippers for giving or receiving illegal freight rates: Great Northern Railroad Company and 5 officers; Chicago, St. Paul, Minneapolis & Omaha Railroad and 3 officers; Wisconsin Central and 2 officers; Minneapolis & St. Louis and 2 officers; W. P. Devereaux Company; McCaull-Dinsmore Company; D. F. De Wolf; Ames-Brooks Company.

In the Federal Court at Kansas City, Nov. 13, the Grand Jury returned indictments against D. H. Kresky, a freight broker and W. A McGowan, agent of the Nickel Plate Fast Freight Line, for conspiring to violate the Interstate commerce law in granting rebates on flour shipped from Wichita to England and Scotland, and against H. S. Hartley for accepting commissions and rebates on shipments of cottonseed meal over the St. Louis & San Francisco.

By the purchase of the town of Shire Oaks on the upper Monongahela river in Pennsylvania, the Pennsylvania Railroad becomes the owner of the Banner mines of the Pittsburg Coal Company, the First M. E. Church, the Shire Oaks Brewery, a hotel, a company store and fifty houses. All will be torn down to be replaced by a large freight yard for the coal trade. The community will move to Elben, several miles below. The improvements at Shire Oaks will cost several million dollars.

According to press reports, the North American Express Company, incorporated in Maine a few weeks ago with an authorized capital of $25,000,000, was organized by Rock Island interests and is to operate on the lines of that road, as well as over other lines. The United States Express, Wells Fargo & Co., the Pacific Express and the American Express now operate on the Rock Island lines. Some of the contracts expire on January 1, 1907, but others will run two years longer.

Cotton exporters of New Orleans are now exercised over the falling off in the export trade through that city since the railroads have complied with the law to make their rates open and undiscriminating. According to the *Times-Democrat* cotton is now taken from Memphis to Boston by rail and thence to Liverpool at 62½ cents per 100 lbs., whereas the rate from Memphis to Liverpool by way of New Orleans is 67 cents. It is said that 7,000 bales have already been sent by way of Boston.

The Missouri Pacific announces that prizes are to be given in the roadway department, and that for the purpose of awarding the prizes a general inspection will be made each autumn. The first prize, $200, will go to the roadmaster having the best line and surface. The second is $100, and the third $50. There will be a section foremen's first premium of $25 on each division of the road; second premium, 10 days' leave of absence, with pass to any point on the road. There will also be lesser premiums for the section foremen, accompanied by placards to be displayed on the tool house of the premium sections.

According to the *Wall Street Journal*, rail manufacturers say that orders will have been booked by January 1, 1907, for the entire 1907 output of the rail mills of the country. It is estimated that orders for about 2,000,000 tons for 1907 delivery have already been given, and there will be left over from the current year about 200,000 tons of unfilled orders. The total capacity of the mills is about 3,500,000 tons, and it is said that negotiations for the differ-

ence between the orders given and the total capacity are already under way. No orders are being accepted for immediate delivery at a premium, all orders being taken at $28 per ton.

New freight tariffs have been filed with the Interstate Commerce Commission by the Union Pacific, which make wholesale reductions in rates to points in Utah and Idaho. They go into effect November 24. First and second class rates from Chicago will be reduced approximately 25 cents and third and fourth class rates 17 cents. Southern Idaho will profit in greater measure than Utah in the reductions that have been made. The first-class rate from Chicago to Pocatello now is $3.30. It will be lowered to $2.85.

Mr. Prall, of the Pittsburg Car Service Association, says that the newspaper reports of congestion in the freight yards of that city are incorrect. There is no trouble from congestion; the difficulty is the lack of cars. The railroads are doing better service than ever before. They are moving 20 per cent. more freight than ever before and yet with fewer cars than were in service two years ago. Mr. Prall estimates that the average capacity of cars has in two years increased 4 per cent., while the quantity of freight handled has increased over 20 per cent.

### Plans for the Panama Canal.

The Isthmian Canal Commission has issued a statement describing the general plan for the construction of the Panama Canal. It is explained that the type of canal adopted by the Commission and approved by the minority of the consulting board is that with a summit level about 85 ft. above the level of the sea, which is to be reached by a flight of locks built at Gatun, on the Atlantic side, by one lock at Pedro Miguel and two others at La Boca, on the Pacific side. The locks are all to be in duplicate.

The summit level will be formed by building a large dam at Gatun and a small one at Pedro Miguel. A second lake, with a surface elevation of 35 ft., will be formed on the Pacific side between Pedro Miguel and Panama Bay by building a dam at La Boca, across the mouth of the Rio Grande, and another dam between Soca Hill and high ground near Corozal. From the Caribbean Sea to the mouth of the Mindi River a channel is to be excavated having a bottom width of 500 ft. and a depth of 45 ft. below mean tide. From the mouth of the Mindi to the Gatun locks the width and depth are to be the same as from the sea to the mouth of the river.

The Gatun locks are to be built in duplicate. The lift will be overcome by a flight of three locks of 28½ ft. or by two locks of 42½ ft. each. The Gatun dam will reach from a point near the Gatun Hills, on which the locks are to be located, to the hill, 3,500 ft. westward, in which the spillway will be built. The object of this dam is to form a reservoir in which the floods of the Chagres will be received. Its area will be 110 square miles. Works for regulating the level of the lake will be situated in the hills that lie midway between two extremes of the dam. They will consist of a system of gates constructed on foundations of concrete. The gates will be almost counterparts of those used on the Chicago Drainage Canal.

From the Gatun locks to San Pablo, about 15 miles, only a small amount of excavation will be required. The canal will be about 1,000 ft. wide and 45 ft. deep. Trees and undergrowth for 50 ft. along the shores are to be removed. Further up the lake, as the amount of excavation necessary to get a depth of 45 ft. increases, the width of the channel will be decreased, first to 800 ft., then to 500, then to 300 from Obispo to Las Cascades, about 1¼ miles, where the Culebra cut begins.

The channel from Matachin to Bas Obispo may be narrowed to 100 ft. From Las Cascades to Paraiso, 4.7 miles, the width of the channel will be 200 ft. This is the hardest work of the whole canal construction. From Paraiso, the end of the Culebra cut, to the Pedro Miguel lock, something less than two miles, the channel will be 300 ft. wide. The Pedro Miguel lock will have a lift of 30 ft. and will be in duplicate, with approach walls at each end. From the lock for 1.87 miles the channel will be 500 ft. wide and will then be increased to 1,000 ft. for 3.61 miles to Sosa Hill, on the shore of Panama Bay, where the Sosa locks will be built. These locks will be in two flights, with lifts of 27½ ft. each, and will be in duplicate.

A dam will be built across the Rio Grande from San Juan Hill to Sosa Hill, another from Sosa Hill to Corozal Hill, and a small dam from Corozal Hill to the high ground eastward. These dams will form a lake to be known as Sosa Lake. It will have an area of eight square miles and will be provided with regulation works for discharging the surplus water. From the Sosa locks to deep water in Panama Bay, four miles, the channel is to have a bottom width of 500 ft. and a depth of 50 ft. below mean tide. The mean rise and fall of the tide is about 15 ft.

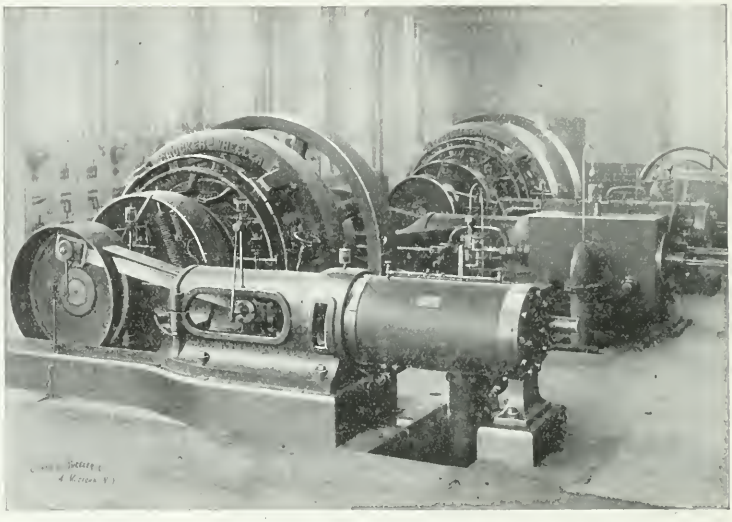
The Panama Railroad will be relocated throughout almost the entire distance from the mouth of the Mindi river to Panama, and some heavy embankments will be needed to cross certain parts of Gatun lake.

### Guayaquil & Quito.

According to a circular issued by the President of the Guayaquil & Quito, 190 miles of road from Guayaquil, Ecuador, to Mocha, are in operation; this section includes the entire Mountain division which crosses the Chimborazo mountain, 11,800 ft. high. Grading and masonry work are finished on the remaining 96 miles into Qnito, and rails are being laid at the rate of 1,000 to 5,000 ft. per day.

### Generator for the Collinwood Shops of the Lake Shore.

The Lake Shore & Michigan Southern has recently installed in its repair shops at Collinwood, Ohio, a 300-k.w., 250-volt d.c. generator built by the Crocker-Wheeler Co. This generator runs at 150 r.p.m. with a current of 1,200 amperes. With the generator is used a three-unit balancing transformer through which currents of 80, 120 or 140 volts can be delivered to the individual motors for machine tool drive. The shops were already equipped with two 400-k.w. and one 75-k.w. compound wound, multipolar, slow speed engine-type generator mounted directly on the engine shafts. The smaller generator is connected to a 150-h.p. simple engine, and the 400-k.w. generators are driven by 650-h.p. cross compound Buckeye engines at 135 r.p.m.



Crocker-Wheeler Generator; Lake Shore Shops at Collinwood, Ohio.

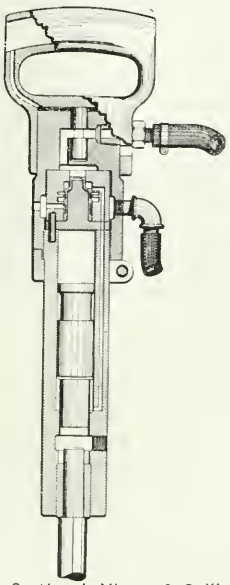
### Changes in the Railroad Map of Texas.

Railroad extensions in Texas during the past year have been numerous and important. Since 1905 the Kansas City, Mexico & Orient has built its line northeast from Sweetwater to Knox City, about 75 miles, connecting with the Texas & Pacific at Sweetwater. The Texas Central has been extended west from Stamford to Dowell, about 50 miles, crossing the Kansas City, Mexico & Orient at Hamlin. The Wichita Valley has been extended south from Seymour to Stamford, about sixty miles. The Abilene & Northern, a new company which is controlled by the same interests that own the Colorado & Southern, the Fort Worth & Denver City and the Wichita Valley, has built a line from Stamford south to Abilene, about fifty miles, connecting with the Texas & Pacific at Abilene. This line is a continuation of the Wichita Valley. The Plainview & Northern Texas, which runs from Canyon City to Plainview, in Hale County, is a new line sixty miles long, controlled by the Atchison, Topeka & Santa Fe. It connects with the Pecos Valley (a part of that system) at Canyon City. In the southern part of the State the new line of the Galveston, Harrisburg & San Antonio between San Antonio and Cuero, sixty miles long, has been completed and is in operation. The St. Louis, Brownsville & Mexico has finished its line between Sinton and Algoa, 180 miles. In eastern Texas the Beaumont, Sour Lake & Western has been extended west from Sour Lake to a point near Vidette, about 30 miles. This is classed as a Colorado &

Southern project. The Orange & Northwestern, belonging to the same interests, has been extended north from Buna to Newton, thirty miles. The Trinity & Brazos Valley, which is to form the link in the Colorado & Southern system between Fort Worth and Houston, has been completed southeast from Mexia to Houston, about 150 miles, and also from Teague north towards Dallas, about 15 mies. The Houston & Texas Central has finished building its "cut-off" line between Mexia and Navasota, 100 miles. The Texas & Gulf has built south from Timpson to Waterman, 15 miles. The Jasper & Eastern (Santa Fe) has been built from Kirbyville Junction east into Louisiana, and the Northeastern Texas, a new line, has been built from Redwater southwest to Munz, about twelve miles.

### Sullivan Pneumatic Hammer Drills.

A light, one-man machine drill to replace hand work in mining and quarrying, and by contractors, is used for drilling "plug and feather" holes in quarries; pop holes for breaking up large masses of stone with explosives; drilling anchor holes; squaring up; cutting hitches; trimming walls of cuts and tunnels, etc. Some pneumatic hammer drills have been used for this purpose for several years and have cheapened the cost of such work. A drill of this type made by the Sullivan Machinery Co., Chicago, is illustrated herewith.



Sectional View of Sullivan Plug Drill.

All working parts are made of hardened tool steel with wide bearing surfaces to minimize wear. All non-working parts are made of steel in order to make the tool durable. The valve motion secures a hard, quick blow, which is adjustable to the character of the material in which the drill is used. The valve is cylindrical, designed for high or low pressure, and balanced. Wide direct ports obviate "wire-drawing" and freezing at the exhaust. The air is maintained at inlet temperature throughout its course. The drill cylinder is fitted at the lower end with removable steel bushings ground to a press fitted to receive the shank of the drill bit and formed to obviate the use of a special drift key for driving out the bushings. The two exhaust openings, from opposite cylinder ends, are tapped out for pipe connection to a blower hose which keeps the hole free from dust.

One of these drills has drilled 160 holes, $\frac{5}{8}$ in. in diameter and 3 in. deep, both horizontal and vertical, in one hour, including time for changing bits. The best previous record is said to be 60 holes in an hour. In a later test, $\frac{5}{8}$-in. holes averaging $5\frac{1}{4}$ in. deep were drilled in an average of 15 seconds each. Two classes of air drills are made: D-15$\frac{1}{4}$ for holes 3 in. to 12 in. deep, and D-19 for holes 1 ft. to 4 ft. deep. There is also a steam driven drill, D-18, of the same capacity as the D-19. The D-15$\frac{1}{4}$ weighs only 20 lbs. The D-19 weighs 30 lbs. and is therefore easily handled by one man.

### Worked for New York Central 60 Years.

After faithful service of 60 years and three months in the employ of the New York Central & Hudson River Railroad and its predecessors, the New York Central Railroad and the Syracuse & Utica, James FitzGerald, the veteran crossing tender at the Mill street crossing in Rome, has resigned his position. When but 16 years old Mr. FitzGerald entered the employ of the road and he has been in the same service ever since. He first swept out the shops, then he "poisoned" the old wooden ties, then he boiled the old wooden keys in linseed oil, the old wooden rails being in use at the time he entered the service, the road then extending only from Utica to Syracuse. He began work August 1, 1846, and has ever since been on the payroll in various capacities for the last 16 years as tender of the Mill street crossing, at a salary of $36 a month. He will now draw a pension. When Mr. FitzGerald had been in the employ of the company 50 years he was asked if he did not want to retire on a pension, and he declined, saying he wanted to work as long as he could. The other day he was taken with a bad spell occasioned by his heart, which has given him considerable trouble of late, and fainted. He then saw that he could not trust himself any longer safely at his post and he sent in his resignation. Since he has been crossing tender there has not been a fatal accident at his crossing while he was on duty. Mr. FitzGerald is strictly a temperate man and his memory is wonderful. When he went to work for the company John Wilkinson, of Syracuse, was superintendent and Mr. Phelps the master mechanic. FitzGerald was foreman of the Central yard at Oneida 20 years. He was then transferred to Rome as switchman in the East Rome yard, holding that position till he was appointed gate tender, the position he now resigns. He does not use tobacco, nor does he drink tea or coffee.—*Utica Press.*

### Talk About Increased Pay.

On the Boston & Albany passenger and freight conductors and brakemen have had their pay increased from 5 to 10 per cent. The newspapers report increases also in the pay of station and yardmen and telegraph operators, but it does not appear that these classes have been granted any general advance.

The railroads centering in Chicago, after protracted discussions with the officers of the Brotherhoods, have granted a material increase in pay to their yard conductors and brakemen. Press despatches say that the increase is four cents an hour, and that the yard men will demand the same increase at Pittsburg and other large cities. Some of the yard men belong to the Brotherhood of the Railway Trainmen, and these will receive the same increase.

The Delaware, Lackawanna & Western, after long continued negotiations with committeemen of the Locomotive Engineers' Brotherhood, has granted its enginemen an increase of pay. Neither the company nor the enginemen make any clear statement as to what the increase will amount to.

The Erie road has held protracted negotiations with the leaders of its firemen, with the result that "peace" was announced on Wednesday, though the magnitude of the grievances and the degree of success accomplished by the men cannot be understood from any of the statements given out.

The New York Central has agreed with its firemen that the electric locomotives which are to be put in use in New York City this month shall be manned, for the first six months, by an engineman and a "helper." The helpers will be former firemen, and will receive the same pay as firemen. At the end of six months the question of pay for this service will again be taken up. The New, York, New Haven & Hartford will probably make the same arrangement with the men who are to handle the electric locomotives on that road.

The Chicago, Milwaukee & St. Paul has increased the pay of firemen 7$\frac{1}{2}$ per cent., and of yard conductors and brakemen 14 per cent.

Those railroads which have already announced general advances in the wages of employees do not seem to escape the attention of the Brotherhood leaders and the newspaper reporters. On the Philadelphia & Reading and the Delaware, Lackawanna & Western the superintendents are said to be in conference with representatives of the labor unions considering various "serious" situations; but whether there is any seriousness in the matter, except from the newspaper standpoint, seems to be questionable. At Pittsburg the Brotherhoods of Brakemen and Firemen are said to be demanding increases of pay from the Pennsylvania Lines West of Pittsburg. Practically all the employees of these lines have been promised an increase of 10 per cent., but this, it is said, will positively not be accepted by the Brotherhood.

### New Pennsylvania Yards at Hollidaysburg.

The Pennsylvania has completed its improvements at Hollidaysburg and now has a large freight yard with 55 miles of track. In the new yard there is a roundhouse with accommodations for 24 engines, a coal wharf, two 75-ft. turntables, four ash-pits with pneumatic hoists, traveling cranes and shop buildings.

### Sherwin-Williams Annual Convention.

The twenty-sixth annual convention of the members of the sales department of the Sherwin-Williams Company was held recently in Cleveland, Ohio. During the five days of the convention officers of the company gave addresses on methods of selling to different classes of buyers and discussed the paints and varnishes made by the company. The most novel literature distributed at the convention was a book of "Songs of the Paints that Cover the Earth," in which popular songs are cleverly parodied in praise of the products and staff of the company. These conventions are not only thoroughly enjoyable for those that attend them, but are also of great value to both the company and its employees in stirring up enthusiasm and disseminating advice and ideas.

## TRADE CATALOGUES.

*Inter-Pole Motors.*—The Electro-Dynamic Co., New York, sends a pamphlet containing testimonials in regard to inter-pole motors. Circular No. 29 is a reprint of an address on "Direct-Current Motor Design as Influenced by the Use of the Inter-Pole" by C. H. Bedell before the American Institute of Electrical Engineers. Circular No. 23 illustrates and describes four types of the inter-pole motors built by the company.

*Pneumatic Hammers.*—The Dayton Pneumatic Tool Co., Dayton, Ohio, sends a circular illustrating and briefly describing its

"Green" pneumatic hammers. Nine sizes are shown and information given regarding dimensions, work adapted for, weight, blows per minute and air consumption.

*Pneumatic Turntable Mule.*—A 20-page pamphlet of the Pilling Air Engine Co., Detroit, Mich., is devoted to its pneumatic mule for locomotive turntables. Half-tone and line engravings illustrate the device, the method of application is shown and a brief description given.

*Signal Relay.*—A 13-page bulletin of the McClintock Manufacturing Co., St. Paul, Minn., illustrates and describes the McClintock signal relay. It is a mercury-contact relay and its essential features are described and illustrated in detail by half-tones and line drawings.

*High-Pressure Blowers.*—Circular No. 110 of the B. T. Sturtevant Co. describes the use, construction and installation of high-pressure blowers. The pamphlet is well and fully illustrated.

*Tie Handling Tool.*—A cardboard mailing folder, describing the "Q. M. S." or Cafferty tie handling tool, is being distributed by the Quincy, Manchester, Sargent Co., Chicago.

### Manufacturing and Business.

The Solid Steel Tool & Forge Co., Brackenridge, Pa., is adding machinery to double its die sinking capacity.

The Star Brass Manufacturing Co., Boston, Mass., has opened an office at 56 Fifth avenue, Chicago, in charge of H. J. Stow.

The Delaware, Lackawanna & Western has ordered from the Crocker-Wheeler Co. a 300-k.w., 480-volt, three-phase, 60-cycle generator for its Kingsland shops.

The Dayton Pneumatic Tool Co., Dayton, Ohio, is distributing a souvenir pencil holder and pencil with an inscription concerning "Dayton" pneumatic hammers.

J. W. Duntley, President of the Chicago Pneumatic Tool Co., sailed for Europe on November 6 for a five weeks' business trip in England, Scotland, France and Germany.

P. G. Ten Eyck, Treasurer of the Federal Railway Signal Company, has been appointed General Manager and Chief Engineer. Clarence E. Newman, Assistant Treasurer, has been appointed Treasurer and Secretary.

Richard S. Buck has resigned as Consulting Engineer of the New York City Bridge Department, effective December 1. Mr. Buck has been, for the past two months, a member of the firm of Sanderson & Porter, engineers and contractors.

The Kisner Construction Co., of Chicago, was the lowest bidder on both contracts Nos. 25 and 27 of the New York State barge canal work, bids for which were recently opened. The company offered to do the work for $1,754,236 on No. 25 contract and for $972,210 on No. 27 contract.

George A. Berry, until recently Engineer of Company Forces of the New York Central & Hudson River, has been elected Vice-President and General Manager of the Hicks Locomotive & Car Works, with office at Chicago, in charge of the plants and business of the company.

The Ralston Steel Car Company, Columbus, Ohio, is doubling the capacity of its plant. At the present time it is turning out 10 cars a day. By the first of the year it is expected to have an output of 20 cars daily. In addition the plant is turning out 20 to 25 steel underframes a day. Orders booked are sufficient to keep the plant busy for a year.

### Iron and Steel.

The New York, New Haven & Hartford has given an order to Lewis F. Shoemaker & Co., Philadelphia, for 4,000 tons of overhead bridges to be used on its Harlem River branch.

Eastern mills report additional contracts for standard rails aggregating 10,000 tons; the Pittsburg mills have been given contracts by the South & Western for 27,500 tons for 1907 delivery. Seventeen thousand five hundred tons of this is to be furnished by the Carnegie Steel Company and 10,000 tons by the Pennsylvania Steel Company.

The St. Louis Frog & Switch Company has bought 5,000 tons of rails; the Ohio & Southern Traction Company 500 tons, and the California Gas & Electric Line 600 tons. The Louisville & Eastern has given an order to the Lackawanna Steel Company for 5,000 tons, and the Manistee & Northeastern one for 500 tons to the Pennsylvania Steel Co. The United Railways of St. Louis has ordered 500 tons, the Metropolitan Street Railway of Kansas City 1,100 tons, the Indianapolis Union Railway 1,000 tons, and the Terre Haute Traction & Light Company 1,000 tons.

## OBITUARY NOTICES.

John C. Welling, Vice President of the Illinois Central in charge of Accounting and of the Treasury department, died in Chicago on November 9th of bronchitis, after two weeks illness. Mr. Welling was born in New Jersey in 1840, and was educated at Lawrenceville, N. J., and Trenton. He began railroad work in 1866 on the Ironton Railroad in Pennsylvania, later becoming private secretary to the owner of the road. Since 1874 he has been on the Illinois Central. He began as Acting Secretary, and in a few months was appointed Assistant Treasurer. In 1876 he was made Auditor, and in 1883 Comptroller. From 1890 until his death he was Vice-President in charge of the Accounting and Treasury departments, having been elected also a member of the Board of Directors in 1892.

J. C. Welling.

## MEETINGS AND ANNOUNCEMENTS.

(*For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page* 24.)

### Engineer Club of Philadelphia.

At the meeting of this club to be held November 17, a paper will be presented by P. A. Maignen on "Purifying Water."

### Canadian Society of Civil Engineers.

At a meeting of the Electrical Section of this society Nov. 15 a paper on "Polyphase Systems of Generation, Transmission and Distribution" by M. A. Sammett, A. M. Can. Soc. C. E., was read by the author.

### Southern and Southwestern Railway Club.

At a meeting of this club at Atlanta, Ga., November 15, the programme included a paper on "Steel Work Construction" by W. E. Symons; also one on "Car Roofs and Doors" by Messrs. Bowers, Goodyear and Robider.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Illinois Central.*—J. T. Harahan, who was recently elected President, was born in Massachusetts in 1843, and began railroad work in 1864 at Alexandria, Va., on the Orange & Alexandria, now part of the Southern. After working for six years on the Louisville & Nashville and other roads, he was, in 1872, made roadmaster of the Nashville & Decatur, now part of the Louisville & Nashville. In 1879 he was appointed Superintendent of the Memphis line of the Louisville & Nashville, and two years later was transferred to the New Orleans division. In 1883 he was appointed General Superintendent of the lines south of Decatur, Ala., and in 1884 was made General Manager of the entire road. The next year he went to the Baltimore & Ohio as General Superintendent of the Pittsburg division, but after a few months returned to the Louisville & Nashville as Assistant General Manager, being soon promoted to General Manager. In 1888 he went to the Lake Shore & Michigan Southern as Assistant General Manager, going later to the Chesapeake & Ohio as General Manager, and then being made General Manager of

J. T. Harahan.

the Louisville, New Orleans & Texas, now part of the Yazoo & Mississippi Valley. In 1890 he was elected Second Vice-President of the Illinois Central, which position he held until his recent election as President.

J. F. Titus, Local Treasurer at Chicago, has been appointed Assistant to the President, in charge of the Accounting and Treasury departments, succeeding to the duties of J. C. Welling, Vice-President, deceased.

L. W. Fritch has been appointed Assistant to the President, succeeding W. L. Smith, who has been made general agent at Memphis, Tenn., reporting to the President.

*Mexican Central.*—A. A. Robinson, President, has resigned. Eben Richards, Vice-President and General Counsel, has been elected Acting President.

*Mobile & Ohio.*—See Southern Railway in Mississippi.

*Rock Island Company.*—G. T. Boggs, Assistant Treasurer, has been elected Vice-President, Secretary and Treasurer. J. J. Quinlan, Vice-President, has been elected also Assistant Secretary and Assistant Treasurer.

*Southern.*—See Southern Railway in Mississippi.

*Southern Railway in Mississippi.*—E. L. Russell, Vice-President and General Counsel of the Mobile & Ohio, has been elected also Vice-President of the Southern Railway in Mississippi, which is the name under which the Southern Railway's line from the Alabama state line to Greenville, Miss., 179 miles long, including two branches, is hereafter to be operated. The authority of A. H. Plant, Comptroller of the Southern; H. C. Ansley, Treasurer of the Southern, and W. S. Cooke, Auditor of the Mobile & Ohio, has been extended over the Southern Railway in Mississippi. Henry Tacon, Secretary and Treasurer of the Mobile & Ohio, has been also appointed Assistant Treasurer of the Southern Railway in Mississippi, and the jurisdiction of the heads of other departments of the Mobile & Ohio has been extended over the Southern Railway in Mississippi.

*Seaboard Air Line.*—A. R. Duval and Y. Vandenburg, both of New York, have been elected Directors, succeeding J. M. Barr and J. B. Dennis.

### Operating Officers.

*Chicago, Indianapolis & Louisville.*—J. B. Sucese, trainmaster at Lafayette, Ind., has been appointed General Superintendent, succeeding G. K. Lowell, resigned.

*St. Louis & San Francisco.*—A. J. Sams, trainmaster at Fort Scott, Kan., has been appointed Superintendent at Birmingham, Ala., of the new division extending from Birmingham, Ala., to Memphis, Tenn., heretofore a part of the Southern division.

*Vandalia.*—F. H. Worthington, Superintendent at Decatur, Ill., has been appointed Superintendent at Logansport, Ind., succeeding I. W. Geer, transferred. F. L. Campbell, trainmaster at Terre Haute, Ind., succeeds Mr. Worthington.

*Wheeling & Lake Erie.*—C. V. Wood, Superintendent of the Cleveland division, has been appointed Superintendent of the Toledo and Pittsburg divisions, with office at Canton, Ohio, succeeding C. A. Van Dusen, resigned to go into other business. C. W. Coe, Assistant Superintendent at Canton, Ohio, succeeds Mr. Wood, with office at that place.

A. P. Titus, Car Accountant, has been appointed Superintendent of Car Service and his former title has been abolished.

### Traffic Officers.

*Chicago, Peoria & St. Louis.*—Charles W. Galligan, who was recently appointed Assistant General Freight Agent, in sole charge of the freight department, was born in Illinois in 1868. After a High School education he began railroad work in 1886 in the local freight office at Cairo, Ill., of the Cairo, Vincennes & Chicago, now the Cairo division of the Cleveland, Cincinnati, Chicago & St. Louis. He was appointed chief clerk to the General Freight Agent of this road in 1890, and after its consolidation with the Big Four was made chief clerk to the Assistant General Freight Agent. In 1891 he was transferred to St. Louis, and two years later was made contracting agent of the Cleveland, Cincinnati, Chicago & St. Louis. In 1895 he was appointed Assistant General Freight Agent of the St. Louis, Chicago & St. Paul, and was appointed General Freight Agent of that road in 1897; when it was consolidated with the Chicago, Peoria & St. Louis, in 1898, he was made Assistant General Freight Agent of both companies. Since 1902 he has been chief clerk of the Chicago, Peoria & St. Louis.

*Wisconsin & Michigan.*—The office of J. C. Fitzgerald, General Freight and Passenger Agent, has been removed from Menominee, Mich., to Chicago, Ill.

### Engineering and Rolling Stock Officers.

*Cincinnati, Hamilton & Dayton.*—R. D. Fidler, foreman of the Chicago, Indianapolis & Louisville roundhouse at Lafayette, Ind., has been appointed Assistant Master Mechanic of the C., H. & D. at Indianapolis, Ind.

*Cleveland, Cincinnati, Chicago & St. Louis.*—W. B. McLoughlin has been appointed Division Engineer, with office at Evansville, Ind., in charge of the construction of the Evansville, Mt. Carmel & Northern, which is to be built from Evansville northwesterly 35 miles to a connection with the C., C., C. & St. L. at Mt. Carmel, Ill.

*Detroit, Toledo & Ironton.*—A. J. Ball, Master Mechanic of the Toledo Railway & Terminal, has been appointed Master Mechanic of the D., T. & I. at Springfield, Ohio.

*Oregon Short Line.*—H. E. Roberts has been appointed Division Engineer at Pocatello, Idaho, succeeding R. B. Ketchum, resigned.

*Toledo Railway & Terminal.*—C. L. Acker, roundhouse foreman of the Baldwin Locomotive Works, has been appointed Master Mechanic of the Toledo Railway & Terminal, with office at Toledo, Ohio, succeeding A. J. Ball. See Detroit, Toledo & Ironton.

## LOCOMOTIVE BUILDING.

*The Gould Lines*, it is reported, are about to order a large number of locomotives.

*The Guayaquil & Quito*, Broad Exchange Building, New York, will shortly be in the market for several locomotives.

*The United States Reclamation Service* has ordered from the American Locomotive Co. four simple locomotives with 10 x 16-in. cylinders.

*The Pennsylvania*, as reported in our issue of November 9th, has ordered from its Juniata shops 25 consolidation (2-8-0) type locomotives. These locomotives will weigh 225,000 lbs., and will have 3,850 sq. ft. total heating surface, cylinders 24 x 28 in., and drivers 62 in. in diameter.

*The Buffalo, Rochester & Pittsburg* has ordered from the American Locomotive Co., for July, 1907, delivery, six simple decapod (2-10-0) locomotives. These engines will weigh 275,000 lbs., with cylinders 24 in. x 28 in., Walschaert valve gear, drivers 52 in. in diameter, radial stayed boiler, tank capacity 9,000 gallons, and coal capacity 14 tons.

## CAR BUILDING.

*The Pere Marquette* has ordered 1,500 coal cars for June, 1907, delivery.

*The Seattle Electric Company* has ordered eight 34-ft. flat cars from the Hicks Locomotive & Car Works.

*Swift & Co.* are building 200 34-ft. refrigerator cars at their own shops for March to June, 1907, delivery.

*The Des Moines, Iowa Falls & Northern* has ordered three Hart convertible Rodger ballast cars of 80,000 lbs. capacity.

*The Vandalia* has ordered 25 Hart convertible Rodger ballast cars of 100,000 lbs. capacity for March, 1907, delivery.

*The Keweenaw Central* has ordered 10 gondola cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The New York, New Haven & Hartford* has ordered 500 refrigerator cars from the American Car & Foundry Company.

*The Las Vegas & Tonopah* has ordered three chair and three combination cars from the Pullman Co., for March, 1907, delivery.

*The Intercolonial* has ordered three motor cars for delivery next spring and will order seven more when these three have been built.

*The Richmond, Fredericksburg & Potomac* has ordered from the Rodger Ballast Car Co. 20 Hart convertible cars of 80,000 lbs. capacity.

*The Forest City Railway*, Cleveland, Ohio, has ordered four 40-ft. flat cars from the Hicks Locomotive & Car Works, to be used in construction work on their road.

*The Chicago, Rock Island & Pacific* has ordered a number of passenger coaches, chair cars, dining cars and observation cars from the Pullman Company for 1907 delivery.

*The Chicago & Illinois Midland* has ordered 240 36-ft. gondola cars of 80,000 lbs. capacity from the Hicks Locomotive & Car Works. The special equipment includes Simplex bolsters.

*The Quebec, Montreal & Southern* has ordered 1,500 steel underframe box and stock cars of 60,000 lbs. capacity from the Canada Car Company for delivery beginning February 1, 1907.

*The Central of New Jersey* is asking bids on a number of com-

posite steel passenger cars, and is building at its Elizabethport, N. J., shops five baggage cars and one air-brake inspection car.

*The Wabash*, as reported in our issue of November 9, is in the market for 4,000 steel hopper cars of 100,000 lbs. capacity, and 3,000 wooden box cars of 80,000 lbs. capacity. The hopper cars will weigh 38,600 lbs. and measure 31 ft. 6 in. long, 10 ft. wide and 10 ft. 3 in. high, over all. The box cars will be 41 ft. ¾ in. long, 9 ft. 11¼ in. wide, and 14 ft. 5 in. high, over all.

*The Toledo & Ohio Central* has ordered 100 steel flat cars of 80,000 lbs. capacity from the Pressed Steel Car Co., for July, 1907, delivery. The special equipment includes:

| | |
|---|---|
| Bolsters | Body Pressed Steel Car Co.'s Truck Simplex |
| Brake-beams | Simplex |
| Couplers | Tower |
| Draft rigging | Miner |
| Wheels | American |
| Journal boxes | McCord |

*The Minneapolis, St. Paul & Sault Ste. Marie* has ordered 19 second class coaches, eight tourist sleeping cars, eight first class sleeping cars, four first class coaches, two dining cars, two baggage cars, eleven 70-ft. combination mail and baggage cars and four compartment observation cars, as reported in our issue of October 26, and also three combination passenger and baggage cars, one combination buffet and baggage car and one mail car from Barney & Smith. The second class coaches will weigh 77,500 lbs. and measure 54 ft. 9 in. long, over sills. The tourist sleeping cars will weigh 111,000 lbs. and measure 70 ft. long, over sills. The first class sleeping cars will weigh 120,000 lbs., and measure 73 ft. long, over sills. The first class coaches will weigh 102,000 lbs., and measure 64 ft. 6 in. long, over sills. The dining cars will weigh 117,500 lbs. and measure 70 ft. long, over sills. The baggage cars will weigh 95,000 lbs. and measure 70 ft. long, over sills. The special equipment for all cars giving the weight includes:

| | |
|---|---|
| Brake-beam | Simplex |
| Brake-shoes | Walsh |
| Brakes | Westinghouse |
| Brasses | National-Fulton |
| Couplers | Washburn |
| Heating system | Gold duplex |
| Journal boxes | McCord |

## RAILROAD STRUCTURES.

Atlanta, Ga.—The Atlanta, Birmingham & Atlantic, according to local reports, will shortly start work on large passenger terminals here.

Calgary, Alb.—The City Engineer has prepared plans for a bridge to be built across the Bow River. It will consist of five spans with a total length of 625 ft. and 18-ft. roadway, with passenger walks on each side. Address Alderman Jones.

Knoxville, Tenn.—A contract has been given by the Southern Railway to Borches, Warhrep & Co., of Knoxville, at about $200,000 for building additions to its Coster shops. Work is to be started at once.

Miami, Fla.—The Florida East Coast is planning to put up a new machine shop here.

Minneapolis, Minn.—The Minneapolis, St. Paul & Sault Ste. Marie is planning to put up at Shoreham a new boiler shop 118 ft. x 206 ft., also a locomotive roundhouse to cost about $70,000.

St. George, N. B.—The Public Works Department at Ottawa is preparing plans for a steel bridge to be built over the Magaguadavic River here. Fred. Gelinas is Secretary of the department.

Salt Lake City, Utah.—The Southern Pacific will soon decide upon the plans for the proposed passenger station to be built at the foot of South Temple street, near Third.

San Francisco, Cal.—Plans are being considered for a one-story steel freight shed, covering a large area, to replace the wooden shed recently destroyed by the fire at Fifth and Townsend streets.

Sidney Mines, N. S.—The Intercolonial will build a new passenger station here.

Virden, Man.—The Canadian Northern has bought a site here for a new passenger station.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—President E. P. Ripley, of this company, is quoted as saying that the first construction work to be done on the three new lines the company is planning to build in Oklahoma will be on a line 40 or 50 miles long running east from Woodward. Work will also be started on the line northwest from Oklahoma City next year. A contract is reported let to A. H. Moore, of Newton, Kan., for work on the Seiling Line, which will connect with the main line at Alston and run southeast through Moscow Mutual and Richmond to Seiling.

Atlanta & Carolina (Electric).—This company has applied to the City Council of Atlanta, Ga., for a franchise to use certain streets in Atlanta on its proposed electric line to be built from Commerce southwest to West Point. (Sept. 21, p. 75.)

Austin & Goldfield.—A new railroad from Austin, Nev., to Tonopah and Goldfield, via Manhattan, is being promoted, it is said, by the Philadelphia capitalists who backed the original Tonopah-Goldfield road. A connection with the Battle Mountain line is contemplated.

Baltimore & Ohio.—An officer writes that plans for the proposed freight line around Baltimore, Md., to be known as the Patapsco & Susquehanna branch, are held in abeyance awaiting a court decision in connection with the petition filed by a property owner along the route. The proposed route is from Gorsuch station in Carroll County, through Carroll and Baltimore counties, to the Western Maryland, east of Pikesville; thence under the Reisterstown turnpike by means of a tunnel; thence crossing the Northern Central near Rider station, passing north of Towsontown to a crossing of the Maryland & Pennsylvania near Oakleigh; thence to a connection with the Philadelphia division east of Baltimore at or near Sewall. The line will be about 40 miles long. Most of the grades will be $^3/_{10}$ per cent. and the maximum $^5/_{10}$ per cent. (Nov. 2, p. 122.)

Berkeley Traction.—Incorporated in California, with $200,000 capital. The project is understood to be controlled by the Oakland Traction Consolidated, of Oakland, which is allied to the San Francisco, Oakland & San Jose Railway. Extensions north from Berkeley, Cal., are projected by these interests. The incorporators include Louis Titus, Walter H. Leimert, Duncan McDuffie, P. T. Tompkins and C. C. Young.

Billings & Northern.—See Great Northern.

Brandon, Saskatchewan & Hudson's Bay.—See Great Northern.

Canadian Northern.—Surveyors are at work running lines for a branch from Neepawa to Shoal Lake which will eventually be extended to Saskatoon, Sask.

Chicago, Milwaukee & St. Paul.—A contract is reported let by this company to Nelson Bennett, of Spokane, to construct a tunnel 8,750 ft. long through the Bitter Root mountain range, between the states of Montana and Idaho. In addition to this work Mr. Bennett has contracts for grading in Montana and Idaho, both east and west of the tunnel. This grading will average 100,000 cubic yards to the mile, nearly all of which is solid rock. On this stretch of roadway are a number of shorter tunnels and some heavy trestle work. Work is to begin shortly.

Cincinnati, Bluffton & Chicago.—Surveys are being made for extending this road from Bluffton, Ind., northwest to Huntington, 23 miles. As soon as the surveys are completed contracts for the work will be let.

Crystal River & San Juan.—Incorporated in Colorado with $100,000 capital to build a line 15 miles long from Placita, the present terminus of the Crystal River Railroad, to marble quarries at Marble, in Gunnison county. The project is backed by eastern capital, and work has been begun. The incorporators include Channing F. Meek, Samuel I. Heyn, Secretary of the Victor Fuel Company, Tandy A. Hughes, George H. Hill, Branch H. Giles, Walter F. Schuyler and Henry P. Lowe.

Dakota & Great Northern.—See Great Northern.

Dawson, El Paso & Southwestern.—Incorporated in New Mexico, by the Phelps-Dodge Co., to build a line from the coal camp of that firm at Dawson, N. Mex., south to Corona, on the El Paso & Southwestern. The line has been surveyed to Las Vegas and work is to begin in the spring.

Delaware & Hudson.—Under the name of the Quebec, Montreal & Southern, the holding company for D. & H. lines in Canada, this company proposes to build a line to Quebec. A contract has been given to O'Brien & Mullarkey for building the section from Pierreville, Que., to St. Philomene, 48½ miles, at which place the line will cross the Lotbiniere & Megantic.

Detroit & Mackinac.—Announcement is made by this company that it will build a branch from Alpena, Mich., west towards Boyne City. Preliminary surveys will begin soon. The new line may connect with the Boyne City, Gaylord & Alpena, now in operation as far as Gaylord.

Falmouth.—An officer writes that this company, which was recently incorporated in Virginia to build 25 miles of road, is undecided as to its route, difficulties having been encountered in securing the right of way. Still, it is expected to let contracts for the work within 30 days. There are to be two steel bridges. (Nov. 2, p. 123.)

Farmer's Grain & Shipping Co.—See Great Northern.

GREAT NORTHERN.—This company's report for the year ended June 30, 1906, shows that the work under way at the close of the previous report which has since been completed, brief mention of which was made in our issue of November 2d, includes the Dakota & Great Northern, from York to Thorne, N. Dak., 34.68 miles; Towner to Maxbass, N. Dak., 12.76 miles; West Hope to Antler, 12.76 miles; Munich to Sarles, 23.53 miles; Allendale to Forbes, 13.36 miles; St. Johns to the International boundary, 3.88 miles. The Washington & Great Northern, from Curlew, Wash., to Ferry, on the International boundary, 14.52 miles, is now in operation. Grading is nearly completed and track laying was commenced last June on the line being built by the Washington & Great Northern and the Vancouver, Victoria & Eastern from Midway to Keremos. The extension of the Farmers Grain & Shipping Co., from Starkweather to Hansboro, N. Dak., was completed in October of last year. The Minneapolis & Great Northern Company's extension from Greenbush to Warrold, Minn., 44 miles, is graded, but track will not be laid this year. The Eastern Railway of Minnesota, in addition to many side tracks, has built several mining branches ranging from one to three miles long. The work now under construction on Great Northern lines includes the Dakota & Great Northern from Aneta to Devil's Lake, N. Dak., 58.60 miles, which is to be completed during the present month to shorten the main line between St. Paul and the west. This line is being laid with 85-lb. rails and will help to relieve the congestion of traffic on the present line between Devil's Lake and Grand Forks. It is expected to complete the line from Barthold to Crosby, 89 miles, about the first of next month. The line from Thorne to Dunseith, seven miles, has been opened for traffic. On the Billings & Northern grading was commenced last June from Armington to Laurel, Mont., 199.29 miles. The new line is to form a connection between the Great Northern and the Montana Central on the north and the Northern Pacific and the Burlington roads on the south, as well as open up a new section in central Montana. The Brandon, Saskatchewan & Hudson's Bay, being built from a connection at the International boundary, with the Dakota & Great Northern Company's extension from St. Johns, N. Dak., to Brandon, Man., 69.45 miles, has just been completed. The Midland of Manitoba from Neche, N. Dak., to Portage la Prairie, Man., 77.01 miles, will be opened this month. Surveys for several other new lines have been made during the year, and work on them is now in progress. During the year the company completed a passenger station at Seattle, Wash., which, with the tunnel under the city, is used jointly with the Northern Pacific. The company also built 13,113 ft. of stone sea wall along Puget Sound between Everett and Ballard. At Sioux Falls, S. Dak., a brick passenger station has been put up. A track 1.23 miles long has been built at Fargo, N. Dak., connecting the Great Northern and the Northern Pacific, and many other passing and yard tracks have been put in or extended during the year. The company is also building a new main line, 4.52 miles long, between Grand Forks Junction and Schuermeier, N. Dak., to connect the line at Neche with the new freight terminal at Grand Forks.

It is reported in Spokane that this company will soon begin improvements on its line in Montana to cost about $8,000,000. The plans contemplate the change of over 100 miles of the main line, beginning at Cut Bank, on the east side of the Rocky Mountains and ending at Belton, on the west side. The distance by the present line between these two points is 105 miles, and the proposed line is to be 17 miles shorter. The new survey includes a tunnel a mile long through the mountains.

Contracts are reported let by this company to Ironsides, Rannie & Campbell and the British Columbia General Contract Co., both of Vancouver, B. C., for the construction of 50 miles of the line from New Westminster, B. C., to Blaine, Wash., via Cloverdale.

ILLINOIS CENTRAL.—It is reported that this road is planning to build an extension to Minneapolis, Minn., and possibly to the Lake Superior region and the copper country.

ILWACO RAILWAY & NAVIGATION.—See Oregon Railroad & Navigation Co.

KLONDYKE MINES.—Bloomfield Smith, representative of this company at Dawson City, has received instructions to at once make arrangements for a 55-mile extension from Sulphur Springs, to be built as soon as possible in the spring. It is believed to be the intention of this company to build a direct line between Dawson City and Edmonton, Alberta.

LAKE CHARLES NORTHERN.—Incorporated by Southern Pacific interests in Louisiana to build a line from a point at or near Lake Charles, La., north to De Ridder, in the parish of Calcasieu, about 50 miles. G. W. Nott is President; J. A. Bell, Vice-President, and G. G. Moore, Secretary and Treasurer.

LAKE SHORE SOUTHERN.—According to reports from Marquette, Mich., a mortgage of $12,000,000 has been given by this company to the Knickerbocker Trust Company, of New York, to secure bonds which it is proposed to sell to build a new line between Madison, Wis., and Huron Bay, Lake Superior, 200 miles. At Madison the new line will connect with the northern terminus of the Illinois Central.

LONG ISLAND.—Work is being pushed by this company on a new short cut route between Jamaica and Far Rockaway, and it is expected that the road will be finished about June 1 of next year. The new road starts at the sub-power station at Springfield, on the South Side division, and runs in a direct line to Cedarhurst, where it joins the Rockaway division. It is seven miles long.

MADRAS & EASTERN.—A company under this name is reported as having completed surveys from Madras, Ore., east for 30 miles. The company proposes to build a line from Madras east to Ontario, on the Oregon Short Line, about 225 miles. W. H. Houston, of Prineville, Ore., is President.

MEXICAN ROADS.—A line about 60 miles long is to be built in the Sierra Madres of western Mexico by Col. W. C. Greene and associates. It will run from Temosachic, state of Chihuahua, to the timber lands of the Sierra Madre Land & Lumber Co. Col. Greene is also at the head of the lumber company. The construction of the railroad will be paid for by an issue of $3,000,000 bonds on the lands and other property of the lumber company. These timber lands aggregate more than three million acres. The new railroad will connect with the Chihuahua & Pacific at Temosachic.

MIDLAND OF MANITOBA.—See Great Northern.

MINNEAPOLIS & GREAT NORTHERN.—See Great Northern.

MISSISSIPPI ROADS.—W. Denny & Co. write that they have completed 19 miles of the line that they are building from Moss Point, Miss., north 40 miles through Jackson County to Donavan, on the M. J. & K. C. The steel bridge over Dog river has been completed and is now in use. (Nov. 2, p. 123.)

MISSOURI, KANSAS & TEXAS.—Surveys have been made by this company for a line from its Shreveport division at Waskom, Tex., south to Port Arthur, about 180 miles. The proposed new line will give the M., K. & T. a direct additional outlet to a Texas port.

MISSOURI PACIFIC.—It is said that the Weatherford, Mineral Wells & Northwestern road, which runs from Weatherford, Texas, west to Mineral Wells, is to be extended west 25 miles, connecting with the Texas & Pacific. This road was bought about two years ago by the Goulds to form part of a new line to Trinidad, Colo. The plans include the extension of the line northwest from Mineral Wells to Trinidad, about 600 miles. Final surveys for the first 150 miles from Mineral Wells have been completed, and grading contracts will soon be let.

NEW ORLEANS GREAT NORTHERN.—Announcement is made that construction work on the Jackson end of this road will begin immediately. The southern end of the line has been completed from Slidell, La., north to the Mississippi state line, 51 miles. The completion of the north end to Monticello would leave a gap of only about 40 miles between Monticello and the state line. The company hopes to be able to fill this gap without serious delay, although injunction suits are pending against it in the courts of Marion County. Routes for branch lines are under survey. (Nov. 2, p. 123.)

OREGON & WASHINGTON.—See Union Pacific.

OREGON RAILROAD & NAVIGATION CO.—A contract has been let to Erickson & Peterson for extending the Ilwaco Railway & Navigation Company's line from the present southern terminus at Ilwaco, Wash., east 13½ miles to a point a short distance west of Knappton. The extension will cost approximately $280,000. Work will be started at once, the plan being to complete the work not later than next spring.

QUEBEC, MONTREAL & SOUTHERN.—See Delaware & Hudson.

ROCHESTER, SYRACUSE & EASTERN (ELECTRIC).—This road, which was opened last spring from Rochester, N. Y., east to Lyons, 37 miles, is projected to Syracuse, a total distance of 87 miles. The company is controlled mainly by Syracuse capitalists, of which Lyman C. Smith is President. It will cost $6,000,000 to complete the road. Much of the road bed traverses private right of way and is of substantial construction. The power house equipment includes Westinghouse-Parsons steam turbines and Westinghouse turbo-generators. The cars weigh approximately 50 tons. They are 54 ft. long and 8½ ft. wide. Each car is equipped with four 125-h.p. Westinghouse motors, Westinghouse multiple unit control and air-brakes. The company will run express trains 50 to 60 miles an hour. It is expected that the entire road from Rochester to Syracuse will be completed and in full operation by January 1, 1908.

SAGINAW, OWOSSO & LANSING (ELECTRIC).—According to J. A. Thick, of Detroit, who is promoting this road, a company under this name will be incorporated in Michigan with $1,500,000 capital to build an electric line from Lansing, Mich., northeast to Saginaw. Rights of way have already been secured. A contract has been made with the Saginaw Valley Traction Co. to enter Saginaw over the tracks of that company, and negotiations are pending with the

Michigan United Railway Co. to enter Lansing over the Pine Lake road.

Southern.—Plans are being made by this company to double track and straighten the line between Atlanta and Gainesville, 53 miles.

Swan Creek.—Incorporated in Tennessee with $50,000 capital by J. H. Ellis, W. H. Northcutt, W. H. Bruce, E. W. Hines and J. B. Keeble. The company proposes to build a line from a connection with the Nashville, Florence & Sheffield division of the Louisville & Nashville near Mt. Pleasant through Maury County to Weatherly, in Hickman County, approximately 17 miles.

Union Pacific.—The survey of the route for the Oregon & Washington from the Columbia River to Tacoma will soon be completed and the route will be announced some time this month. (Sept. 21, p. 75.)

Vancouver, Victoria & Eastern.—See Great Northern.

Washington & Great Northern.—See Great Northern.

Weatherford, Mineral Wells & Northwestern.—See Missouri Pacific.

West Chester Street Railway.—The line of this company has been completed from West Chester, Pa., to Coatesville, completing a through line from 63d and Market streets, Philadelphia, to First avenue and Main street, Coatesville.

## RAILROAD CORPORATION NEWS.

Alabama, Tennessee & Northern.—This is the new name of the Carrollton Short Line, which runs from a junction with the Mobile & Ohio at Reform, Ala., to Aliceville, 21 miles.

Boston & Maine.—Gross earnings for the three months ended September 30, 1906, were $11,219,155, an increase of $769,568; net earnings $3,353,434, an increase of $69,513.

Carrollton Short Line.—See Alabama, Tennessee & Northern.

Georgia Southern & Florida.—Gross earnings for the year ended June 30, 1906, of this company, which is a subsidiary of the Southern and owns 392 miles of road between Macon, Ga., and Palatka, Fla., and between Valdosta, Ga., and Grand Crossing, Fla., were $1,944,946, an increase of $230,244; net earnings, after taxes, $425,286, an increase of $22,969. The net income was $160,159, an increase of $24,482. Regular dividends of 5 per cent. on the $684,000 first preferred stock, and 4 per cent. on the $1,084,000 second preferred stock were paid, leaving a surplus for the year of $82,599, an increase of $24,482.

Illinois Central.—Gross earnings for the three months ended September 30, 1906, were $13,495,940, an increase of $1,751,049; net earnings, after taxes, $3,711,102, an increase of $629,379. During the corresponding period in 1905, the Illinois Central, like most southern roads, suffered heavily from the yellow fever embargo at New Orleans.

Interborough Rapid Transit.—The Appellate Division of the New York State Supreme Court has ruled in a suit for damages brought against the Manhattan Elevated, a subsidiary of the Interborough, that an action begun by a tenant does not prevent that suit being outlawed as to the landlord. The suit in question was for damages done the plaintiff by the operation of the Manhattan Elevated beginning in 1880, and suit was not entered by the owner of the property until 1901, although the tenant of the property had brought suit earlier. This decision, it is said, will affect several hundred claims against the Interborough, so that the company will get a favorable decision in cases aggregating $1,000,000 in claims for damages.

Kansas City, Fort Scott & Memphis.—Blair & Co., New York, are offering, at 82 and interest, a block of the $19,143,000 outstanding 4 per cent. refunding mortgage bonds of 1936 of this company, guaranteed principal and interest by the St. Louis & San Francisco, which leases the road. These bonds are secured by a mortgage on 1,200 miles of main line and branches between Kansas City, Mo., and Birmingham, Ala. These bonds will become a first lien on this property as soon as the divisional mortgage bonds are refunded. Of the $60,000,000 authorized, $30,376,770 are reserved for refunding, $2,032,500 reserved to provide for improvements not exceeding $600,000 per year, and the remainder is issuable for additional lines and extensions at the rate of $22,500 per mile.

Kansas City, Mexico & Orient.—The Mexican Government has paid to this company $500,000 subsidy on 62 miles of road completed from Minaca, State of Chihuahua, west.

New York Central & Hudson River.—See Rutland Railroad.

New York Central Lines.—Gross earnings for October were as follows:

| | October, 1906. | —Inc. or dec.— | |
|---|---|---|---|
| New York Central & Hudson River | $8,592,458 | Inc., | $454,082 |
| Lake Shore & Michigan Southern | 3,761,685 | Inc., | 357,634 |
| Lake Erie & Western | 450,793 | Dec., | 21,900 |
| Chicago, Indiana & Southern | 211,900 | Inc., | 21,219 |
| Michigan Central | 2,421,325 | Inc., | 174,578 |
| Cleve., Cin., Chicago & St. Louis | 2,270,095 | Inc., | 202,413 |
| Peoria & Eastern | 282,641 | Dec., | 11,795 |
| Cincinnati Northern | 81,731 | Inc., | 5,550 |
| Pittsburg & Lake Erie | 1,272,168 | Inc., | 97,328 |
| Rutland | 266,797 | Inc., | 14,083 |
| New York, Chicago & St. Louis | 848,609 | Inc., | 5,482 |
| Total | $20,462,882 | Inc., | $1,298,674 |

Northern Pacific.—Estimated gross earnings for the month of October, 1906, of the lines owned, were $6,896,422, an increase of $728,223.

Oregon Short Line.—It is reported that the Harriman interests have bought a majority of the $2,062,500 outstanding common stock of the Utah Light & Railway Company, which owns and operates 88 miles of track in Salt Lake City, and also controls the electric lighting of the city.

Pennsylvania.—There were outstanding, on November 10, as listed on the Philadelphia Stock Exchange, $99,626,000 convertible 3½ per cent. bonds of 1915, and $305,991,000 capital stock.

Pullman Company.—At the annual meeting on November 14th, the stockholders approved the following plan for the distribution of the surplus: The outstanding capital stock is to be increased from $74,000,000 to $100,000,000, and the new stock, as well as $640,000 treasury stock, will be divided among the present shareholders at the rate of 36 shares for every 100 shares already held. The regular dividend of 8 per cent. annually to be continued. The surplus on hand July 31, 1906, was $27,122,020, or 31 per cent. of the present capital stock. Quarterly dividends of 2 per cent. have been paid since November, 1899. The Directors decided to spend $1,000,000 for a steel car plant.

Rio Grande, Sierra Madre & Pacific.—See Rock Island Company.

Rock Island Company.—It is reported that interests identified with this company have bought the Rio Grande, Sierra Madre & Pacific, which runs from El Paso, Tex., to Terrazas, Mex., 136 miles. W. C. Greene, President of the Greene Consolidated Copper Company, is President of the R. G., S. M. & P. and, with associates, controls it.

Rutland Railroad.—The minority holders of the $9,057,600 outstanding preferred stock of this company have issued a circular describing their attempt to get a distribution of the accumulated dividends on their stock at the recent annual meeting. They asked that common stock to the extent of 25 per cent. of the accumulated dividends, which are said to aggregate 160 per cent. on the preferred stock, only 1½ per cent. having been paid so far in 1906, nothing in 1905 and 1904, and varying amounts previously, should be issued to the preferred stockholders, and that the preferred stock should hereafter be non-cumulative, the dividend rate to be reduced from 7 per cent. to 5 per cent. yearly, but that the New York Central & Hudson River, which controls the road, should guarantee this dividend. No action was taken on this proposal. The preferred stockholders contend that the surplus is being put into unnecessary betterments.

St. Louis & San Francisco.—See Kansas City, Fort Scott & Memphis.

Southern.—See Southern Railway in Mississippi.

Southern Pacific.—Gross earnings for the three months ended September 30, 1906, were $28,671,715, an increase of $3,008,936; net earnings, after taxes, $10,707,781, an increase of $1,942,542.

Southern Railway in Mississippi.—This is the operating company for the Southern Railway's line from the Alabama state line to Greenville, Miss., 179 miles including two branches. See Elections and Appointments column.

Toledo, St. Louis & Western.—Gross earnings for the year ended June 30, 1906, were $4,205,051, an increase of $419,887; net earnings $1,063,433, an increase of $257,978, the operating ratio having fallen from 78.7 to 74.7. The surplus after charges was $472,323, an increase of $299,712. The company has outstanding $10,000,000 common stock and $10,000,000 4 per cent. non-cumulative preferred stock on which dividends are not paid.

Union Pacific.—Gross earnings of this company, including the Oregon Short Line and the Oregon Railroad & Navigation Company, for the three months ended September 30, 1906, were $18,913,650, an increase of $1,489,693; net earnings, after taxes, $9,206,111, an increase of $824,370.

Utah Light & Railway Company.—See Oregon Short Line.

# GENERAL NEWS SECTION

## NOTES.

The National Express Company has increased the wages of its employees 10 per cent.

The Boston Elevated Railway has increased the wages of its employees, beginning January 1, an average of 10 cents a day.

The Cumberland Valley Railroad has increased the pay of its employees 10 per cent., the change to take effect December 1st.

The National Tube Works Company, of Pittsburg, has received an order for 430 miles of 8-in. iron pipe to be used for an oil pipe line to connect the oil fields of Indian Territory with Port Arthur, Tex.

It is reported that the Union Pacific will not comply with the ruling of the Interstate Commerce Commission that party rates for theatrical companies must be no lower than similar rates open to all.

Telegraph operators on the main line of the Union Pacific now receive 10 per cent. commission on the commercial (Western Union) telegraph business that they handle, limited to a maximum of $15 per month.

The New York City Railway, operating the street surface cars in Manhattan, announces to its employees that all its cars are to be equipped with vestibules, for the protection of the motormen from cold in the winter.

A press despatch from Boston says that the members of the Boston Transit Commission have been arraigned in court and required to furnish bail in $50 each for the crime of having printing done at a shop where the employees worked more than eight hours a day.

On the night of November 18 two trespassers (who have not been found) took a locomotive out of the engine house of the New York, New Haven & Hartford at Hopewell Junction, N. Y., and ran it, unlighted, 10 miles to Fishkill Landing. They arrived in safety and then left the engine and escaped.

The General Freight Agent of the Seaboard Air Line is distributing a list of cotton mills whose shipping points are on the lines of this road. The list gives the name of the officer to correspond with, the shipping point, postoffice address, class of goods manufactured, number of looms, number of spindles, and kind of power used.

The Great Northern has issued a new freight tariff for most or all of its lines in Minnesota, and extending also into Wisconsin, North and South Dakota and Nebraska. In most of the rates there has been a reduction. From Duluth to Sioux City, the reduction (first class) is three cents, making these rates that much lower than the rates from Chicago to Sioux City.

On Saturday and Sunday last an extensive rain storm did much damage in Tennessee, Mississippi and Arkansas. In the region of Jackson, Tenn., the Nashville, Chattanooga & St. Louis, the Mobile & Ohio, the Southern, and the Illinois Central were unable to run trains for two days. Tracks were washed out for long stretches, bridges are down, and in some places the water stood over the tracks for miles.

The New York State Railroad Commission, reporting on an investigation of street railroad conditions in Brooklyn, recommends the construction of an elevated road in Manhattan to connect the Williamsburg and the Brooklyn bridges (to facilitate street car traffic between Brooklyn and New York), and also recommends the construction of a third main track throughout the length of the Second Avenue and Third Avenue elevated railroads in Manhattan.

During the month of October, 1,393,423 bushels of wheat and 678,903 bushels of corn were shipped from New Orleans. These figures compare with 184,000 bushels and 162,857 bushels, respectively, shipped during the same period of 1905. During the two months ended October 31 there were shipped 2,597,423 bushels of wheat, an increase of 2,301,423 bushels; 713,188 bushels of corn, an increase of 497,008 bushels, and 30,000 bushels of oats, a decrease of 120,224 bushels.

W. J. Lynch, Passenger Traffic Manager of the western lines of the New York Central, in answering the irresponsible assertion that the railroad companies could afford to reduce fares because of the reduction which has been made in the number of passes issued, says that 90 per cent. of the free passes represent travel that would not exist without the passes. Mr. Lynch says that the density of passenger traffic is much heavier in Indiana than in Ohio. He says that the prevailing passenger rate in Illinois is 3 cents a mile; in Indiana, 2½ cents; in Ohio, 2 cents, and in Michigan, 2 cents, 2½ cents and 3 cents.

Chicago newspapers report that the railroads of the northwest and southwest which have been giving passes freely to immigration promoters will withdraw this privilege at the end of this year, and that it will affect thousands of men. The railroads will give regular employment to a few of the most successful of these men. It is also reported from Chicago that the cutting off of passes which has been made or soon will be made on account of the revision of the Interstate Commerce law, will be applied in the same way by the western roads to intrastate traffic; in other words, the whole business of free transportation will be regulated according to the terms of the federal law.

The Interstate Commerce Commission has declined to require railroads to report all cases of false classification of freight. This decision was made on an application of a soap maker of Buffalo, N. Y., who desires to ship premiums in boxes with the soap. The application to the Commission was made in the hope that, if honest classification could thereby be assured, the soap maker could then induce the railroads to carry soap and premiums in the same box at two different rates. It was proposed that "if the actual weight of the articles of each class is shown on the bill of lading, each article shall be charged at its weight and class rate, adding the weight of the box to the weight of the heaviest article."

In the United States Circuit Court at New York City, November 15, the New York Central was found guilty of paying rebates on shipments of sugar from New York to Cleveland, said to have aggregated $26,000. The agreement to pay the rebate—reducing the tariff rate of 21 cents to 15 cents—was made in July, 1902, but the actual payment of the money by the railroad did not take place until after the passage of the amendment to the rate law in February, 1903. As the indictments in this case were based partly or wholly on the provisions of the 1903 law, the railroad company, in its defense, claimed that the charge against it was not proved, as the essential thing—the agreement to pay the rebate—took place before such doings had been declared unlawful.

In the same Court, November 20, the American Sugar Refining Company was found guilty of receiving the $26,000 in rebates.

O. H. Taylor, General Passenger Agent of the New England Navigation Co., has been appointed Passenger Traffic Manager, effective Dec. 5, of the steamship lines controlled by C. W. Morse. These lines are: The Eastern Steamship Company, between Boston and Kennebec river points, Boston and Portland, Eastport and Bangor, Me., also St. John, N. B., as well as numerous other lines operated on the coast of Maine; the Metropolitan Steamship Co., the outside all water line between New York and Boston; the Mallory lines between New York and Galveston, Tex., also Mobile, Ala., and other points; the Clyde line with its various routes from New York and Boston to southern ports; and the Peoples' Line and Troy Line on the Hudson river between New York and Albany and Troy, respectively.

### Forty-One Steamboat Passengers Drowned.

On November 18 the steamer "Jeanie" of the Alaska Coast Company and the steamer "Dix" of the Alki Point Transportation Company collided in Puget Sound about two miles north of Alki Point. The "Dix," according to the statement of the captain of the other steamer, was struck amidships while trying to cross the bows of the "Jeanie" and sank almost immediately. According to press reports 41 of the 80 people on board the "Dix" were drowned.

### I. C. C. Regulations.

The Interstate Commerce Commission has issued circular No. 6 answering questions which have been presented in relation to orders issued within the past two months. In regard to the filing of joint rates, the Commission wants concise statements of contracts, but does not wish to have division sheets filed. The free transportation of caretakers of freight is interpreted to mean, not only men in charge of animals and fruit, but of perishable vegetables, when caretakers are necessary; and the transportation of these men includes their return to points from which they actually accompanied the freight. The road may carry such persons either free or at reduced rates, but must publish the terms in the freight tariffs. The Commission some time since gave authority to reduce, without notice, any through freight which is higher than the sum of the locals. If such a through freight (not reduced) is complained of, the Commission will probably decide that it is prima facie unreasonable, thus putting the burden of proof upon the carrier to defend the rate.

Applications for permission to change tariffs on short notice must be sent in the regular form and must be signed by the President, Vice-President, General Traffic Manager, Assistant General

Traffic Manager, General Freight Agent or General Passenger Agent, and the signer must give his title. The Commission requests that as far as possible such applications be sent by mail, not by telegraph. Railroads are requested to designate not more than two freight men and two passenger men to manage correspondence between the road and the Commission. The Commission cannot undertake to send its circulars and rulings to more than one passenger official and one freight official on each road. Each company is requested to designate persons to receive the circulars, etc., and report their names to the Commission. The Commission will, upon application, mail its official circulars to regularly organized boards of trade and shippers' associations.

### Mr. Harriman on the Rate Law.

The following abstract is made of the address given before the Trans-Mississippi Congress at Kansas City, November 20, by E. H. Harriman:

The impression prevails that I control more miles of railroad than any other man. That statement is made frequently. I deny it. It is not true. I do not control one mile of railroad. I do not believe in one man or any one company controlling vast interests of this kind. There are 14,000 or 15,000 persons who co-operate in the control of railroads and other corporations in which I am interested. One man could not do the work and do it right. We have our stockholders and our boards of directors, and they all share in the responsibility of conducting our affairs. I appear as a dictator in published statements, but I am not. Every important step in our business is considered by many minds before any decision is reported.

Last year this congress passed a resolution antagonistic to the general clamor that increased power be given to the Interstate Commerce Commission in the regulation of railroads and other corporations. Your contention was that the Sherman Anti-Trust law and the Elkins amendment gave the Commission sufficient power to correct existing evils. But since your congress passed that resolution the Congress of the United States has passed a measure which is now a law that gives to the Interstate Commerce Commission almost unlimited power. To the commission is given the power to control all of the railroads of this country. It is composed of seven men, and four of these men constitute a quorum which can control all the transportation lines of the country.

I do not want to criticize the Commission. I believe it acted in good faith when it said it needed more power. But as I said last night, the President, in his Harrisburg speech, intimated that still greater power should be conferred on the Commission. Now, before any further action is taken, I should like to see how the power which exists under the present law will be used. Perhaps it may not be necessary for the Commission to act under the new law. I hope not.

If the Commission makes a mistake in the use of its power conditions may ensue from which the business interests of this country will not recover in a decade. The transportation business is the most vital for the development of the country. No community could prosper without transportation facilities. Your success and the success of the interests you represent depend largely upon the transportation lines of the country.

I think the railroad traffic men have learned by this time that they do not make rates, but equalize them. The rates are made by the communities served by the railroads. Common centers must be treated alike.

You should not disturb rates at this distributing center without affecting all other distributing centers. The rates are controlled by commercial necessities.

But, under the new law, the rates controlled from commercial necessity now may be controlled by political opportunity. The politician may promise a reduction in rates for election to office.

The railroads have reached almost the limit of economy in transportation. If the rates are to be lowered the railroads must be able to carry traffic at less cost than now. The great industrial development in this country since 1899 and 1900 has been due to the fact that the owners of railroads have had confidence in the communities and people served. In order to develop all sections of the country the railroads have improved their lines and spent hundreds of millions of dollars bringing their lines nearer perfection. The railroads must continue to improve. The expenditure of money for railroad improvement gives other business interests a chance to expand. If the railroads are too soon subjected to a reduction of income, where is the money coming from to develop the railroads further and to develop your interests?

### Evening Technical Courses at Columbia University.

The Board of Extension Teaching of Columbia University, New York, announces a series of nine evening technical courses which will be given at the university this winter, beginning November 26 and lasting 20 weeks. The courses are under the immediate direction of Professor Walter Rautenstrauch, of the Faculty of Applied Science, and are to be given by professors and instructors of the university and other persons especially qualified. The fees are from $7.50 to $15, and most of the courses are for two evenings a week. The courses are as follows:

*Engineering Physics* (as illustrated in the mechanical plants of modern buildings): (1) An elementary study of physics; (2) A practical study of steam and electrical machinery, heating, ventilating, water system, wiring, elevators, etc., included in the plant of Columbia University. For two classes of students those wishing an introductory study of physics as preparation to advanced study in electricity, steam, etc., another winter; those desiring practical training for positions as superintendents of buildings, engineers, janitors, etc.

*Elementary Mathematics*: Those parts of arithmetic, algebra, geometry and trigonometry used in technical work. Practice with engineering handbooks, tables, etc.

*Drafting*: A beginner's course; fits for positions as draftsmen; reading of drawings, etc.

*Strength of Materials*: A lecture course for those who design or manufacture machinery, or modern structures. With this course should be taken either the first or second of the two following courses in design.

*Machine Design*: Advanced drafting, computations, and designing for persons engaged in the design and manufacture of machinery.

*Structural Design*: Advanced drafting, computations, and designing for those who do structural work.

*Electrical Engineering*: A course especially for those engaged in electrical work of any sort.

*Steam Engineering*: A course for those engaged in the management of steam machinery of any sort.

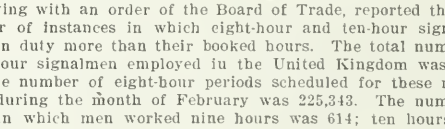
*Special Engineering Problems*: A study of any special elementary or advanced engineering problems desired by the student; individual instruction will be arranged for such a period of time as the special problem may demand.

A complete catalogue of these courses will be sent on request. Address Evening Technical Courses, Extension Teaching, Columbia University. Personal information may be secured Tuesday and Thursday evenings, between 7.30 and 9 o'clock, from Benjamin R. Andrews, room 111, Teachers College.

### The "Anti-Waste Grabber."

A simple and ingenious device to prevent displacement of the packing waste in journal boxes is shown in the accompanying illustration. It is called an "anti-waste grabber" because it effectually stops the grabbing action of the journal which carries the waste around and wedges it in between the lug of the box and the rotating journal. When the waste gets in this position it wipes the journal in front of the bearing free from lubricating oil and a hot box results.

The "anti-waste grabber" is made from copper wire, in the form of a coil and stiffened by having three wires soldered on the inside to each turn of the coil. At one end of the grabber, the



Anti-Waste Grabber.

wire projects from ¼ in. to ½ in. This projection holds firmly in the waste and prevents the grabber being lost in case a journal box should be open.

The use of this device insures care being taken in packing journal boxes. They cannot be jammed full of waste, as it must be placed evenly and room must be left for the grabber. The weight of the grabber itself has the tendency to hold the waste down and if it does raise a trifle, the grabber strikes the lug on the box and bearing first, preventing further movement. When in this position the waste cannot get beyond the grabber.

It is claimed for the device that the waste will remain in the position placed, that the journal will be lubricated evenly, that there will be a saving in oil, waste and bearings and delays to fast trains will be avoided. These grabbers have been in use for two years on passenger trains of the Lackawanna, and have proven entirely satisfactory. They are made by the V. O. Lawrence Co., Philadelphia, Pa.

### Working Hours of English Signalmen.

For the month of February last the railroads of Great Britain, complying with an order of the Board of Trade, reported the total number of instances in which eight-hour and ten-hour signalmen were on duty more than their booked hours. The total number of eight-hour signalmen employed in the United Kingdom was 9,164, and the number of eight-hour periods scheduled for these men to work during the month of February was 225,343. The number of cases in which men worked nine hours was 614; ten hours, 328; eleven hours, 161; twelve hours, 1,086; thirteen hours and upward, 37, making a total of 2,226 instances of overwork. The number of ten-hour signalmen employed was 9,721, and the number of booked periods during the month 229,849. The number of instances in which these men worked eleven hours was 4,065; twelve hours, 5,136; thirteen hours, 171; fourteen hours, 84; fifteen hours, 40; sixteen hours and upward, 16; total, 9,512.

Many of the companies sent with their statements explanatory letters, showing that certain cases of overwork had been due to

extraordinary sickness among the men, or to other emergencies, and to inability to get relief men on duty promptly. Many of the men who worked over hours were employed during the extra time not as signalmen but in other kinds of station work or in attending to lamps. Some of the largest items, however, are not accompanied by any explanation. The Great Central, employing 463 eight-hour men, reports 408 cases of these men working 12 hours. The road employs 358 ten-hour signalmen and reports that men were kept on duty for 12 hours 642 times. The Great Western, the Midland and the South Eastern & Chatham report considerable numbers of cases; but the other large roads report very few.

### Radical Recommendations by Mr. Comer.

Mr. B. B. Comer, President of the Alabama State Railroad Commission, has been elected Governor of the state, and by way of indicating the policy that he intends to pursue in his new office, he has made a minority report to accompany the annual report of the commission. In his individual report Mr. Comer recommends the passage of laws to require the railroads to build stations wherever the commission deems them necessary; to make the present freight rates on all lines in Alabama the maximum which cannot be raised, and to compel prompt settlement of claims for stock killed, freight damaged and other non-performance of contracts. He would also have laws requiring the railroads to provide adequate equipment to handle all business on their lines and penalize any case where there is special delay; also car service rules providing for reciprocal demurrage. Mr. Comer says that the waterways of the state are boycotted by the rail lines and he would have the rail lines forced to make traffic contracts with water carriers. He would forbid increase of the stock shares of railroads without the approval of the railroad commission, and when capital is to be increased for the purpose of making improvements he would require a certified schedule of such improvements.

He would provide for the railroad commission ample legal talent to combat the railroads in all cases where the commission seeks to regulate them. He proposes to actively regulate the telegraph and telephone service, and, in general, to supervise all public service corporations.

### Surprise Checking for Shippers and Consignees.

The New York, New Haven & Hartford has appointed several general agents of the freight department who are to keep in close touch with every industry along the company's lines in their respective districts. They are to visit each at least once every two weeks, and thus promote an intimate relationship [and get cars unloaded?].

### New Signals.

The Houston (Tex.) *Chronicle* says that on the Southern Pacific lines in Texas and Louisiana 280 miles will be equipped next year, with automatic block signals, and that this will nearly or quite complete the signaling of the line between New Orleans and San Antonio.

The Delaware & Hudson is preparing to establish the block system on the line from Rutland, Vt., to Whitehall, N. Y., and from Plattsburgh to Rouses Point.

The Boston & Maine has contracted with the Union Switch & Signal Company for the material for automatic block signals on 1,000 miles of track.

### A Symmetrical Time-Table.

The increase in speed of New York and Philadelphia expresses recently announced by the Reading and the Central of New Jersey is to go into effect November 25. The hourly express trains between the two cities (90 miles, excluding the Hudson river ferry) will make the run in two hours, including the ferry. These trains start from New York hourly, 7 a. m. to 6 p. m., and from Philadelphia every hour from 7 a. m. to 8 p. m. In addition, there will be five new express trains each way, a total of thirty-six trains, independent of the Baltimore and Washington expresses. These five new trains will be known as "between the hour" trains, and make all stops cut out on the runs of the hourly trains, which will make no stops between Jersey City and Wayne Junction in either direction.

The five new trains will leave New York and Philadelphia simultaneously at 6.30, 8.30 and 11.30 a. m., and 1.30 and 5.30 p. m., their time for the trip to be 2 hours and 25 minutes.

### Increases in Pay.

Negotiations between railroad officers and representatives of their employees, concerning advances in pay, have been reported from a dozen different cities during the past week, and all of the prominent roads appear to have questions of this kind under consideration. The question whether certain classes of employees intend to strike if they cannot get what they want, has also been given its usual prominence during the past week, and the reporter who can so word his announcement as to make a strike appear probable continues in high favor with the editor. Among the more prominent items which seem to be truthful are the following: Norfolk & Western, 10 per cent. increase, December 1, to all employees now receiving less than $200 a month. Chicago & Northwestern, an unsolicited advance to 1,100 agents and 500 operators; estimated total increase, $10,000 a month. Chicago & Alton, 13 per cent., November 1, to all switchmen. Union Pacific (and all Harriman lines), 10 per cent. increase for clerks, to apply probably at general offices and at stations, and perhaps to other station employees. The New York Central is said to be considering a similar increase for clerical employees. The Delaware, Lackawanna & Western has reduced the hours of the enginemen of switching engines, at some of its smaller yards, and of pushing engines, from 11 hours a day to 10 hours. The 10-hour day will apply to enginemen on work trains. Passenger enginemen are to receive $3.60 per 100 miles, an increase of 10 cents; and on the newest heavy ten-wheel engines will receive $3.75. This rate applies also to the runners on milk trains. The negotiations with brakemen, firemen and switchmen have as yet reached no conclusion. The Erie road has not yet reached any agreement with its employees, but the negotiations are still going on. The brotherhood firemen on the road have been voting on the question of giving their committees power to use their own judgment as to the question of calling a strike.

### National Convention for the Extension of Foreign Commerce.

A committee of the New York Board of Trade and Transportation announces that a national convention for considering and devising means for the enlargement of the foreign trade of the United States and for promoting the demand abroad for the productions of this country's farms, work shops and mines, will be held at the New Willard Hotel, Washington, D. C., beginning January 14, 1907. All national, state and local associations interested are invited to send at least five delegates each, and the governor of each state is invited to appoint 10 delegates. Elihu Root, Secretary of State, is to address the convention.

### Some Comparisons.

Somebody on the Atchison, Topeka & Santa Fe has figured out that the company pays out nearly $500 daily for track-walkers and watchmen. Also $1,150 for the water its locomotives use. The expense of maintaining equipment amounts to $30,000 every 24 hours. While the Santa Fe is liberal in its advertising, it cost more money the last fiscal year to keep snow, ice and weeds off the track than it did to pay for newspaper and magazine advertisements, books of travel, time-table folders and pictures.

### Marking Progress.

The Virginia State Corporation Commission is hearing the last evidence in the uniform freight rate inquiry which has been going on with brief intermissions since last spring, and which will soon go to the court. * * * It is believed that the commission will decide against the companies. * * * —*Press Despatch from Richmond.*

## TRADE CATALOGUES.

*Irrigation.*—The Denver & Rio Grande is distributing an interesting and instructive pamphlet describing the methods and excellent results of the irrigation being carried out by the United States Reclamation Service in Colorado. A tunnel six miles long is being built in the Uncompahgre valley to connect the Gunnison and Uncompahgre rivers. It is to be finished by the fall of 1908, and is to carry water to 150,000 acres of now arid land.

*Motor Hoists.*—The Ingersoll-Rand Co. sends a bulletin illustrating and fully describing "Imperial" motor hoists, including illustrated lists of parts. The apparatus, which consists of an enclosed pneumatic motor driving a hoisting drum through worm gears, can be attached to a crane or any part of a structure, and is controlled from the ground. The load can be locked in any position.

*Air-Brakes for Electric Cars.*—The Westinghouse Traction Brake Co., Pittsburg, Pa., has issued a circular describing schedule SM straight air-brake equipment for electric cars. Three varieties of this schedule are illustrated and described; the general arrangement of operation is the same in each, but the details differ to suit different conditions.

*Electric Headlights.*—The Rushmore Dynamo Works, Plainfield, N. J., is distributing an illustrated and full description of their electric headlight for locomotives. This headlight is really a powerful searchlight, and its construction, except that electricity is used instead of gas, is similar to the Rushmore lens mirror acetylene searchlight.

*Ice Tools.*—Two recent catalogues of the Gifford-Wood Co., Hudson, N. Y., and Arlington, Mass., illustrate and describe, with price lists, ice tools and handling machinery.

*Thermodynamics.*—The September issue of the *Penberthy Engineer and Fireman*, published by the Penberthy Injector Co., Detroit,

Mich., contains an interesting article on the principles of heat. After some general remarks, a theoretical discussion of the nature of wet steam and superheated steam is given.

*Trolley Wire Frogs.*—Bulletin No. 4,465 of the General Electric Co. is devoted to trolley wire frogs. Formulæ are given for the proper location of these frogs at turn-outs and for finding the angle of divergence suited to the radius of the turn-out. Several varieties of two and three-way frogs are shown.

*Pneumatic Hammers.*—Bulletin No. 2,011 of the Ingersoll-Rand Co. is devoted to the "Little Jap" hammer drill. It is a small drill designed for rock work in confined places or where drill holes of small diameter only are wanted.

*Chicago, Milwaukee & St. Paul.*—The passenger department of this company sends a mailing card calling attention to the deer hunting grounds in northern Wisconsin and the upper peninsula of Michigan.

*Air-Brakes.*—Bulletin No. 1,508 of the Allis-Chalmers Co. describes the Christensen air-brake, patents for which were recently sold to the Allis-Chalmers Co.

### Manufacturing and Business.

Carl R. Green, heretofore President of the Dayton Pneumatic Tool Co., Dayton, Ohio, has resigned and has opened an office in Dayton as a Consulting Mechanical Engineer, making a specialty of compressed air appliances.

Charles M. Jacobs, Consulting Engineer for the Pennsylvania North river tunnel into New York City, has been retained by the French government to build a tunnel under the Seine at its mouth between Rouen and Havre.

William S. Love, Manager of the Chicago office of the Wheeler Condensing & Engineering Co., has been appointed General Sales Manager, with office at 42 Broadway, New York City, effective January 1. Grant Beebe succeeds Mr. Love at Chicago.

The new 37 stall roundhouse of the Northern Pacific at Mandan, N. Dak., is to be equipped with an engine-driven fan and a steam heater built by the B. F. Sturtevant Co. The new shops of the Maine Central at Waterville, Me., are also being equipped with Sturtevant heating apparatus.

The Baltimore Railway Specialty Co. recently completed a malleable iron foundry at Corning, N. Y., for the manufacture of castings used for Baltimore center and side ball bearings. This foundry will also supply malleable iron to the T. H. Symington Co., one of whose plants is close to the new foundry.

Robert W. Hunt & Company, Engineers, The Rookery, Chicago, have been appointed Consulting, Designing and Constructing Engineers for the new municipal electric lighting plant for the city of Milwaukee. The site for the plant has been bought, and work will immediately start upon plans and specifications. The estimated cost is $700,000.

### Iron and Steel.

During the month of October the Edgar-Thompson blast furnaces at Braddock, Pa., turned out 128,134 tons of iron and two of the company's rail mills at that place turned out 84,595 tons of standard rails.

Supplies of steel continue very scarce and there is a corresponding stiffening in price. Recent orders for rails include 25,000 tons for the Atlantic Coast Line, 18,000 tons for the Gainesville & Gulf, and 5,000 tons additional for the Texas & Pacific. An unusual number of roads are adding to their orders for early delivery in 1907.

Orders for rails have recently been given by the Virginia Air Line for 4,000 tons, Georgia Railway 4,000 tons, San Francisco & Napa 1,800, Deepwater-Tidewater 2,000, Chicago, Lake Shore & Eastern 1,500, and Monongahela Connecting 5,000 tons. Orders are pending for about 150,000 tons for delivery next year. The Missouri Pacific recently increased its contract for bridge material to the Pennsylvania Steel Co. from 2,500 to 3,000 tons, and the Chicago & North-Western has given a contract to the same company for 400 tons of fabricated steel. This company is still in the market for 1,600 tons, and the Chicago, Milwaukee & St. Paul for 200 tons.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Railway Surgeons.

The New York and New England Association of Railway Surgeons held its annual meeting in New York City last week. The President for the ensuing year is Dr. H. T. Dana; Secretary, Dr. George Chaffee, Brooklyn, N. Y.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Chicago & Eastern Illinois.*—H. I. Miller, who was recently elected President of this road and of the Evansville & Terre Haute, worked from October, 1880, to 1888 in various positions in transportation, maintenance and construction departments on different roads. He was then appointed Superintendent of the Richmond division of the Pennsylvania lines, and two years later was transferred to the Louisville division. In 1894 he was made Superintendent of the Terre Haute & Indianapolis, now part of the Vandalia. In 1901 he was appointed General Manager of the Vandalia, and in 1903 went to the Chicago, Rock Island & Pacific as General Manager. Two years later he was elected Second Vice-President and General Manager of the Chicago & Eastern Illinois, and Vice-President of the Evansville & Terre Haute, the Evansville & Indianapolis and the Evansville Belt.

H. I. Miller.

*Illinois Central.*—Joseph F. Titus, who, as announced in our issue of last week, has been appointed Assistant to the President in charge of the Accounting and Treasury departments, was born in New Jersey in 1859, and was educated at the State Model school at Trenton, N. J. He began railroad work in 1873 as a clerk in the Motive Power department of the Pennsylvania. Five years later he went to the Illinois Central, where he has been ever since. He began as a clerk in the Auditing department of this road, and was later made traveling auditor, then acting paymaster, and then Local Treasurer at Chicago, which position he held until his recent promotion. He now has charge of the departments formerly under the authority of J. C. Welling, Vice-President, who died recently.

J. F. Titus.

*Isthmian Canal Commission.*—Changes have been made among the officers in charge of the Panama Canal work and of the government of the Canal Zone so that T. P. Shonts, Chairman of the Commission, is now in charge of both, Governor Magoon, of the Canal Zone, having recently been transferred to Cuba. Seven departments instead of three have been created, and will be in charge respectively of J. F. Stevens, Chief Engineer; R. R. Rodgers, General Counsel; W. C. Gorgas, Chief Sanitary Officer; D. W. Ross, Chief Purchasing Officer; E. S. Benson, General Auditor; J. Williams, Chief Disbursing Officer, and Jackson Smith, Manager of Labor and Quarters.

*New York, New Haven & Hartford.*—T. E. Byrnes, Assistant to the President, has been elected Vice-President, succeeding Percy R. Todd, resigned.

*Southern.*—H. B. Spencer, General Manager, has been appointed Sixth Vice-President in general charge of the Construction and Purchasing departments, with office at Washington, D. C. C.

H. Ackert, Fourth Vice-President, has been appointed also General Manager, succeeding Mr. Spencer.

### Operating Officers.

*Chicago & North-Western.*—S. M. Braden, Superintendent of the Galena division, with office at Chicago, Ill., has been appointed Assistant General Superintendent of the lines west of the Missouri river. W. D. Beck, Superintendent at Baraboo, Wis., succeeds Mr. Braden. P. J. O'Brien, Superintendent at North Fond du Lac, Wis., succeeds Mr. Beck. F. H. Hammill, Superintendent at Sioux City, Iowa, succeeds Mr. O'Brien. S. H. Brown, Superintendent at Eagle Grove, Iowa, succeeds Mr. Hammill. E. E. Smith, trainmaster at Sioux City, succeeds Mr. Brown. C. E. Andrews, Assistant Superintendent at Escanaba, Mich., has been appointed to the new office of Superintendent of the Lake Shore division, with office at Green Bay, Wis.

*Chicago Great Western.*—L. M. Shipley, trainmaster at Chicago, Ill., has been appointed Superintendent of Terminals at Oelwein, Iowa, succeeding William Matthie, resigned to go to another company.

*Cumberland Valley.*—See Washington Terminal.

*Mississippi Central.*—G. K. Smith, who recently resigned as General Manager of the Detroit, Toledo & Ironton, has been appointed General Manager of the Mississippi Central.

*Rio Grande Western.*—George Geiger, formerly Superintendent of the Texarkana & Fort Smith, has been appointed Superintendent of the Rio Grande Western at Salt Lake City, Utah, succeeding W. E. Miller, transferred.

*Southern.*—The lines east and south of Harriman Junction, Tenn., Nashville, Chattanooga and Memphis will hereafter be operated in four districts, with a General Superintendent in charge of each. G. R. Loyall, Assistant General Superintendent at Knoxville, Tenn., has been appointed General Superintendent of the Eastern district, with office at Charlotte, N. C. W. N. Foracre, Assistant General Superintendent at Birmingham, Ala., has been appointed General Superintendent of the Western district, with office at Birmingham. E. H. Coapman, Assistant General Superintendent at Danville, Va., has been appointed General Superintendent of the Northern district, with office at Danville. M. M. Richey, formerly Assistant General Superintendent at Birmingham, but more recently Vice-President of the Sloss-Sheffield Steel & Iron Co., has been appointed General Superintendent of the Middle district, with office at Knoxville, Tenn. J. N. Seale, Assistant General Superintendent at Charlotte, has been appointed to the new office of Manager of Transportation, with office at Washington, D. C.

*Washington Terminal.*—G. W. Martin, hitherto Superintendent of the Cumberland Valley, has been appointed Superintendent of the Washington Terminal, with office at Washington, D. C.

### Traffic Officers.

*Chicago, Rock Island & Pacific.*—C. H. Morrill has been appointed Industrial Agent of this road and of the St. Louis & San Francisco, with office at St. Louis.

*Nashville, Chattanooga & St. Louis.*—E. M. Smith has been appointed Assistant General Freight Agent, with office at Nashville, Tenn., succeeding Charles Barham, promoted.

*St. Louis & San Francisco.*—See Chicago, Rock Island & Pacific.

*Wisconsin Central.*—Frederick Signer has been appointed General Freight Agent, succeeding Burton Johnson, resigned.

### Engineering and Rolling Stock Officers.

*Atlantic Coast Line.*—C. J. Kelloway, hitherto Supervisor of Interlocking on the Delaware, Lackawanna & Western, has been appointed Signal Engineer of the A. C. L., with office at Wilmington, N. C.

*Gulf, Colorado & Santa Fe.*—P. T. Dunlop, Master Mechanic at Temple, Tex., has been appointed Mechanical Superintendent, with office at Cleburne, Tex., succeeding A. Harrity, resigned.

*Lehigh Valley.*—A. W. Whiteford, Superintendent of Shops at Omaha, Neb., of the Union Pacific, has been appointed Shop Superintendent of the Lehigh Valley, with office at Sayre, Pa., succeeding E. T. James, resigned.

*Union Pacific.*—Hamilton Stovel, general foreman at Omaha, Neb., has been appointed Superintendent of Shops at that place, succeeding A. W. Whiteford, resigned to go to another company. See Lehigh Valley.

### Purchasing Agents.

*Colorado & Southern.*—F. W. Mahl, Mechanical Engineer of the Southern Pacific at San Francisco, Cal., has been appointed Mechanical Engineer and General Purchasing Agent of the Colorado & Southern, with office at Denver, Colo. A. L. Cochrane, Purchasing Agent, has been appointed Assistant General Purchasing Agent, with office at Denver.

*Southern Pacific.*—See Colorado & Southern.

## LOCOMOTIVE BUILDING.

*The Marquette & Southeastern* has ordered two consolidation (2-8-0) type locomotives from the Baldwin Locomotive Works.

*The Cuban Central* has ordered one ten-wheel (4-6-0) type locomotive from the Hicks Locomotive & Car Works. This locomotive will weigh 45 tons and have 18-in. x 24-in. cylinders.

*The Canadian Pacific* is building 10 simple superheater consolidation (2-8-0) type locomotives at its Angus shops. These locomotives are exactly like the 20 consolidation locomotives reported in our issue of October 12, except as to heating surface, which is 2,870 sq. ft. for the 10 locomotives.

## CAR BUILDING.

*The Colorado & Southern* is in the market for 1,000 box cars.

*The Grand Trunk* is reported to be in the market for 500 refrigerator cars.

*The New Orleans Great Northern* is in the market for 200 box cars of 80,000 lbs. capacity.

*The Cuban Central* has ordered ten 36-ft. flat cars from the Hicks Locomotive & Car Works.

*The Lehigh Valley* has ordered 500 additional box cars from the Standard Steel Car Company.

*The Gulf & Ship Island* has ordered 500 flat cars from the American Car & Foundry Company.

*The Roddis Lumber & Veneer Co.*, Marshfield, Wis., has ordered two 36-ft. flat cars from the Hicks Locomotive & Car Works.

*The Texas Company*, 8 Bridge street, New York City, has ordered 300 tank cars from the American Car & Foundry Company.

*The Missouri Pacific*, it is reported, has ordered 1,500 refrigerator cars from the American Car & Foundry Co., and is asking prices on 3,000 box cars.

*The Butler Lumber Co.*, Butler Spur, Wash., has ordered six 41-ft. logging flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The Tri-City Railway & Light Company*, Davenport, Iowa, has ordered 10 street cars from J. G. White & Co., and 200 more are to be built as soon as the first 10 are completed. They will measure 31 ft. long and will carry 36 passengers.

*The Chicago, Rock Island & Pacific*, as reported in our issue of November 16th, has ordered 10 chair cars, 10 passenger coaches, five observation cars and five dining cars from the Pullman Co., and 10 combination smoking and baggage cars, 10 baggage cars, five steel underframe postal cars, five steel underframe baggage and mail cars, and five combination coach and dining cars.

*The Pennsylvania* is about to ask bids from the American Car & Foundry Co., the Standard Steel Car Co. and the Pressed Steel Car Co. on 100 all-steel non-inflammable passenger cars. The railroad will at once start building an experimental all-steel dining car, and the Pullman Company is designing for the road an all-steel non-inflammable sleeping car, of which type 500 must be ready for service when the new terminal at New York City is opened to traffic.

*The Union Pacific* has ordered 10 additional steel motor cars to be built at its Omaha shops. These cars will weigh 57,150 lbs. The passenger compartment will measure 41 ft. $10\frac{5}{8}$ in. long, and the engine room 12 ft. 8 in. long; the cars will be 9 ft. $8\frac{1}{32}$ in. wide over side sills, and 12 ft. $1\frac{3}{16}$ in. high from top of rail to top of roof. The special equipment includes:

| | |
|---|---|
| Bolsters | Commonwealth Steel Co. |
| Brake-beams | Waycott |
| Couplers | Climax |
| Curtain fixtures | Union Pacific special |
| Curtain material | Pantasote |
| Light | Adams & Westlake acetylene |
| Paint | Sherwin-Williams |
| Wheels, driving | Railway Steel Spring Co. |
| Wheels, trailer | Standard Steel Works |

*The Mexican Southern* has ordered three narrow gage passenger coaches for February, 1907, delivery from the Mexican Car & Foundry Co. These cars will measure 39 ft. 4 in. long and 7 ft. 4 in. wide, inside measurements; 45 ft. 10 in. long and 8 ft. $3\frac{1}{2}$ in. wide,

over all, and 6 ft. 1 in. high from floor to under side plate. The bodies and underframes will be of wood. The special equipment includes:

| | |
|---|---|
| Bolsters | Trussed oak |
| Brakes | Westinghouse |
| Draft rigging | M. C. B. |
| Dust guards | Wooden |
| Journal boxes | Cast iron |
| Light | Dual burner |
| Paint | Pullman standard |
| Roofs | Covered with duck |
| Trucks | Company's standard four-wheel |

*The Atchison, Topeka & Santa Fe*, as reported in our issue of November 9, has ordered five postal cars and 17 additional baggage cars from the American Car & Foundry Co., for December delivery. The postal cars will weigh 105,200 lbs., and will measure 60 ft. long, 9 ft. ½ in. wide and 7 ft. 7½ in. high, inside measurements. The baggage cars will be 69 ft. 2⅛ in. long, 9 ft. 3⅝ in. wide and 6 ft. 8½ in. high, inside measurements. The special equipment for both includes:

| | |
|---|---|
| Brake-beams | Chicago Railway Equipment Co. |
| Brake-shoes | American Brake-Shoe & Foundry Co. |
| Brakes | Westinghouse |
| Brasses | Hewitt |
| Couplers | National |
| Draft rigging | Miner |
| Dust guards | A., T. & S. F. standard |
| Journal boxes | Symington |
| Light | Pintsch |
| Springs | Simplex Railway Appliance Co. |
| Vestibules | Pullman standard |
| Wheels | Standard Steel Works |

## RAILROAD STRUCTURES.

Armourdale, Kan.—The land which the Chicago, Rock Island & Pacific recently bought at this place is to be used for enlarging the freight yards, but not for new shops. A new roundhouse is to be put up to replace the present one.

Atlanta, Ga.—The Gate City Terminal Company, which is to provide an entrance for the Atlanta, Birmingham & Atlantic into this city, has agreed to build a bridge over Hunter street and underpasses at Western avenue and at Meldrim street, also to widen and pave other streets.

Cedar Falls, Iowa.—The Illinois Central, it is said, will at once being work on a new brick station here.

Des Moines, Iowa.—The Interurban Railway Company will build a combined storage and car repair shop of brick and steel to cost $25,000.

Elkhart, Ind.—The car repair shops of the Lake Shore & Michigan Southern were recently damaged by fire; loss about $40,000.

Evansville, Ind.—The Evansville & Terre Haute is having plans made for putting up a stone passenger station here.

Hamilton, Ont.—The Canadian Pacific is having plans made for a large office building.

A contract has been given at about $225,000 to the Canadian White Co. for the Union Electric Railroad station by the Cataract Power & Traction Company.

Lethbridge, Alberta.—A contract for the steel work on the Canadian Pacific bridge at this place has been given to the Dominion Bridge Co., of Montreal. The contract amounts to about $780,000.

Lincoln, Neb.—Plans are being made by the Union Pacific to increase its terminal facilities. The yards are to be enlarged and a new passenger station also a new freight house put up.

Mackinaw, Ill.—The McKinley Company has given a contract to Burham & Ives, of Bloomington, to build a bridge over the Mackinaw river, for the use of the Interurban lines.

Mount Carmel, Ill.—The Cleveland, Cincinnati, Chicago & St. Louis has plans made for putting up a two-story passenger station 36 ft. x 112 ft., to cost about $23,000.

Nebraska City, Neb.—The Chicago, Burlington & Quincy will put up a new brick passenger station here to cost $40,000.

New York, N. Y.—Plans are being made by Walker & Morris for the superstructure of the Whitehall street ferry terminals which have recently been taken over by the city. Commissioner Bensel, of the Department of Docks and Ferries, will soon ask bids for the work, which will cost approximately $500,000.

Omaha, Neb.—An officer writes that the Chicago & North-Western has just started work on a brick steel skeleton two-story freight house to be 86 ft. x 718 ft.

Richmond, Va.—The Chesapeake & Ohio has given contracts to A. M. Walkup to build floors over the basin from Eighth street to Twelfth street 160 ft. wide, which will give that company an additional three acres of floor space to be used for freight facilities. The cost of the improvement is about $200,000.

Saskatoon, Sask.—A contract has been given to John Guinn & Son, of Winnipeg, at $90,000 for putting up the Grand Trunk Pacific bridge here.

South Bend, Ind.—The Northern Indiana Railway Co., it is reported, is making plans for putting up a large power station here.

Syracuse, N. Y.—A contract has been given by the C. D. Beebe Syndicate of Electric Railroads to the American Bridge Co. for building a steel bridge over the Delaware, Lackawanna & Western tracks to replace the present structure at Stiles Crossing.

Spokane, Wash.—The Chicago, Milwaukee & St. Paul has given a contract to the Milwaukee Packet Company at Trinidad, Wash., to carry 400 carloads of cement for the abutments of a bridge across Priest river, 25 miles below Trinidad. The structure will be of steel, and cost $200,000.

Topeka, Kan.—The Atchison, Topeka & Santa Fe has given a contract to Frank Spencer for putting up a number of buildings at a cost of $94,000. The principal building will be a 30-stall roundhouse to cost $62,000.

Winnipeg, Man.—According to reports from Ottawa, application will be made to Parliament by the Canadian Northern, the Canadian Pacific and the Grand Trunk, for joint terminals in this city. A meeting of the companies interested and the National Trans-Continental Commission will be held shortly to arrange the terms of the agreement.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Brownsville, Hidalgo & Northern.—This company has under consideration the question of further extending its line under construction up the valley of the Rio Grande from Brownsville to Eagle Pass, about 350 miles. Land owners along the route offer large gifts of land.

Buffalo & Susquehanna.—It is said that the Goodyear interests, which control this road, are negotiating for the purchase of the routes, surveys, etc., of the proposed Pittsburg & Northeastern, projected to be built from Pittsburg, Pa., northeast to South Bend, in Armstrong County, 40 miles, and eventually to Binghamton. The route is desired for an entrance into Pittsburg for the Buffalo & Susquehanna. The B. & S. in a few days will ask for bids for building large yards near South Bend, Pa., where 1,000 acres of land were recently bought. The line is now being built from Plumville to Sagamore, where large coal mining operations are under way, and surveys have been completed from Sagamore to South Bend.

Canadian Northern.—In the annual report of this company, the Duluth, Virginia & Rainy Lake, which was the predecessor of the Duluth, Rainy Lake & Winnipeg, is shown on the map as a Canadian Northern line under construction. The Duluth, Rainy Lake & Winnipeg runs from Rainy Junction, Minn., north to Gheen, 57 miles, and work is under way on a northwesterly extension to a connection with the Canadian Northern at Fort Francis, Ont. It is reported that surveys have been made for also extending the road south from Rainy Junction to Duluth, about 60 miles.

Canadian Pacific.—This company has leased the Georgian Bay & Seaboard Railway, now under construction from Victoria Harbor to Peterboro, and is also negotiating for a lease of the Lucknow Railway, under construction from Proton, Ont., to Walkerton.

Work is being pushed in the west from Saskatoon, Sask., east so as to be ready for work on the lines west of that point early next year. Contracts are about being let for the superstructure of a bridge at Saskatoon, and work on the bridge is to be continued throughout the winter. The bridge is to be of concrete and steel and is to be completed by May of next year. Grading on the line from Saskatoon southeast to Strassburg is almost completed. Application is to be made to Parliament for permission to build a line from Saskatoon into the Goose Lake country.

It is said that this company will apply at the next session of Parliament for permission to build a new line from Weyburn west 100 miles to Range 30, west of the second meridian. This will be a further extension of the branch line from Stonghton west to Weyburn. It is also said that application will be made to build a new line from a point on the Moose Jaw branch near Elbow to the present terminus of the Lacombe branch. This would give Moose Jaw direct connection with Edmonton via Lacombe, and indicates that the Moose Jaw branch will be extended into new territory, probably paralleling the Prince Albert branch of the Canadian Northern into Saskatoon, Rostern and Prince Albert districts.

Chicago & Alton.—This company has placed in service 30 miles of double track between Lincoln, Ill., and Springfield, the work having been under way for several months. Work is now under way on the section between Bloomington and Lincoln, about 30 miles.

Corinth & Shiloh (Electric).—This company has been incorporated in Mississippi and Tennessee with $250,000 capital to build an electric line from Corinth, Miss., to the National Shiloh Park, Tenn., 22 miles. Bonds have been issued to secure funds to carry out the work. By a special act of Congress the company has been granted permission to operate its cars into Shiloh Park and to put up a hotel there. A. Rubel is President of the company, and W. W. Williams & Co., of Nashville, Tenn., are financing the project.

Delaware & Eastern.—The last spike completing this road was recently driven at East Branch. The road, it is said, is to form a part of the projected Schenectady & Southwestern. (See Construction Record.)

Delaware & Hudson.—An officer writes that contracts have been given to O'Brien & Mullarkey, of Montreal, for building 48½ miles on the Quebec, Montreal & Southern. Maximum grades will be 16 ft. to the mile, and maximum curves 1 deg. The work includes five steel bridges. (Nov. 16, p. 136.)

Duluth, Rainy Lake & Winnipeg.—See Canadian Northern.

Great Northern.—The Vancouver, Victoria & Eastern has completed the section of its road from Midway, B. C., west to Molson, about 50 miles, and this section is now ready for operation. The Washington & Great Northern, from Molson to Oroville, Wash., 26 miles, which is a part of the V., V. & E., is also about finished.

Georgian Bay & Seaboard.—See Canadian Pacific.

Hidalgo & Northeastern.—Surveys for the proposed extension of this road from its present northern terminus to the Port of Tuxpan will be completed in about six months. The road, which was recently bought by the Mexican Government, is now operated as a part of the Government merger system. The proposed extension is through a rough country involving some difficult engineering.

Idaho Northern.—This company, of which B. F. O'Neill, President of the National Bank, of Wallace, Idaho, is President, and the Big Bend Water Power Co. announce that they will expend $800,000 in a power plant to develop 30,000 h.p. 28 miles north of Spokane, Wash.; and will build 76 miles of railroad into the Coeur d'Alene mining district at a cost of $1,500,000. E. P. Spalding, Vice-President and General Manager, will have direct supervision of the work.

Indian Creek & Pound River.—This company will build a seven-mile extension of its road from Pound, Va., south into the flats of the Cumberland mountains, where coal and timber fields are to be opened up. The five-mile extension up the north fork of Pound river is well under way. Construction work is to be completed within a few weeks.

Kentucky-Virginia.—Announcement from Wise, Va., says that this line will at once be extended to Clintwood, Va., 23 miles. Surveys were completed last year. Address J. A. Boyd, Wise, Va.

Linares & San Carlos.—This road, which runs from Linares south to San Carlos, state of Tamaulipas, Mex., is to be extended to a point on the gulf coast, either to Barra de Sandoval or to Soto la Morina.

Louisiana Central.—See New Orleans, Crowley & Western.

Lucknow Railway.—See Canadian Pacific.

Mackenzie-Mann System.—Application is to be made by Mackenzie & Mann to Parliament for franchises to build extensions and new branch lines on the Canadian Northern and the other roads of this system as follows: On the Canadian Northern Ontario Railway Co.: Washago west to Lake Huron near Kincardine; Arnprier south to St. Lawrence river between Kingston and Brockville; Pembroke southwest to Lake Ontario between Toronto and Belleville; Toronto-Ottawa line northwest to Georgian Bay, near Collingwood or Owen Sound; Toronto-Ottawa line west through or near Toronto, Hamilton and London to Windsor, with branches to St. Thomas and Sarnia, and a branch or loop north of Toronto; Niagara river northwest through or near Hamilton to Lake Huron near Goderich; Lake Erie west of Port Colborne, north through or near Brantford or Berlin to Georgian Bay; from a point near Washage to the Georgian Bay east of Collingwood; Montreal-Ottawa line north of Montreal, westerly to connect with the authorized line in the County of Leeds or Lanark.

In the Northwest the following branches and extensions of the Canadian Northern are asked for: From the line at or near Humbolt in the province of Saskatchewan, in a southwest direction to Calgary; on the Qu'Appelle, Long Lake & Saskatchewan Railroad, between Craik and Baldworth.

Also an extension of its line from a point on its line at Humbolt northwest to Township 43; from a point on the railroad at South Battleford in a westerly direction to a point in Township 44, Range 27; from a point on its line at North Battleford in a northwesterly direction to a point in Township 59, Range 1; from its line at Strathcona south to Calgary; from Regina southwest to a point on the International boundary; a point at or near Saskatoon southwest to a point on the South Saskatoon river; a point on its authorized line at or near Edmonton, thence by the most feasible route to a point on the Pacific coast; a point on its authorized line near the forks of the Athabasca and McLeod rivers southwest to the head waters of the McLeod river; from Battleford westerly a distance of 100 miles.

Manitoba Radial.—An application has been made by Arthur Wagner, of Ottawa, representing Winnipeg capitalists, to incorporate a company to build a line from Winnipeg northwest to Lake Manitoba, with a number of branches.

Mexican International.—It is said that this company's proposed branch from Allende to a point on the Rio Grande opposite Delrio, Tex., will be built next year. Surveys have been finished and submitted to the Mexican Government for approval. The line will be 60 miles long. It will connect at Delrio by means of a bridge across the Rio Grande river with the Southern Pacific.

The Government System of railroads is planning to secure an entrance into the city of Guadalajara by building an extension of this road from Durango south to that city. Surveys have been under way since June of last year. It is said that the final locating work has been completed to within a short distance of Guadalajara and will be completed by spring. The proposed line will have easier grades than the Mexican Central, and will make a short and direct route from the United States border to Guadalajara. It is hoped to have the new line completed before the new line of the Southern Pacific reaches Guadalajara.

Milwaukee & Fox River (Electric).—Incorporated in Wisconsin with $25,000 capital by J. M. Seaman, of Sheboygan; G. Bricknauer, J. B. Connell, H. W. Wilson, F. Phillips, A. J. Pullen and others. The company proposes to build an electric line from Cedarburg, Ozaukee County, on the Chicago, Milwaukee & St. Paul, north, following the lines of the Chicago & North-Western and the St. Paul roads through Sheboygan and Calumet counties to Chilton; thence to Kaukauna and Appleton, in Outagamie County, about 80 miles. A branch is also to be built southwest from Chilton along the east shore of Lake Winnebago to Fond du Lac, 30 miles, where connection will be made with the Milwaukee Northern.

Mineral Belt.—This company was recently to hold a meeting at Florence, Ala., to authorize an issue of bonds to secure funds for building its proposed line from Florence to Manning, Tenn., about 15 miles. T. H. Allen of Florence is interested.

Missouri, Kansas & Texas.—The line from Trinity, Tex., to Colmesneil, 75 miles, will be extended northeast to Shreveport, La., 125 miles, where a connection is to be made with the eastern division of the road. Surveys are now being made. It is also planned to build west from Trinity to a connection with the Austin & Smithville division at Granger, 200 miles.

New Orleans, Crowley & Western.—Surveys, it is said, are being made by this company for a new route into New Orleans. It is believed that this company, projected from New Orleans to a connection with the M., K. & T. in Texas, and the Louisiana Central, under construction from Monroe, La., south to New Iberia, were organized for the purpose of surveying a route into New Orleans, and possibly building all or a part of a line into that city, with the intention of selling out to the Kansas City Southern. The Louisiana Central is said now to have abandoned its work, which seems to mean that the New Orleans, Crowley & Western has won in its efforts to have the Kansas City Southern adopt its route into New Orleans in preference to that offered by the Louisiana Central.

New York Central & Hudson River.—This company is planning a two-track subway under West Fifty-third street, New York City, to connect the present Park avenue tunnel with the proposed subway under Eleventh avenue. Such a connection, if built, would allow some Hudson division trains to be run by this route from Spuyten Duyvil to Grand Central Station and so relieve the Park avenue tunnel.

Oklahoma, Texas & Gulf.—This company is being organized with headquarters at Clarendon, Texas, to build a line from Clarendon, Texas, on the Fort Worth & Denver City, east through Oklahoma and Indian Territory to Nashville, Ark., on the Arkansas & Louisiana, about 350 miles. The promoters include F. B. Wildman, of Blair, Okla.; E. A. Williams, of Roosevelt, Okla.; C. A. Huber, of Weatherford, Okla.; R. K. Wooten, of Chickasha, Ind. T.; J. W. Buchanan, of Van Buren, Ark.; R. Burge, Felix P. Both and L. B. Comer, all of Fort Worth. It is said that this is a Rock Island-Frisco project.

Orford Mountain.—This company, operating 50 miles of road from Eastman, Que., has made application to Parliament for an extension of time to complete an extension of its Bolton branch 10 miles. Grading has been completed for six miles.

Pennsylvania.—Improvements on the Pittsburg division of this road, between Altoona and Pittsburg, to cost about $1,750,000, were

recently authorized by the Board. At Greensburg the improvements include cutting out the tunnel and the construction of overhead bridges at street crossings, so as to make a four-track line.

Pennsylvania Roads (Electric).—A new syndicate is reported formed to build an electric line from Pittsburg down the Ohio river on the west side, with a branch up the Beaver Valley to Newcastle. This line will compete with the Beaver Valley system of the Philadelphia company. Connection is proposed at Newcastle with the Sharon & Newcastle electric line. The names of the promoters are not given.

Pittsburg & Northeastern.—See Buffalo & Susquehanna.

Quebec, Montreal & Southern.—See Delaware & Hudson.

St. Joseph, Savannah & Northern.—Incorporated in Missouri with $300,000 capital, and office at St. Joseph, to build a line from St. Joseph north to Savannah, in Andrew County, about 15 miles. The incorporators include T. B. Campbell, M. Tootle, F. J. Wheeler and others, of St. Joseph.

San Francisco, Idaho & Montana.—This company, which proposes to build a line from Butte, Montana, to San Francisco with a branch from Caldwell to Winnemucca, Nev., has completed surveys from Caldwell to Homedale, Idaho, 16 miles, and has surveys under way from the latter point to Winnemucca, 180 miles. It is expected to start construction work early next spring. Donald Grant, Faribault, Minn., is President.

Schenectady & Southwestern.—See Delaware & Eastern.

Sierra Pacific.—A holding company, the Sierra Pacific Company, has been incorporated in California with a capital stock of $200,000. This road is to be built from Globe, Tulare County, Cal., southwest to Port Hanford, 193 miles from Globe, with branches aggregating 280 miles. The railroad company's first block of $1,000,000 of 6 per cent. preferred debenture stock was greatly over-subscribed, and another million has since been taken up. The company is now about to sell 6 per cent. 40-year, first mortgage gold bonds to complete the road. The road will be laid with 70-lb. and 80-lb. rails, and will have pressed steel passenger cars electric lighted. Several new towns will be created by this company, at one of which, Ellisvale, shops will probably be built. The company intends to build a line from Globe, Cal., the proposed eastern terminus, to a point in Nevada, where connection will be made with the Western Pacific. Surveys have been made through the Sierra Nevada mountain range and a favorable route selected. It is proposed to build also to Los Angeles, the capital stock of the road to be increased. The President of the company says that English capital has been interested in this addition to the project, and that the company will issue 30-year bonds to cover this addition, most of these bonds being already negotiated for. (Oct. 12, p. 99.)

Springfield, Wilmington & Cincinnati (Electric).—Incorporated in Ohio, with $3,000,000 capital stock, by George F. Parmalee, Frederick Gargenhire, William C. Morton, Gustav Von Den Steinen, Richard Ingliff, Julian W. Tyler and Horace Andrews. The company proposes to build an electric line connecting Springfield, Ohio, with Cincinnati, traversing the counties of Clark, Greene, Clinton, Warren and Hamilton, with a branch from the main line, in Greene County, to Xenia. The headquarters of the company are at Springfield.

Sumpter & Choctaw.—This company, which is owned by the Allison Lumber Company, of Bellamy, Ala., and operates a line 17 miles long from that place to Temopolis, has extended its road south to Witfield. The company is planning to extend the road an additional five miles south into Choctaw County.

Vancouver, Victoria & Eastern.—See Great Northern.

Wabash.—An officer writes regarding the double-track work on this road, that the company expects to build about 30 miles of track each year until the entire line is double-tracked between St. Louis and Chicago. Plans are also being made to double-track portions of the Detroit division aggregating about 30 miles, and to straighten the line on the Moberly division.

Washington & Great Northern.—See Vancouver, Victoria & Eastern.

Yankton & Southern.—Incorporation has been asked for by this company in South Dakota with $100,000 capital to build a line from Yankton, S. Dak., south to Galveston, Tex. The offices of the company are to be at Yankton and at Cincinnati, Ohio. The incorporators include Robert J. Gamble and W. J. Frantle, of Yankton; J. Lowman, T. R. Paxton, F. Hill, W. C. Proctor and others, of Cincinnati, Ohio.

## RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Gross earnings for the month of October, 1906, were $7,321,458, an increase of $467,666; net earnings $2,635,771, an increase of $93,790.

Chattanooga (Tenn.) Railways.—The first quarterly dividend of 1¼ per cent. on the $1,000,000 5 per cent. preferred stock has been declared, payable December 1 to shareholders of record on November 15. The company was organized last April as a consolidation of all the street railways in Chattanooga.

Chicago, Milwaukee & St. Paul.—According to press despatches from Chicago, this company has incorporated in New Jersey an express company with $30,000,000 capital stock, which is to operate over the C., M. & St. P. lines after the present contract with the American Express Co. expires on January 1, 1908.

Cleveland, Cincinnati, Chicago & St. Louis.—The $10,000,000 new stock authorized last October is to be offered on December 15 at 90 to the holders of the present $40,000,000 outstanding common and $10,000,000 outstanding preferred stock to the extent of 20 per cent. of their holdings; the privilege of subscribing terminates on January 15.

Great Northern.—An official announcement was made on November 22, stating that the Board of Directors had authorized the Lake Superior Company to transfer the iron ore properties, which have been leased to the United States Steel Corporation, to Lewis W. Hill, James N. Hill, and Walter J. Hill, Trustees, to be held by them for the benefit of the stockholders of the Great Northern. The beneficial interest will be divided into 1,500,000 shares, certificates of which will be distributed at the rate of one share for every share held to holders of the $150,000,000 Great Northern stock. The profits accruing from the rental of the ore lands are to be distributed at least once a year by the trustees to the holders of these certificates. (Oct. 12, p. 100.)

Interborough Rapid Transit.—The New York Stock Exchange has listed $4,800,000 capital stock of the Manhattan Railway, making the total outstanding $60,000,000, which is the amount authorized. The Manhattan Railway owns all the elevated railroads in the Boroughs of Manhattan and the Bronx, New York City, 38 miles, and is leased to the Interborough Rapid Transit, which guarantees 7 per cent. per year on the stock. It is understood that the proceeds from the sale of the recent issue are to be used for improvements.

Kansas City Southern.—Gross earnings for October, 1906, were $778,917, an increase of $146,646; net earnings $328,284, an increase of $166,118. Gross earnings for the four months ended October 31, 1906, were $2,843,868, an increase of $564,118; net earnings $1,050,042, an increase of $555,480.

Manhattan Railway.—See Interborough Rapid Transit.

New York & Port Chester (Electric).—See New York, Westchester & Boston.

New York, Westchester & Boston (Electric).—According to New York newspapers, control of this company has been bought by Oakleigh Thorne and Marsden J. Perry, who, it is said, also control the New York & Port Chester. The routes of the two lines are parallel and close together and the companies have been opposing each other for some time. The New York, Westchester & Boston is to run ultimately from 129th street and the Harlem river, New York City, north and east to White Plains. Work has been under way from 177th street north. The New York & Port Chester has franchises for a four-track line through the Borough of the Bronx, New York City, and has other franchises in towns along its route which, as stated above, parallels the New York, Westchester & Boston. Some construction work has also been done in connection with this line.

Pennsylvania Company.—The New York Stock Exchange has listed $20,000,000 4 per cent. 15-25 year collateral trust bonds, issued by the Pennsylvania Company and guaranteed by the Pennsylvania Railroad. The collateral was originally secured on $10,000,000 Baltimore & Ohio common stock, $14,000,000 Pittsburg, Cincinnati, Chicago & St. Louis common stock, and $4,000,000 Vandalia stock. Acting on an option held under the deed of trust, the company on July 17, 1906, withdrew the Baltimore & Ohio common stock and substituted other collateral, so that the bonds are now secured by the following stock:

| | Par. | Appraised value. |
|---|---|---|
| Pitts., Cin., Chic. & St. Louis, common stock | $14,000,000 | $11,340,000 |
| Vandalia, stock | 4,000,000 | 3,400,000 |
| Bald Eagle Valley, stock | 765,000 | 1,912,500 |
| Cumberland Valley, common stock | 975,800 | 2,146,760 |
| Cleveland & Pittsburg, betterment stock | 2,216,500 | 2,305,160 |
| West Jersey & Seashore, common stock | 3,660,100 | 4,538,524 |
| Philadelphia, Washington & Baltimore, stock | 500,000 | 500,000 |
| Total | $26,117,400 | $26,142,944 |

Gross earnings for the year ended June 30, 1906, of the Pennsylvania Company, which operates the Northwest system of the Pennsylvania Lines West, were $42,083,766; net earnings $11,535,973. The net income was $5,711,090, out of which were paid $1,656,623 for sinking funds, an annual dividend of 5 per cent. in December, 1905, on $40,000,000 stock, and a semi-annual dividend in June, 1906, of 3 per cent. on $60,000,000 stock. The surplus for the year was $254,466.

# GENERAL NEWS SECTION

## NOTES.

The Erie engineers and firemen have reached an agreement by which wages are to be advanced.

Freight trainmen on the Philadelphia & Reading have been refused their demand for a 10-hour day.

The Texas & New Orleans, according to a press despatch from Houston, Tex., has increased the pay of switchmen four cents an hour.

The New York Central firemen have received an increase of 10 per cent. in pay. The engineers have also been granted an increase. Committees of the trainmen and conductors are now conferring with the management.

The Richmond, Fredericksburg & Potomac and Washington Southern have granted an 8 hour day to all trainmen. For freight conductors there has been a 12 hour day, but all time over 8 hours is now to be paid for as overtime.

The New Orleans & Northeastern, Alabama & Vicksburg and Vicksburg, Shreveport & Pacific have increased the wages of 800 agents, clerks, engineers, firemen, conductors and trainmen, effective in some cases from October 1 and in others from November 1.

Announcement is made that the Lackawanna will increase the wages of employees in the traffic department of its ferry service from 8 to 20 per cent., the increase taking effect on December 1. The company is to extend the 10 hour day privilege, already granted to engineers and switchmen, to all trainmen.

Over $1,000,000 worth of granite awaits shipment from the quarries at Barre, Vt., said to be held up on account of scarcity of freight cars.

A new steamship line has been established between New York and Odessa in European Russia. The first steamer arrived in New York on November 24.

It is reported that in addition to the 30 miles of the Rochester division of the Erie on which electrification work is now under way, the road has decided to electrify 70 miles more in the same territory.

There is a newspaper report that a charter has been procured by Boston capitalists for a great railroad terminal at Pittsburg to cost between 15 and 20 million dollars, and a belt route from Economy on the north to McKeesport on the south.

A conference has been held between a joint committee of aldermen of Minneapolis, St. Paul, Duluth and Superior and the General Manager of the Twin City Rapid Transit Company in regard to reduced fares on the surface lines in these cities.

It is estimated that damages from recent floods in Shelby County, Tenn., will approximate $250,000. Fourteen county bridges and nine miles of levees are reported destroyed, and railroad traffic has been impeded and practically suspended on several lines.

The Texas Pipe Line Company, of which J. S. Cullinane is president, and which has by many been classed as a Standard Oil concern, has increased its capital stock from $6,000,000 to $12,000,000. It is said that the new capital has been over-subscribed in New York.

Judge Holt in the United States Circuit Court has imposed a fine of $18,000 upon the American Sugar Refining Company, which was recently convicted of accepting $26,000 in rebates from the New York Central. The defendant was given 60 days in which to prepare papers for an appeal.

The Aurora, Elgin & Chicago electric line is to do an express business out of Chicago making its charges about half that of the express companies operating on the steam routes. As it has not been able to procure a franchise in the city of Chicago for this traffic, express matter will be hauled to an out-of-town point by automobiles.

As Engine No. 634 of the Lehigh Valley, hauling a train of empty coal cars, was rounding a curve near Drifton Breaker, November 25, it plunged into an open bridge and fell 30 feet, leaving the train intact on the bank. The bridge at this point had been undergoing repairs the past week, a fact that had been overlooked by some one.

The Interstate Commerce Commission has officially announced that it is unable to make the rule that the sum of local rates shall be through rates. When complaints are made, however, the fact that the sum of the local rates is lower than the through rate will be treated as *prima facie* evidence that the through rates are excessive and unreasonable.

The new 10,000-ton steamer "Momus," one of the new boats for the Morgan Line to be put in service by the Southern Pacific between New York and New Orleans, is to make her first trip to New Orleans on December 12. She is now receiving her final equipment at the Cramp shipyards in Philadelphia.

A passenger train bound from Denver to Fort Worth over the Colorado & Southern and Fort Worth & Denver City arrived at Fort Worth on Saturday, November 24, one week after leaving Denver, having been delayed by snowstorms in thinly settled parts of the Texas panhandle. Harrowing experiences are reported as the passengers were unable to obtain food. The snow was seven feet deep in places.

### A Summary of Railroad Operations for 1906.

The preliminary report of the Interstate Commerce Commission on the income account of the railroads of the United States for the year ending June 30, 1906, contains returns for companies operating 220,028 miles of line, including line operated under trackage rights, or about 99 per cent. of the mileage that will be covered by the final report. The total gross earnings of the roads shown in this report were $2,319,760,030, being equivalent to $10,543 per mile. Passenger earnings $618,555,934, or $2,811 per mile; freight earnings $1,640,942,862, or $7,458 per mile. Operating expenses were $1,532,163,153, or $6,963 per mile; net earnings were $787,596,877, being $3,580 per mile, and nearly $97,000,000 more than the corresponding amount reported for the previous year. The amount reported as income from sources other than operation was $132,624,982. This amount includes a few duplications. Adding this amount to net earnings from operation gives $920,221,859. Against this amount were charged as interest, rents, betterments, taxes and miscellaneous items the sum of $590,386,554, and as dividends the sum of $229,406,598, leaving a surplus for the year of $100,428,707. The taxes paid during the year were $68,903,288. The final report for the year ending June 30, 1905, showed a surplus of $89,043,490. The amount of dividends declared in 1906 was $34,248,605 more than that shown for the dividends of practically the same roads in 1905. This preliminary report relates to operating roads only, and does not include the statement of any dividends paid by leased lines from the income they received as rent. The dividends declared by the subsidiary leased lines for the year 1905 were about $35,750,000.

### Wind Blows Passenger Train from Track.

A press despatch from Nederland, Colo., states that on November 15 the wind blew a hurricane, and a train on the Switzerland Trail Line of the Colorado & Southern was carried off the rails while crossing a trestle four miles from Cardinal. That all on board were not killed is considered a miracle. The train was made up of one passenger coach and three freight cars and only the fact that they were traveling at a good rate saved the train from being hurled into the gulch, which would have meant certain death to all. After being derailed, the engine dragged the cars into a cut just off the bridge, where the passenger coach overturned. For a time it was feared that the car would take fire from the heating stove, but the trainmen succeeded in beating out the flames before they had gained any headway.

### Two-Cent Fares in Canada.

A test case for the purpose of enforcing the provision of the railroad act providing for the carrying of passengers by third class carriages at two cents per mile was brought against C. arles M. Hays, general manager of the Grand Trunk Railway, before a police magistrate at Toronto, on November 21. The charge was laid under the provision of the criminal code naming a penalty for any infringement of the railroad act not provided for by the act itself. The facts of the case were not disputed. The Grand Trunk admits that it does not run third class carriages at the rate of two cents per mile, but claims that the law is inoperative and that the police magistrate has no jurisdiction as the railroad act provides a remedy for any infringement by a civil suit for damages. It was arranged that counsel should draw up a stated case for submission to the Court of Appeal, the magistrate making a nominal conviction.

### Proposed Extension of Peruvian Railroad.

Halbert S. Kerr, chief engineer of the Cerro de Pasco in Peru, one of the highest railroads in the world, states that it is probable that the Cerro de Pasco will be extended some 250 miles eastward to connect with the navigable waters to the east coast of South America. A proposition is under consideration to secure government aid in extending the line. This would open up a vast territory in Peru, which has wonderful possibilities for wealth hitherto undeveloped because of a lack of transportation facilities. The pro-

posed line will run through a great agricultural country and also will open up a large expanse of timber lands. Present conditions in Peru are such that with the west slope of the Andes practically without timber the supply of the country is being shipped from the United States. On the east slope of the mountains timber is plentiful. The Cerro de Pasco leaves the Peruvian Central at Arroyo, and runs east 125 miles, through a highland valley, with a branch to the coal properties of the company. The lowest point on the railroad is 12,200 ft. above sea level and the highest 14,800 ft., while the average elevation of the road is 13,700 ft. On the Peruvian Central, which is 132 miles long, there are 52 tunnels, and 75 per cent. of the road was built through very heavy rock. This road was expensive to build, but work on the Cerro de Pasco was much easier. The principal difficulty was with marsh ground and peat beds, unexpected at such an altitude, but difficult to overcome. The construction of the coal branch was through a rugged country and on heavy grades.

### Fast Run on the Panhandle.

A special train carrying members of a theatrical company, consisting of one sleeper, one coach and two baggage cars, made a run from Pittsburg to Chicago over the Panhandle (Pennsylvania Lines West, Southwest System) on November 18, 507 miles in 10 hours and 52 minutes, which is at the rate of 46.7 miles an hour. The Pennsylvania Special, which runs over the Pittsburg, Ft. Wayne & Chicago (Northwest System), makes 468 miles by that route regularly at 50.1 miles an hour. The fastest regular train by the Panhandle route makes the run from Pittsburg to Chicago in 15 hours and 30 minutes.

### An Unsuccessful Train Robbery in Missouri.

A lone robber, masked and armed, robbed 20 passengers in three cars of the eastbound Chicago & Alton-Burlington passenger train No. 24 from Kansas City to St. Louis on the morning of Nov. 26 between Slater and Armstrong, Mo., and was then captured single handed by the conductor of the train. The robber boarded the smoking car as the train was pulling out of Slater shortly after midnight, relieved the passengers in that car of their valuables, got off the train at Glasgow, the next station, 25 minutes later and boarded the chair car, where he pursued the same tactics. After cleaning up the chair car he started through a sleeping car, but at this minute the conductor appeared and instead of throwing up his hands at the robber's command, knocked the revolver from the man's hand and threw him to the floor. At Armstrong, which was reached at 12.50 a.m., the robber was handed over to the authorities and taken into the station, where he remarked freely on the cowardice of the passengers and commended the nerve of the conductor. He was recognized as the same man who robbed a Rock Island train on November 9 and escaped.

### Manila Railway Company.

Work has begun on the 400-mile railroad system which the syndicate recently formed by Speyer & Co., New York, plans to build in the Island of Luzon, P. I. A contract for 10,000 tons of 65-lb. rails has been awarded to the Lackawanna Steel Company. The only existing steam railroad in the Philippines was originally built and operated by the Manila Railway Company between the capital city and Dagupan. It was backed by British capital. About two years ago, however, a controlling interest in the concern was secured by the Speyer interests through whom negotiations with the insular government were carried out for the building of the new lines now under way. According to the concession the syndicate agrees to build some 428 miles of road in Luzon, including about roughly 100 miles in Albay and Ambos Camarines, the line from Manila to Batangas and Lucena with branches and several branches from the existing line of the Manila and Dagupan, branching to the east and to the west and including a line from Dagupan to San Fernando de la Union and a branch to the foot of the mountains within a few miles of Baguio.

No guaranty is asked on any of this construction. While the rates are to be based on those now enjoyed by the Manila & Dagupan, the government has the power to regulate them at any time. The existing Manila & Dagupan and all its branches give up their franchises, withdraw any claims which they may have against the municipal, provincial or insular governments, or the government of the United States, and come in under the new charter on exactly the same basis on which the new lines go in. The concession is perpetual. No mention, however, is made of competing lines, the government being free to grant franchises for such lines at any time. The company is to be taxed one-half of one per cent. on the gross earnings for 30 years; one and a half per cent. for the ensuing 50 years, and thereafter the rate is to be fixed by the government.

The concessionaires have the privilege of importing free of duty all material, etc., necessary to the carrying out of the projects. The gage of the lines will be 42 in. The President of the new company is Richard Schuster, who is a member of the firm of Speyer & Co., and the General Manager is Horace L. Higgins, who has for several years past held that position on the old Manila Railway Company.

### A New Lining-Up Jack.

A new lining-up jack, combining lifting and traversing features, all worked by one interchangeable lever, is illustrated herewith. It consists of a traversing base and the jack proper. The base has a handle at one end and may be carried separately. Another handle in the form of a spur, near the top, is to carry the jack and place it in position. In lining-up, enough earth is removed from between the ties to allow the base to slide under the rail and form a firm, level foundation. The jack, being slid into the grooves of the base, is then brought up so that the foot rests under the base of the rail.

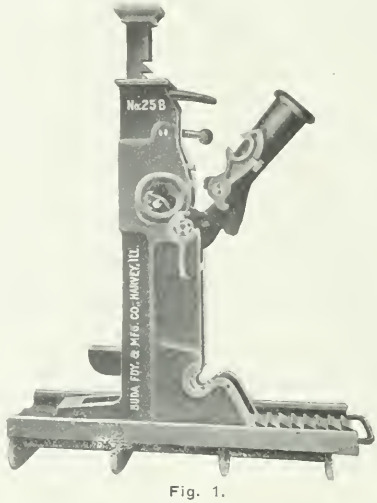



Fig. 1.

The rail is lifted by using the lever with its fulcrum resting in the upper sockets (Fig. 1), and the lifting should continue only until the ties are loosened from the earth and not far enough to allow cinders and gravel to fall under the ties. When the proper height has been reached, the lifting bar, or rack, is held in this position by a dog moved from the outside by a lever at the top of the frame on the right-hand side. When this is set, the lever is taken out and reversed and fitted into the lower sockets (Fig. 2), allowing the pawls to fall into the rack that extends along the center of the base. The track is then powerfully forced into proper line. Slightly

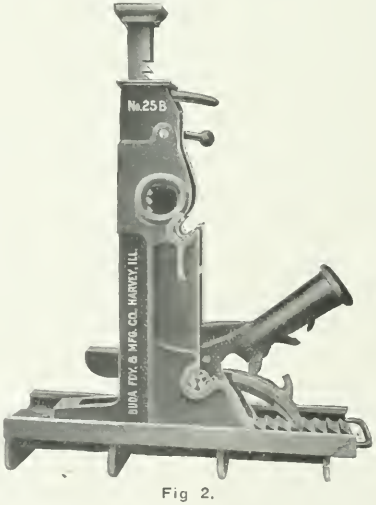



Fig 2.

loosening the ballast at the end of the ties makes this easier, though this is not absolutely necessary because of the capacity of the jack and powerful leverage obtained.

The jacks are used in pairs, one being placed on the outside and one on the inside of the rails. They are useful for newly laid or ballasted track, and it is also claimed that they will be found particularly valuable during the months when the section force is cut down. It needs six to eight men, with lining bars, to line up track. When the section force is very small, work of this nature

is apt to be neglected, and when the track gets in such bad shape that alinement cannot be further delayed, men must be brought from other sections to do it. But with a pair of these lining-up jacks it is claimed that the foreman and one man may go out on a hand car and line up the track where necessary as easily as they now tighten bolts. This also applies to branch lines at all seasons.

While intended primarily for lining-up, the jack may also be used for replacing cars and for general wrecking purposes. Also it may be used without the base for purposes like the ordinary ratchet jacks. Its capacity is 12 tons. It is made by the Buda Foundry & Manufacturing Co., Chicago.

### Mallory Steamship Company.

The gross earnings of the Mallory Steamship Co. for ten years ended January 31, 1906, were $19,500,000, and the net earnings $3,925,000. The net earnings have shown a remarkable increase in the past four years, advancing from $450,000 in 1902 to $646,000 for the year ended last December, a gain of $200,000 or 44 per cent. in four years.

The net earnings of the company for the last five years have been as follows:

| | |
|---|---|
| 1901 | $450,000 |
| 1902 | 450,000 |
| 1903 | 481,000 |
| 1904 | 536,000 |
| 1905 | 646,000 |

The earnings represent the balance applicable to interest and dividends after liberal charges for maintenance and repair of steamers, wharves and equipment, which have averaged $250,000 yearly for the last five years.

The net earnings for 1906 will show a substantial gain over 1905, but whether it will be more than $100,000 it is too early yet to predict. Unlike the Eastern Steamship Co., the big earning months for the Mallory lines come in the last quarter of the year, when the heavy freight movement takes place from southern ports north. Some idea of the development of the business this year may be gained by comparison of the gross business for the first nine months of 1906 with the same period last year.

Nine months:

| | 1906. | 1905. | Changes. |
|---|---|---|---|
| Gross earnings | $2,040,000 | $1,812,000 | Inc. $228,000 |

The Mallory lines have been in operation since 1866, when the firm of C. H. Mallory & Co. was formed. Galveston, Mobile, and other southern ports were chosen for the field of operation. The first steamers of the company had a cargo capacity of 800 bales of cotton each, which contrasts with the 11,000-bale capacity of the "San Jacinto," the largest coastwise steamer in the United States (excluding the boats to Cuba and the new Morgan boats not yet in commission). The Mallory lines operate but eleven steamers, but they are all of large dimensions and capacity, and are splendidly fitted up for tourist travel. The eleven Mallory boats have a combined capacity of over 40,000 tons.

The Mallory lines have open accounts with 50 railroad companies. Of the 500,000 bales of cotton moved annually by coastwise steamers through Galveston the Mallory gets by far the largest proportion.—*Wall Street Journal.*

The following officers of the Mallory company have just been elected: Calvin H. Austin, President; H. H. Raymond, General Manager; N. H. Campbell, Secretary and Treasurer, and C. D. Mallory, Assistant Secretary.

### The Pennsylvania Freight Traffic.

An officer of the Pennsylvania is quoted as follows in a Philadelphia paper:

"It is almost impossible to say what car shortage exists on the Pennsylvania because of the daily increasing amount of traffic. The demand for more cars comes from every part of the system. There does not seem to be an unusual amount of business in any one, but in all commodities. I was in Erie last week, and the business interests of that section of the State are flourishing as never before. The shipments of iron and steel products are heavy, but they are not out of proportion to the great quantity of general merchandise being shipped to the west and south. The general belief is that this business is not only going to keep up, but will increase during the next year. Railroad officers throughout the country feel confident that the general prosperity will continue. The railroad rate bill is working out as well as we can expect, and its provisions are of benefit to railroad and shipper alike."

### Gently Retroactive.

The Interstate Commerce Commission, deciding an inquiry of the Illinois Central Railroad, holds that land and immigration agents, unless they are bonafide and actual employees of carriers, are not within the excepted classes specified in the free-transportation clause of the law and that providing transportation for such agents free or at reduced rates over lines of such carriers is, and *since the Act was originally passed has been, unlawful.* The ruling in Tariff Circular No. 5A is reaffirmed.

### The Danville Car Company.

The Danville Car Co. has been organized with a capital of $250,000. A large tract of ground on the outskirts of Danville, Ill., has been acquired and new shops will be erected. The contract for the erection of the plant has been awarded to H. F. Vogel & Co., St. Louis, Mo. The erecting shop for railroad and electric cars will be 240 ft. x 320 ft., built of brick, with a 100 ft. transfer table at one end. The woodworking shop will be 60 ft. x 180 ft., the cabinet shop 60 ft. x 120 ft., varnish room 60 ft. x 120 ft. and the engine room 60 ft. x 120 ft. These buildings will all be wood. The blacksmith shop will be steel and brick, 80 ft. x 120 ft., the truck shop 60 ft. x 120 ft. and the machine shop 60 ft. x 120 ft.

The Illinois Traction System has tracks into the grounds at present and the Big Four and the Wabash are arranging to put in spurs. The plant will be driven by electric motors entirely. A large freight car repair shop will be put up and track space provided for a large number of freight cars. Also railroad specialties will be manufactured. It is expected to have the plant ready to repair cars by the first of February, 1907.

## TRADE CATALOGUES.

*Air Compressor Lubrication.*—The Joseph Dixon Crucible Co., Jersey City, N. J., has published a pamphlet with this title, dealing with the causes of ignitions and explosions in discharge pipes and air receivers, the theoretical and practical functions and value of Dixon Flake Graphite as an air cylinder lubricant, methods of feeding flake graphite, secondary advantages of graphite lubrication, and the use of this lubricant in rock drills.

*The Process of Concreting.*—This is the title of a booklet issued by the Universal Portland Cement Co., Chicago. It is a reprint of two chapters of "Concrete, Plain and Reinforced," by Taylor and Thompson. It gives rules and formulae for grades of mixtures suited to different purposes, as well as telling what tools to use, how to make forms, instructions for the methods of mixing and laying concrete and some approximate costs.

*Grinding Wheels.*—The Norton Company, successor to the Norton Emery Wheel Co., Worcester, Mass., is distributing a catalogue and price list of grinding wheels, oil stones and grinding machinery. The abrasive used is alundum, made by the company in electric furnaces at Niagara Falls, N. Y.

*Vises.*—The Pittsburg Automatic Vise & Tool Co. sends an illustrated catalogue and price list of "Pittsburg" automatic two way vises.

*Lamps.*—Catalogue No. 8 of the Dressel Railway Lamp Works, New York, illustrates different styles of semaphore and other signal lamps.

## Manufacturing and Business.

L. A. Wyman has been appointed to a position in the sales department of the Dayton Pneumatic Tool Co., with headquarters at Dayton, Ohio.

The T. H. Symington Co. have been given a contract by the Chesapeake & Ohio for supplying journal boxes for 2,000 50-ton coal cars, which are to be built by the Standard Steel Car Company.

M. G. Cervello, for five years engineer in the Hennebique Construction Co., Paris, France, and later with the Trussed Concrete Steel Co., Detroit, Mich., has been appointed Engineer for the Gabriel Concrete Steel Co., Detroit.

John R. Blakeslee, President of the Ajax Manufacturing Co., Cleveland, Ohio, died on November 9th. Mr. Blakeslee was born in Connecticut in 1843, and served in the Union army through the Civil War. In 1872 he went to Cleveland, Ohio, and organized the Ajax Manufacturing Co. at that place in 1894.

A. B. Gilbert has been appointed Advertising Manager of *Engineering-Contracting* and *Railway Maintenance and Structures*, published by the Myron C. Clark Publishing Co., New York. Mr. Gilbert was on the *Engineering News* for 12 years and for the last three years has been Assistant Business Manager of the *Railway Age*.

The directors of the Niles-Bement-Pond Co. have declared a stock dividend of 40 per cent. on the $5,000,000 outstanding common stock, payable January 2 to holders of record on November 30. Of the $3,500,000 additional common stock recently authorized $2,000,000 is to be issued as the above dividend, and the rest is to be sold to present stockholders.

The machine and erecting, boiler and tank shops in the locomotive shop of the Grand Trunk at Battle Creek, Mich., being built by the Arnold Co., Chicago, are under one roof, the building being 175 x 817 ft. and containing 25 erecting pits, nine boiler stalls, and nine tank stalls. The foundation work on this building is started. Other buildings of the locomotive department will follow shortly, as the intention is to complete the buildings of this department for operation before the end of 1907. Bids have been received for the boiler and forge shop of the Big Four at Indianapolis,

Ind., and the contract will be let shortly. Work on the power house, tank shop and the storehouse is being pushed rapidly. The roundhouse, power house, coaling pocket, cinder pits and sand house of the Kansas City Southern shops at Pittsburg, Kan., are nearing completion. The improvements will include a new 16-pit machine and erecting shop, a 30-ton yard crane, transfer table and reinforced concrete oil house. The Arnold Company has recently issued Bulletin No. 16, describing the Sedalia, Mo., shops of the Missouri Pacific.

### Iron and Steel.

The Mexican Central will shortly be in the market for about 15,000 tons of rails. Considerable bridge material will also be ordered.

## OBITUARY NOTICES.

Fred L. Pomeroy, Freight Traffic Manager of the New York Central & Hudson River, died in Brooklyn, N. Y., on November 26, of heart disease. Mr. Pomeroy was 50 years old.

Henry S. Mitchell, Superintendent of the St. Louis & San Francisco at Fort Scott, Kan., died at Fort Scott on November 17th. Mr. Mitchell was 46 years old and had been in ill health for several years. He began railroad work in 1875 as a messenger boy on the Missouri River, Fort Scott & Gulf. He soon went to the Kansas City, Fort Scott & Memphis as a telegraph operator, and then was made a clerk in the General Superintendent's office; he was later appointed chief clerk to the General Superintendent, and for one year was also Superintendent of Telegraph. In 1888 he was appointed Superintendent of the Western division, and in 1901 went to the St. Louis & San Francisco as Superintendent of the Northern division, where he remained until his death.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

At a meeting of this club to be held December 1 a discussion of P. A. Maignen's paper on Filtration by Messrs. Ledoux, Trautwine, Leffmann and Mebus will take place.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Cincinnati, New Orleans & Texas Pacific.*—Lawrence Maxwell, Jr., has been elected a Director, succeeding W. A. Garrett, recently resigned to become First Vice-President and General Manager of the Seaboard Air Line.

*Illinois Central.*—L. C. Fritch, who was recently appointed Assistant to the President, began railroad work in the engineering department of the Ohio & Mississippi, now part of the Baltimore & Ohio, in 1884. After being made Assistant Engineer, he was, in 1892, appointed Engineer of Maintenance of Way of that company and at the same time Chief Engineer of the Cincinnati & Bedford. Later in 1892, when the Ohio & Mississippi was absorbed, he was appointed Division Engineer of the Baltimore & Ohio. In 1899 he went to the Baltimore & Ohio Southwestern as Superintendent of the Mississippi division. He has been on the Illinois Central since February, 1904; at first he did special work for the Assistant General Manager and in 1905 was appointed Assistant to the General Manager, which position he held until his recent promotion.

L. C. Fritch.

*Missouri, Kansas & Texas.*—Adrian H. Joline, Chairman of the Board, has been elected President, succeeding F. N. Finney, resigned.

*St. Louis & San Francisco.*—C. R. Gray, Vice-President and General Manager, has been elected Second Vice-President. W. C. Nixon, General Manager, has been elected also Vice-President.

*Western of Alabama.*—See Atlanta & West Point

### Operating Officers.

*Chicago & Eastern Illinois.*—W. J. Jackson, General Superintendent, has been appointed General Manager, succeeding H. I. Miller, promoted. Mr. Jackson was born in 1859 at Toronto, Ont., and began railroad work in 1877 as a machinist's helper in the Grand Trunk shops at that place. The next year he was made freight clerk on the same road at Toronto, and in 1882 went to the Chicago & Grand Trunk as chief claim clerk at Chicago. Three years later he was made general freight foreman, and in 1890 was appointed assistant agent at Chicago. He went to the Chicago & Eastern Illinois in 1891 as assistant local freight agent at Chicago, and in 1893 was made local freight agent. He was appointed Assistant General Superintendent in 1899, and in 1903 was made General Superintendent, which position he has held until his present promotion.

W. J. Jackson.

*Cincinnati, New Orleans & Texas Pacific.*—Horace Baker, General Superintendent of the Southern district of the Missouri Pacific, has been appointed General Manager of the Cincinnati, New Orleans & Texas Pacific, succeeding W. A. Garrett, who resigned to go to the Seaboard Air Line.

*Jonesboro, Lake City & Eastern.*—A. N. Leitnaker, General Superintendent, has resigned.

*Mexican Central.*—The following changes in divisions have been made, effective December 1, 1906:

Mexico Division.—Mexico City to Balsas; Mexico City to San Juan del Rio, including the San Juan del Rio yard; Tula to Pachuca; Pachuca to Mexico City via Telles, and also the line Telles to Apulco, and Tepenacasco to Honey. J. J. Kertin, Superintendent, with office at Mexico City.

Aguascalientes Division.—San Juan del Rio to La Colorada, including the La Colorada yard; Guanajuato branch; Tepezala branch. J. H. Clegg, Superintendent, with office at Aguascalientes.

Torreon Division.—La Colorada to Jiminez; Dynamite branch; Gomez Palacio to Hipolito, but not including the Hipolito yard. R. I. Craig, Superintendent, with office at Jimulco.

Chihuahua Division.—Jiminez to Ciudad Juarez, including the Jiminez yard; Parral and Santa Barbara branches. W. T. Provence, Superintendent, with office at Chihuahua.

Monterrey Division.—Doña Cecilia to Hipolito, including the Hipolito yard. Charles Stich, Superintendent, with office at Monterrey.

*Missouri & North Arkansas.*—S. A. Nicholas has been appointed Superintendent, with office at Eureka Springs, Ark., succeeding E. O. Man, resigned.

*Missouri Pacific.*—See Cincinnati, New Orleans & Texas Pacific.

### Traffic Officers.

*Wabash.*—C. H. Stinson, chief clerk to the General Traffic Manager, has been appointed Assistant General Freight Agent, in charge of fast freight lines, succeeding F. E. Signer, resigned to go to the Wisconsin Central.

### Engineering and Rolling Stock Officers.

*East Broad Top.*—T. R. Schanks has been appointed Master Mechanic, succeeding Edgar Shellabarger, deceased.

*Macon, Dublin & Savannah.*—W. F. Milner has been appointed Engineer of Maintenance of Way and Structures, with office at Macon, Ga., succeeding W. C. Curd, resigned.

*Union Pacific.*—George F. Maitland has been appointed Resident Engineer of the Wyoming and Colorado divisions, with office at Cheyenne, Wyo., succeeding L. B. Merriam, resigned to go to another company.

### Purchasing Agents.

*South & Western.*—W. A. Starritt has been appointed Purchasing Agent, succeeding J. F. Johnson, resigned to go into other business.

## LOCOMOTIVE BUILDING.

*The Grand Trunk*, as reported in our issue of November 9th, has ordered 30 Richmond compound consolidation (2-8-0) type locomotives from the Locomotive & Machine Co. of Montreal for April and September, 1907, delivery, and 14 six-wheel switching (0-6-0) locomotives from the American Locomotive Co., to be built at Schenectady, for March and April, 1907, delivery. The specifications are as follows:

| Type of Locomotive | Consolidation. | Switching. |
|---|---|---|
| Weight on drivers | 184,800 lbs. | 139,500 lbs. |
| Total weight | 211,200 lbs. | 139,500 lbs. |
| Diameter of cylinders | 22½ in. & 35 in. | 20 in. |
| Stroke of piston | 32 in. | 26 in. |
| Diameter of drivers | 63 in. | 56 in. |
| Type of boiler | Ext. wagon top. | Straight. |
| Working steam pressure | 210 lbs. | ..... |
| Heating surface, total | 2,925.3 sq. ft | 1,920 sq. ft. |
| Tubes, No. | 353 | 264 |
| " material | Charcoal iron | Charcoal iron. |
| " outside diameter | 2 in. | 2 in. |
| " length | 15 ft. | 12 ft. 9½ in. |
| Firebox, length | 8 ft. 0⅞ in | 8 " 2½ " |
| " width | 6 " 3¼ " | 3 " 4⅛ " |
| " material | Steel. | Steel. |
| Grate area | 50.62 sq. ft. | 27.44 sq. ft. |
| Tank capacity, water | 7,000 U.S. gals. | 5,000 U.S. gals. |
| Coal capacity | 10 tons. | 8 tons. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Bell ringer | Grand Trunk standard |
| Boiler lagging | Consolidation—Wood and asbestos<br>Switching—Sectional magnesia |
| Brake-beams | Grand Trunk standard |
| Brake-shoes | Grand Trunk standard |
| Couplers | Washburn or Melrose |
| Headlights | Grand Trunk standard |
| Injectors | Hancock |
| Journal bearings | Grand Trunk standard |
| Piston rod packing | United States Metallic |
| Valve rod packings | United States Metallic |
| Safety valve | Star |
| Sanding devices | Hand |
| Sight-feed lubricators | Grand Trunk standard |
| Springs | Consolidation—Locomotive & Mach. Co. standard<br>Switching—Grand Trunk standard |
| Steam gages | Utica |
| Steam heat equipment | Gold |
| Wheel centers | Consolidation—drivers, cast-steel; others, iron<br>Switching—Cast-iron |

*The Boston & Maine* has ordered 10 simple consolidation (2-8-0) locomotives, 15 simple mogul (2-6-0) locomotives, 10 simple Atlantic (4-4-2) locomotives and 15 simple six-wheel switching (0-6-0) locomotives from the American Locomotive Co. The specifications are as follows:

*General Dimensions.*

| Type of locomotive | Consolidation. | Mogul. |
|---|---|---|
| Weight, total | 170,000 lbs. | 142,400 lbs. |
| Weight, on drivers | 148,000 lbs. | 122,800 lbs. |
| Diameter of drivers | 61 in. | 63 in. |
| Cylinders | 20 in. x 30 in. | 19 in. x 26 in. |
| Boiler, type | Radial stay; straight top. | Radial stay, extended wag. top. |
| " wkg. stm' pressure | 200 lbs. | |
| " number of tubes | 326 | 286 |
| " material of tubes | Charcoal iron, Worth Bros. | |
| " diameter of tubes | 2 in. | |
| " length of tubes | 16 ft. | 11 ft. 8 in. |
| Firebox, length | 102¾ in. | 108 1/16 in. |
| " width | 65¼ in. | 40⅜ in. |
| " material | Worth Bros. | |
| " grate area | 46.5 sq. ft. | 30.2 sq. ft. |
| Heating surface, total | 2,859.87 " | 1,893.2 " |
| Tank capacity | 5,000 gals. | |
| Coal capacity | 10 tons. | |

| Type of locomotive | Atlantic. | Switching. |
|---|---|---|
| Weight, total | 156,000 lbs. | 114,000 lbs. |
| Weight, on drivers | 85,000 lbs. | |
| Diameter of drivers | 79 in. | 51 in. |
| Cylinders | 19 in. x 28 in. | 19 in. x 24 in |
| Boiler, type | Radial stay, straight top. | |
| " wkg. stm. pressure | 200 lbs. | 160 lbs. |
| " number of tubes | 326 | 259 |
| " material of tubes | Charcoal iron, Worth Bros. | |
| " diameter of tubes | 2 in. | |
| " length of tubes | 16 ft. | 11 ft. |
| Firebox, length | 92 in. | 102 in. |
| " width | 65¼ in. | 33 in. |
| " material | Worth Bros. | |
| " grate area | 41.75 sq. ft. | 23.7 sq. ft |
| Heating surface, total | 2,893.0 " | 1,635.7 " |
| Tank capacity | 5,000 gals. | 4,000 gals. |
| Coal capacity | 10 tons. | 7 tons. |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Axles | Carnegie |
| Boiler lagging | Franklin magnesia |
| Brake-beams | Sterlingworth |
| Brake-shoes | Boston & Maine |
| Couplers | Tower |
| Headlights | Dewey |
| Injector | Hancock composite |
| Piston rod packings | Downing-Hayden Mfg. Co. |
| Valve rod packings | Downing-Hayden Mfg. Co. |
| Safety valve | Ashton |
| Sanding devices | Hanlon |
| Sight-feed lubricators (for all but switching) | Detroit |
| Springs | Railway Steel Spring Co. |
| Steam gages | American |
| Steam heat equipment (for Atlantic) | Consolidated |
| Tires—Driving wheel (for all but switching) | Midvale |
| " —Driving wheel (for switching) | Latrobe |
| " —Truck wheel (for all but switching) | Midvale |
| " —Tender wheel (for Atlantic) | Midvale |
| Wheel centers (for all but switching) | Midvale |

*The Canadian Northern* has ordered 10 ten-wheel (4-6-0) type locomotives, and 15 consolidation (2-8-0) type locomotives from the Locomotive & Machine Company of Montreal; 15 ten-wheel (4-6-0) type and 15 consolidation (2-8-0) type engines from the Canadian Locomotive Co., and 20 consolidation (2-8-0) type locomotives from the Canada Car & Foundry Co. for 1907 delivery.

## CAR BUILDING.

*The Tidewater* is in the market for 300 gondola cars of 100,000 lbs. capacity.

*The Grand Rapids & Indiana* is in the market for eight or ten passenger coaches.

*The Trinity & Brazos Valley* is asking bids on 200 flat cars of 60,000 lbs. capacity.

*The Boston & Maine* is reported to have ordered 1,000 box cars from the Pullman Company.

*The Chicago, Burlington & Quincy* will be in the market for about 3,000 freight cars in the near future.

*The Milwaukee Refrigerator Transit Co.*, Milwaukee, Wis., is reported as in the market for 200 refrigerator cars.

*The Chicago & Eastern Illinois* has ordered three buffet library cars and three chair cars from the Pullman Company.

*The Hocking Valley*, it is reported, has ordered 1,000 steel underframe gondolas from the Ralston Steel Car Company.

*The Manufacturers Junction Railway* is asking bids on six box cars of 60,000 lbs. capacity, and four flat cars of 80,000 lbs. capacity.

*The Georgia Railway & Electric Company*, Atlanta, Ga., it is reported, is about to order 25 street cars, of which nine will be semi-convertible.

*The La Crosse & Southeastern*, it is reported, has ordered three 36-ft. box cars of 50,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The Buffalo, Rochester & Pittsburg*, as reported in our issue of October 26, has ordered from the American Car & Foundry Co. 500 steel hopper cars of 100,000 lbs. capacity.

*The Canadian Northern* has ordered for 1907 delivery 1,500 box cars, 12 day coaches, six baggage cars and six mail and express cars from Rhodes, Curry & Co.; 100 flat cars, 200 stock cars, 15 cabooses, 16 day coaches, four baggage cars and four mail and express cars from the Crossen Car Mfg. Co.; 200 Hart convertible cars to be built by the Canada Car Co.; four day coaches, two parlor cars, three sleeping cars and two diners from the Barney & Smith Car Co. These orders include the cars reported in our issue of August 31st. The equipment is to be distributed to the Canadian Northern, the Canadian Northern Ontario, the Canadian Northern Quebec, and the Halifax & Southwestern.

*The Texas Company*, as reported in our issue of November 23, has ordered 275 steel underframe tank cars of 8,000 gallons capacity, weighing 80,000 lbs., and 25 steel underframe tank cars of 12,000 gallons capacity, weighing 100,000 lbs., from the American Car & Foundry Co., for September to November, 1907, delivery. The smaller cars will measure 28 ft. 1½ in. long, inside measurements; 33 ft. long, over all, and 82½ in. inside diameter. The larger cars will measure 33 ft. long, inside measurements; 37 ft. 10½ in. long, over all, and 93¼ in. inside diameter. Both types of cars will be 8 ft. wide over all. The special equipment includes:

| | |
|---|---|
| Bolsters | 3-10 in. web plates conforming to tank |
| Brake-shoes | Am. Car & Fdry Co. standard M.C.B. cast-iron |
| Brakes | Westinghouse Automatic |
| Couplers | M. C. B. Automatic cast-steel |
| Draft rigging | Friction draft gear |
| Dust guards | Bass wood or white pine |
| Journal boxes | M. C. B. cast-iron |
| Springs | M. C. B. Class "C" and "H" |
| Trucks | M. C. B. |

## RAILROAD STRUCTURES.

ABERDEEN, S. DAK.—The Minneapolis & St. Louis has plans ready for a brick passenger station 70 ft. x 100 ft., to cost $25,000.

ANTIGO, WIS.—The Chicago & North-Western is to put up a new station here to cost $25,000.

CANON CITY, COLO.—The Denver & Rio Grande has plans ready for a brick passenger station to cost $40,000.

COFFEYVILLE, KAN.—Work is to be started this year on a combined passenger and freight station for the Missouri, Kansas & Texas. The proposed structure will be of brick, two stories high, and will contain a passenger room 75 x 32 ft., freight room 60 x 32 ft., and baggage room 33 x 32 ft.

COVINGTON, KY.—The Louisville & Nashville will put up a new passenger station here.

KNOXVILLE, TENN.—The Southern Railway, it is reported, has given a contract to Borches, Waldrep & Co., of this place, to put up new shops, to cost $200,000.

MERRITTON, ONT.—A steel bridge is to be built by the Niagara, St. Catharines & Toronto Railway at this place.

MINNEAPOLIS, MINN.—According to local reports the Northern Pacific, the Great Northern, the Minneapolis, St. Paul & Sault Ste.

[illegible] and the Wisconsin Central will jointly construct new freight terminals at this place. Sixteen square blocks have been bought in the northwestern section of the city as a site for yards. Plans for this work have been under way for some time.

MONCTON, N. B.—Bids are wanted December 10th by L. K. Jones, Secretary of the Department of Railways and Canals at Ottawa, for putting up locomotive shops at Moncton for the Intercolonial Railway.

NEW YORK, N. Y.—The Board of Estimate and Apportionment has ordered the immediate buying of land in Manhattan at a cost of about $1,000,000, and in Brooklyn at a cost of $300,000, for approaches for the Manhattan bridge.

OMAHA, NEB.—An officer writes that the new shops to be put up by the Union Pacific at this place are to be built in the form of an L. The coach and cabinet shop portion is to be 21 ft. high from floor to bottom chord of roof truss, 178 ft. x 342 ft., and car repair shop portion 26 ft. 6 in. high, 150 ft. x 342 ft. The approximate cost of the building without equipment will be $200,000. The building is to have steel skeleton with brick walls. Contracts have been let to B. J. Jobst, of Omaha, Neb., for work above water line, and to J. W. Towle for pile driving. The balance of the foundation work has been done by the company's forces.

OTTAWA, ONT.—The Canadian Northern Ontario has been authorized to build four bridges over the outlet to Lake Couchiching.

PITTSBURG, PA.—The Wabash, it is said, is planning to replace many wooden structures with steel bridges on the West Side Belt and the Wheeling & Lake Erie roads, for which contracts are to be let shortly. The proposed bridges are to be made for two tracks, preparatory to double-tracking between Pittsburg Junction and Huron Junction, 124 miles.

ROANOKE, VA.—The Tidewater, it is said, has given a contract to E. Tatterson for putting up a freight house here, to cost $50,000.

TWO HARBORS, MINN.—The Duluth & Iron Range has given a contract to the Barnett & Record Company, of Duluth, for rebuilding its ore dock No. 5 at this place. The contract calls for the completion of the work by the opening of navigation next spring.

WICHITA, KAN.—The Missouri Pacific has started work on a roundhouse, car shops, repair, equipment and machine shops here.

WINNIPEG, MAN.—The city authorities are considering the question of putting up a steel bridge over the Red river to St. Boniface. Application has been made by the Canadian Northern for permission to build a roundhouse here.

A steel bridge is to be built over the Canadian Pacific tracks, to cost about $200,000.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ASTORIA & COLUMBIA RIVER.—See Corvallis & Eastern.

ATCHISON, TOPEKA & SANTA FE.—See Gulf, Colorado & Santa Fe under Railroad Corporation News.

BALTIMORE, FREDERICK & HAGERSTOWN (ELECTRIC).—A mortgage has recently been filed by this company with the Fidelity & Deposit Co. of Maryland to secure funds to complete its proposed electric road from Hagerstown to Baltimore, 78 miles. (May 18, p. 149.)

BEAVERTON & WILLSBURG.—Incorporated in Oregon with $75,000 capital by W. Crooks, H. T. Conner and others, of Portland. The company proposes to build a line from Beaverton, on the Oregon & California (Southern Pacific) northeast to Willsburg, East Portland, about eight miles. This is said to be a project of the Southern Pacific.

BESSEMER & LAKE ERIE.—In order to double the ore carrying capacity from Conneaut Harbor to the Pittsburg district an amount of $1,000,000, it is said, is to be spent to double track this road.

BUFFALO & LAKE ERIE TRACTION.—A consolidation of the Buffalo & Lake Erie Traction and the Dunkirk & Fredonia Railroad has been incorporated in New York under the above name with a capital of $4,070,000. The directors include Joseph B. Mayer, of Buffalo; Alexander Keogh, of New Rochelle; P. C. Shutrum and others, of New York City.

BURRS FERRY, BROWNDEL & CHESTER.—This company, organized last spring, has completed surveys from Rockland, Tex., east via Browndel for a distance of 56 miles, and has eight miles of road completed from Rockland to Aldridge. Contracts will soon be let for additional work. The proposed route is from Burrs Ferry, on the Sabine river in Newton County, west of Chester on the Missouri, Kansas & Texas, in Tyler County, about 80 miles. The road is ultimately to be extended from its eastern terminus towards Alexandria into a timber section of Louisiana. (See Construction Record.)

CANADIAN NORTHERN ONTARIO.—This road, which is part of the Mackenzie-Mann System, and was formerly known as the James Bay Railway, recently started train service on its new line from Toronto north to Parry Sound, 149 miles, providing an additional route for traffic from the upper lakes south to Toronto and the East. It is proposed to extend the line northwest to Sudbury, thence north into a mineral section on which work has already been begun. The road has many sharp curves and grades on the section north of Lake Simcoe. (See Canadian Northern Oct. 19, p. 106.)

CANANEA, YAQUI RIVER & PACIFIC.—This company has obtained a concession from the Mexican Government to build a line from a point on the Naco & Cananea railroad to Imuris on the Sonora railroad. The terms of the concession call for completion of the line within 18 months, and it grants to the company exclusive rights for 10 years to the traffic of the territory for about 20 miles on each side of the proposed line.

CHEWAHWAH VALLEY.—Incorporated in the state of Washington with $1,000,000 capital by H. F. Albers, of New York; T. E. Ellis and J. S. Jurey, of Seattle, and W. R. Woodward, of Leavenworth, Wash. The company proposes to build a line from a point on the Great Northern in Chelan County north to a point in the same county, about 30 miles.

CHICAGO & EASTERN ILLINOIS.—The work of double-tracking this road is to be pushed to completion. Only 52 miles remain to be double-tracked, the section from Tuscola southwest to Pana.

CHICAGO, IOWA & NORTHWESTERN.—This company proposes to build a line from Anamosa, Iowa, on the Chicago, Milwaukee & St. Paul, the Chicago & North-Western and the Chicago, Anamosa & Northern, northwest via Waterloo to Austin, Minn., about 160 miles, and thence into northwestern Minnesota to points not yet determined. To carry out this work it has incorporated the Empire Railway Construction Co., with office at Waterloo, Iowa, in which George E. Armstrong, Jr., William Bristol and G. H. Myers, of New York, are interested.

CHICAGO, MILWAUKEE & ST. PAUL.—Contracts are reported let to Michael Jennings, of Spokane, Wash., for building 150 miles of this company's proposed line from Whitehall, Mont., east to Harlowton, the base of operations being Jefferson Island. Work will begin as soon as men and material can be assembled. Much of this is heavy grading, together with the boring of a number of tunnels. The longest tunnel is to be 576 ft. long, and the shortest 160 ft. The contract calls for the completion of the work in 14 months.

CHICAGO, ROCK ISLAND & PACIFIC.—Surveys are reported being made by this company for a line from a point near Watanga, Okla., on its main line, northwest, about 60 miles, into Dewey County north of the Canadian river.

COLUMBIA RIVER & OREGON CENTRAL.—See Union Pacific.

COLUMBUS & SOUTHERN.—According to reports from Columbus this road has been bought by E. B. Bingham, of Toledo, representing New York and Philadelphia capitalists. The company operates 34 miles of road from Wyandotte, Ohio, on the Cincinnati & Muskingum Valley, south to South Bloomingville. It is the intention of the new owners to extend the road northeast to Lancaster, about 15 miles.

CORVALLIS & EASTERN.—It is reported that President A. B. Hammond, of this company and of the Astoria & Columbia River, announces that the C. & E. will be extended from its eastern terminus at Idanha, Linn County, Oregon, east across that state to a point on the Ontario river, probably at Ontario, and that the Astoria & Columbia River is to be extended from its southern terminus at Seaside south along the coast to a point in Tillamook County. These projects aggregate about 350 miles.

DELAWARE & EASTERN.—Train service was started on this road November 17. The line runs from East Branch, N. Y., on the New York, Ontario & Western northeast to Arkville on the Ulster & Delaware, 45 miles. (Nov. 23, p. 145.)

DETROIT, FLINT & SAGINAW (ELECTRIC).—The Detroit Trust Co. was recently appointed receiver of this 12 mile road, which runs from Saginaw to Frankenmuth, Mich. It is said that the line is to be extended to Flint, an additional 20 miles.

EASTERN TEXAS.—According to reports this company, operating a road 30.3 miles from Lufkin, Texas, west, is planning to build an extension from its present western terminus at Kennard west to Crockett, on the International & Great Northern, about 15 miles.

GREAT NORTHERN.—Construction work on the branch line from Wenatchee, Wash., northeast to Oroville, 140 miles, is to be begun next month, according to a statemenet of an officer of the road. While it is not said where the work will begin, it is stated that three contracts have been let between Orondo and Wenatchee, also from Oroville south. Wenatchee will be the base of construction for the southern end of the line.

GULF, COLORADO & SANTA FE.—Surveys are reported being made by this company for an extension of its Beaumont line from the

northern terminus at Center, Shelby County, Tex., north for a distance of 20 miles.

See same road under Railroad Corporation News.

GULFPORT & NORTHWESTERN.—Incorporated in Mississippi, with officers as follows: Edward Hines, of Chicago, President; E. F. Barthe, First Vice-President; A. McAlpin, Second Vice-President; F. A. Weyerhaeuser, of St. Paul, Minn., Treasurer; C. F. Wiehe, Secretary; S. J. Cusson, General Manager; V. A. Griffith, of Gulfport, General Counsel. The company proposes to build a line from Gulfport, on the Louisville & Nashville and the Gulf & Ship Island, northwest to Vicksburg, 175 miles. Contracts have been made with the Gulf & Ship Island for terminals at Gulfport and wharf privileges. Rights of way have been secured from Gulfport to Poplarville.

MALAD VALLEY.—See Union Pacific.

MINIDOKA & SOUTHWESTERN.—See Union Pacific.

NORTHERN PACIFIC.—Surveys are being made for a line from De Smet to St. Regis, in the Coeur d'Alene country, 72 miles, for the purpose of making material changes in the Coeur d'Alene branch, a portion of which is to be made the main line of the road. This line will be connected with the new line which has just been run from Paradise to St. Regis. It will make the main line about 28 miles longer than the present route, but there will be no heavy grades.

This company has completed laying double track from Fargo, N. Dak., east to Glyndon, Minn., and it is now in use. The company now has its line double-tracked from Casselton, N. Dak., east to Glyndon, 29 miles.

OKLAHOMA NORTHERN.—Incorporated in Oklahoma with $1,000,000 to build a line from Thomas, on the St. Louis & San Francisco, northwest to Taloga, 35 miles. The incorporators include A. A. Patterson, of Benton Harbor, Mich.; C. D. Nichols, of Oklahoma City; F. L. Black, of Taloga, and others.

OREGON & WASHINGTON.—See Union Pacific.

OREGON RAILROAD & NAVIGATION.—See Union Pacific.

OREGON, WASHINGTON & IDAHO.—See Union Pacific.

PEORIA RAILWAY TERMINAL.—Incorporated in Illinois with $1,000,000 capital to build a line from Peoria south through Pekin to a point in Tazewell County. The Board of Directors includes: T. A. Grier, F. H. Smith, H. F. Steele and William J. Jack, of Peoria, and W. J. Conzelman, of Pekin.

ST. JOSEPH & GRAND ISLAND.—This company is asking bids to build a branch line from Stouts, Kan., north to Highland, seven miles.

SAN SABA VALLEY.—This company, which was incorporated in Texas last summer, to build a line from Antelope Gap, on the Gulf, Colorado & Santa Fe, west to Crothers, 50 miles, has completed surveys from Antelope Gap to San Saba, 20 miles, and expects to begin construction work about the first of next year. W. S. Haywood, of Jefferson, Tex., is Chief Engineer. (June 15, p. 175.)

SOUTH OMAHA & WESTERN.—See Union Pacific.

SPRING, HAZEL & TRINITY RIVER.—This company has been organized in Texas to build a line from Spring, on the International & Great Northern, east to a point on the Trinity river, near Liberty. The company proposes to buy the 5½ miles of railroad and the rights of way of the Huik-Blain Lumber Co., from Hazel, on the Houston, East & West Texas, west to the San Jacinto river, which is to be extended to Spring; also east from Hazel to the Trinity river, traversing about 30 miles of timber lands. The office of the company is at Hazel, Montgomery County.

TECUMSEH & NORMAN TRACTION.—Incorporated in Oklahoma with $1,000,000 capital by S. P. Mitchell, G. C. Standford, M. H. Tennison and J. T. Butler, of Tecumseh, and G. Weed, of New York. The company proposes to build an electric line from Tecumseh west to Norman, about 40 miles.

TEMISKAMING & NORTHERN ONTARIO.—The Province of Ontario has again filed a request at Ottawa for a Federal subsidy of $6,400 per mile on new mileage for this road, which is being built from New Liskeard north 100 miles by the Ontario Government to a junction with the Grand Trunk Pacific at Abittibi.

THE MINNEAPOLIS & ST. PAUL SUBURBAN.—This company, which is a subsidiary of the Twin City Rapid Transit Co., has bought the Robbinsdale electric line, the last remaining independent line running out of Minneapolis, operating about 10 miles north and west of Minneapolis. A. S. Robbins, former owner of the line, had secured franchises from Anoka and Osceo, two prosperous towns of Minneapolis, and was about to extend the line. Its purchase by the Twin City Interests means greater extensions than originally planned. During 1907 several of the lines north and west of Minneapolis will probably be extended and improved.

TOLEDO & INDIANA (ELECTRIC).—Preliminary surveys have been completed by this company for its proposed extension from Bryan, Ohio, west to Waterloo, Ind., 30 miles; also for a branch line from Delta, Ohio, southwest via Napoleon to Defiance, an additional 30 miles.

TONOPAH & TIDEWATER.—This company, which is building a line from Ludlow, Cal., where a connection is made with the Atchison, Topeka & Santa Fe, north to Bullfrog, Nev., 170 miles, has opened the first 75 miles of its road from Ludlow to Front.

TOPLKA & NORTHWESTERN.—See Union Pacific.

UNION PACIFIC.—The annual report of this company issued on November 27th sums up construction work as follows: The mileage of the three railroads known as the Union Pacific Railroad and auxiliary companies at the end of the fiscal year was 5,664 miles, an increase of 76 miles. The Minodoka & Southwestern was opened for traffic in September, 1905, from Minodoka, Idaho, to Twin Falls, 59 miles. The projected route of this company extends across Snake river to a point on Salmon river, a total of about 85 miles. The Yellowstone Park Railroad from St. Anthony to Morrisville, Idaho, 16 miles, was opened for traffic in June, 1906. The projected route of this company from St. Anthony to the boundary of Yellowstone Park has a total length of 70 miles.

The following lines have been projected and are in course of construction by the following named companies or by companies organized in their interest:

Union Pacific.—A line from O'Fallon, Neb., to Northport, about 111 miles, all graded, and of which about 19 miles of main track are laid. A line from Stromsburg to Central City, Neb., about 23 miles, which will probably be completed about January, 1907, and which will considerably shorten the distance between points on the Manhattan and Beatrice branches and points west of Central City. A line from Thayer, Wyo., to the coal mines in Horse Thief Canon, about 12 miles, and a line from the Washington mine, Colorado, to Grant coal mines, about seven miles, will probably be completed by the end of the current calendar year.

Oregon Railroad & Navigation.—An extension of the Elgin branch from Elgin, Ore., to Joseph, about 63 miles, of which about 18 miles are graded. An extension of the St. Johns branch from St. Johns to a point near Troutdale, 20.15 miles, which will form a loop with the present main line to Portland; about three miles of this line are graded.

Malad Valley.—The remaining part of this line, from Garland, Utah, to Malad, Idaho, 31.83 miles in length, was completed during the year and put in operation July 1, 1906.

South Omaha & Western.—The construction of this double-track cut-off line from South Omaha to Lane, Neb., 11.6 miles, which will shorten the distance between South Omaha and Council Bluffs and points west of Lane 8.94 miles, is progressing.

Topeka & Northwestern.—This company was organized to build a line from Menoken to Marysville, Kan., about 70 miles. The line from Menoken to Onaga, Kan., about 38 miles, was opened for traffic February 5, 1906.

Columbia River & Oregon Central.—This company's line from Arlington to Condon, Ore., 45.31 miles, was leased to the Oregon Railroad & Navigation Company, July 1, 1906.

Oregon & Washington.—This company was incorporated to build the line from Portland, Ore., to Puget Sound, about 230 miles. The acquisition of ample terminal properties in the best locations is well advanced in both Tacoma and Seattle, and work on this line will be actively prosecuted when pending applications for the necessary municipal franchises shall be granted.

Oregon, Washington & Idaho.—Under an agreement for construction of a joint line with the Northern Pacific from Texas City, Wash., a point opposite Riparia on the Snake river, to Lewiston, Idaho, about 72 miles, the Oregon, Washington & Idaho was incorporated for the construction of this road. About 15 miles of main track are laid, about 32 miles additional are graded and the entire line will be completed during the next year.

Since the close of the fiscal year, additional companies have been incorporated. The cost of lines in course of construction, of other lines projected, and of additional equipment, will involve an outlay of about $50,000,000.

VALLEJO & NORTHERN.—Incorporated in California with $2,500,000 capital by Melville Dozier, Jr., and George S. Lackie, of Oakland, T. C. Gregory, of Suisun, and others, to build a line from Woodland, on the Southern Pacific, southwest via Winters, Vacaville, Fairfield and Napa Junction to Vallejo, in Solano County, 70 miles. The office of the company is to be at Vallejo.

VANDALIA.—The Board of Public Works of Indianapolis, Ind., has granted this company permission to lay 12 additional tracks at grade, across Belmont avenue, in addition to the eight tracks now in use. This is somewhat of a compromise as the railroad asked the city to vacate Belmont avenue, while the city wanted the railroad company to elevate its tracks.

Western & Gulf.—Surveys are being made and rights of way secured by this company, which was recently incorporated in Georgia to build a line from Hawkinsville to Americus and Dawson, about 85 miles. Contracts for construction work are to be let early next year. Crawford Wheatley, of Americus, is President. (Nov. 9, p. 130.)

Wheeling & Lake Erie.—According to reports from Pittsburg this company will spend $3,500,000 double-tracking its road between Pittsburg Junction and Huron Junction, 124 miles.

Yellowstone Park Railroad.—See Union Pacific.

Yosemite Valley.—An officer writes that operation on a 12-mile extension from Pleasant Valley southeast to Bagby was commenced November 15, making 48 miles now under operation. The company is also building an additional 30 miles, which it expects to have completed by March of next year.

## RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—See Gulf, Colorado & Santa Fe.

Atlanta, Birmingham & Atlantic.—The Brunswick Steamship Company, organized in the interest of the Atlanta, Birmingham & Atlantic, has begun service between New York and Brunswick, Ga., with the freight steamer "Satilla." A second steamer, the "Ogeechee," is to be put in service December 15, and early in 1907 two other steamers, the "Okmulgee" and the "Ossabaw." These four boats will run in a regular semi-weekly service. On January 5, the passenger steamer "Brunswick" will leave New York for Havana, Cuba, calling at Brunswick both going and returning, thereafter sailing semi-monthly. C. L. Dimon is Vice-President and General Manager of the Brunswick Steamship Company, with offices at 32 Broadway, New York.

Atlantic Coast Line.—See Macon, Dublin & Savannah.

Buffalo & Lake Erie Traction.—The Buffalo & Lake Erie Traction Company was formed on October 29 as a consolidation of the Buffalo, Dunkirk & Western and the Lake Erie Electric Traction, the last named company being a consolidation of the Lake Erie Traction Company and the South Shore Suburban Railway. The Dunkirk & Fredonia (Electric) has now been merged into the Buffalo & Lake Erie Traction Company, the capital stock of which has been consequently increased from $3,900,000 to $4,070,000. The Dunkirk & Fredonia owns about seven miles of track in Fredonia, New York.

Chicago, Indianapolis & Louisville.—The American Trust & Savings Bank, Chicago, is offering at 96½ and interest $1,500,000 first mortgage 4 per cent. bonds of 1956, of the Indianapolis & Louisville, which is building 60 miles of road as an extension of the main line of the Chicago, Indianapolis & Louisville from a point near Quincy in Putnam County, Ind., to Shirley Hill, in Sullivan County. The bonds are part of an authorized issue of $6,600,000 guaranteed principal and interest by the C., I. & L., which is to lease the line for 99 years, and the balance is to be issued for extensions and betterments at the rate of $30,000 per mile after the above 60 miles of road are built.

Cincinnati, New Orleans & Texas Pacific.—A semi-annual dividend of 2½ per cent. has been declared on the common stock. The last payment, in June, was 3 per cent. In 1905, 3 per cent. was paid in June and 2 per cent. in December. Previous payments were 2 per cent. in September, 1904, and 2 per cent. in December, 1903.

Consolidated (N. Y., N. H. & H. Electric Lines.)—This company has bought some 72 miles of trolley lines in northern Rhode Island and southern Massachusetts, including the Milford, Attleboro & Woonsocket Street Railway, operating 30½ miles of line, the Woonsocket Street Railway with 22 miles of line, the Providence & Burrillville Street Railway with 10 miles and the Columbian Street Railway (Pascoag), 9½ miles. All the stock, with small exceptions, of the latter three companies is taken over, and a controlling interest in the first named company.

Dunkirk & Fredonia (Electric).—See Buffalo & Lake Erie Traction.

Great Northern.—The shares, each representing one-1,500,000th part of the beneficial interest in the trust created to hold the Great Northern ore properties, have been quoted at from 88 to as low as 79½. (Nov. 23, p. 146.)

Gulf & Interstate.—See Gulf, Colorado & Santa Fe.

Gulf, Colorado & Santa Fe.—Notice has been given as required by law that application will be made to the Texas legislature to consolidate the Gulf, Colorado & Santa Fe, which has 1,473 miles of line, the Texas & Gulf, which runs from Longview to Timpson, 71 miles, the Gulf & Inter-State, which has a line from Beaumont to Port Bolivar, opposite Galveston, 85 miles, and the Gulf, Beaumont & Kansas City and Gulf, Beaumont and Great Northern, two projected railroads. Permission is asked to build a 15-mile connecting line to Timpson and a line from the other (northern) end of the Texas & Gulf at Longview to a point on the Red River, 125 miles, this line to be extended northwest from the Red river through Indian Territory to connection with the Atchison, Topeka & Santa Fe, 150 miles. This announcement confirms the reported purchase of the Gulf & Inter-State.

Indianapolis & Louisville.—See Chicago, Indianapolis & Louisville.

Inland Empire.—See Spokane & Inland.

Macon, Dublin & Savannah.—A meeting of the stockholders has been called for December 2 to vote on an issue of $1,880,000 improvement and consolidated mortgage bonds, the profits of which are to be used to retire all outstanding indebtedness, and also to pay for betterments. All the stock and bonds of the company are owned by Atlantic Coast Line interests.

Peoria & Pekin Terminal.—See Peoria Railway Terminal.

Peoria Railway Terminal.—Under this name a company has been incorporated in Illinois with $1,000,000 capital stock as a successor, it is believed, to the Peoria & Pekin Terminal, which is to be sold soon under foreclosure. (Nov. 9, p. 130.)

Spokane & Inland (Electric).—This is the new name of the Inland Empire, which was a consolidation of four electric roads and a power company in and near Spokane, Wash., operating about 100 miles of road, and building about 75 miles more. E. H. Rollins & Sons, Boston, are offering at 100 and interest $2,743,000 first and refunding mortgage 5 per cent. bonds of the new company, being part of an authorized issue of $15,000,000; the rest is reserved to retire prior liens, to pay for the power plant mentioned above, and for future permanent extensions and additions.

Texas & Gulf.—See Gulf, Colorado & Santa Fe.

Union Pacific.—The annual report of the Union Pacific covering the operations of the year ended June 30, 1906, was made public on November 27. It shows surprising increases, particularly as they follow two record-breaking years. Gross transportation earnings were $67,281,543, an increase of $7,956,594 over 1905. Operating expenses and taxes, which include $2,200,000, charged as a reserve fund for maintenance, renewals, etc., increased by $5,101,059, leaving net earnings, after operating expenses and taxes, of $30,317,769, a gain of $2,855,539. Other income amounted to $10,329,816, larger by $3,833,056 than in 1905, while fixed charges were smaller by $2,290,575 than in that year. The surplus available for payments on the common stock was $27,482,642, or about 14 per cent., a gain of $8,979,945 over the previous year, and there was an increase nearly as large in the amount of common stock dividends. The company still holds about 20,000 shares of the 29,868 shares of Great Northern and 24,000 shares of the 38,877 Northern Pacific shares, which it received in exchange for its Northern Securities stock. The operations in these stocks are described as follows in the report:

"In exchange for 100,000 shares of the stock of the Northern Securities Company there were received 29,868.3 shares of the preferred stock of the Great Northern Railway Company, 38,877.3 shares of the common stock of the Northern Pacific Railway Company and 1,000 shares of the Northern Securities Company stubs. Under the subscription rights given to the stockholders of the Great Northern Railway Company, the Oregon Short Line Railroad Company acquired 37,444 shares of the preferred stock of said company.

"There were sold during the year stock of the Northern Securities Company to the amount of $2,850,000 par value; preferred stock of the Great Northern Railway Company to the amount of $9,960,089.49 par value; common stock of the Northern Pacific Railway Company to the amount of $14,830,082.15 par value, and stubs of the Northern Securities Company to the amount of $18.71 par value. The amounts realized from the sale of these stocks were credited against the cost of the stocks owned; the proceeds therefrom were used in the construction and acquisition of new lines, and in the purchase of equipment and other property; also in an increase in cash assets, which, since the close of the fiscal year, has been applied to the construction of new lines and to the acquisition of other property. The current and other free assets increased $71,354,759.20 over the preceding year.

"The stocks and bonds owned stand charged at the close of the year with $96,781,806.06, against $159,275,326.24 at the close of last year, a decrease of $62,493,520.18, mainly the result of the above-mentioned sales."

Including an extra $4,000,000 to be received as a full year's dividends on the common stock of the Southern Pacific owned and the amount charged to operating expenses for extraordinary improvement reserve and other equities, the surplus available for the common stock is equal to 20 per cent. Of the 10 per cent. annual dividends now paid, 6 per cent. is from railroad earnings and 4 per cent. from income from investments.

# GENERAL NEWS SECTION

## NOTES.

Southern roads have announced an advance of 25 cents a ton on pig iron from Birmingham, Ala., to points north of the Ohio river.

A press despatch from Chicago says that 4,000 employees of the Adams Express Company, one-fourth of its total force, have had their pay increased; hut the rate of increase is not given.

To meet the complaints of the grain men at Girard Point, Philadelphia, the Pennsylvania Railroad has agreed to allow 1,000 cars to stand on the tracks there [as storehouses] when necessary.

The Supreme Court of Virginia has affirmed the decision of the State Corporation Commission that the law requiring railroads to sell 500-mile tickets at two cents a mile is unconstitutional.

In the United States District Court at Kansas City, December 2, a shipper, pleading guilty, was fined $1,000 for having secured from the St. Louis & San Francisco a secret rate on a shipment of cotton seed meal.

At Greensburg, Pa., the Pullman Company has been fined $50 and costs on each of six indictments for furnishing in its cars adulterated milk, though the court ruled that the adulteration was not done by the company.

The Illinois Tunnel Co., operating the Chicago subways, now carries the United States mails between the general postoffice and all of the principal railroad stations. About 600 trips are made each day, carrying nearly 50,000 bags of mail.

Judge Gray, of Delaware, who was a member of the Anthracite Coal Strike Commission of 1902, has been appointed umpire to settle the questions on which the Southern Railway is at variance with the shopmen of the company who recently struck.

On Monday, November 26, the Interborough Rapid Transit Company of New York, operating the elevated and subway lines in the Boroughs of Manhattan and the Bronx, carried 1,486,777 passengers; a number which is 171,559 larger than any previous record.

Soon after the announcement of an advance in wages on the Pennsylvania, and before the advance took effect, the employees of the road were surprised by an order laying off several hundred shop employees at Altoona and about 100 at the division shops at Verona, on the Allegheny division.

An engineman of the New York Central tells a reporter that the men who are to run electric locomotives on the electric division of that road will receive higher pay than they are now receiving; and that the negotiations on this matter have resulted also in a substantial increase of wages for the men who still run steam loco motives.

In the United States Circuit Court at Louisville, Ky., Nov. 17, the demurrer of the Louisville & Nashville was sustained, thus throwing out of court the suit of the Order of Railroad Telegraphers to enjoin the railroad from forbidding its employees to join the union. Judge Evans holds that Section 10 of the Federal Law of June 1, 1898, is unconstitutional.

Judge Trieher in the United States Circuit Court at Little Rock, Ark., instructing the jury in a suit of a negro woman for damages for being denied a meal on a dining car on the Iron Mountain road, said that, in view of the race feeling, known to exist, the railroad should have set apart separate hours in the dining cars for white passengers and for blacks. A rule assigning the car to whites from 12 to 1:30 and to negroes after 1:30 would be reasonable. The woman was awarded $12.50 damages.

The right of the Florida Railroad Commission to regulate rates on freight within that state has been affirmed by the United States Supreme Court in three cases brought by the Atlantic Coast Line and the Seaboard Air Line. The commission fixed a rate of 1 cent per ton per mile on phosphate, and the roads sought to prevent its enforcement by writ of mandamus. The Florida Supreme Court denied that the commission's rates were unreasonable, and the Supreme Court, finding nothing in the evidence to warrant the reversal of that judgment, has affirmed it.

The Panama Railroad announces that arrangements have been made to accept freight from all carriers to either Colon or Panama, to haul it across the Isthmus and forward it to the ports of destination by the regular carriers beyond, upon repayment of freight equivalent to the proportions which accrue to the Panama Railroad and the on-carrier, from the regular through tariffs as published from time to time. The conditions of the through transit are to be those expressed in the through bills of lading in current use by the regular lines, co-carriers via the Isthmus route.

Evidence was presented to the Interstate Commerce Commission at Denver on December 4 showing that the Denver & Rio Grande had paid rebates to the Utah Fuel Company and the Colorado Fuel & Iron Company, which are both controlled by the Gould interests. The rebates to the Colorado Fuel & Iron Co. have been over $1,000,000 annually. The discrimination was made through preferential rates, which Vice-President Schlacks, of the railroad, is reported to have testified he considered justified on the ground that the fuel companies were part of the Denver & Rio Grande system and as such entitled to the commodity rate customarily granted by railroads for transportation of each others materials and supplies.

The United States Circuit Court at New Orleans has sustained the order of the Interstate Commerce Commission in the case of the Central Yellow Pine Association vs. The Illinois Central and other carriers. On April 15, 1903, the railroads made an advance of 2 cents per 100 lbs. in the rate on yellow pine lumber from points in lumber producing territory east of the Mississippi river in Louisiana, Mississippi and part of Alabama, to Ohio river points. The association, composed of manufacturers and shippers, complained and the commission sustained the complaint, holding the advanced rate unreasonable. The defendants refused to obey the order and the commission brought suit. The defendants have taken an appeal to the Supreme Court.

According to newspaper reports the Southern Railway is to put on two new trains between Washington and Atlanta, running opposite each other, for the purpose of lightening the heavy passenger traffic now carried on the present through trains. It is also said that the present 13 divisions of the system are to be increased to 27, each to have a superintendent, the complete list of appointments to be announced on or before the beginning of the new year. Each of these superintendents will be in absolute control of his division, and it is the purpose to enable each superintendent to get over his entire division at least twice a week. The new trains are to be numbered 43 and 44. The former will carry the mail now hauled by train No. 37 and is to leave Washington at 11 p.m., 15 minutes later than No. 37.

The government has begun another batch of suits against railroads to recover penalties for violation of the Safety Appliance Law. The roads (with the number of violations where 10 or more) are as follows: Allentown Terminal; Ann Arbor; Arizona & New Mexico; Baltimore & Ohio (20); Baltimore & Ohio Southwestern; Central of New Jersey; Chicago & North-Western; Chicago, Milwaukee & St. Paul (32); Cincinnati, Hamilton & Dayton; Cleveland, Cincinnati, Chicago & St. Louis; Detroit & Toledo Shore Line; Duluth, South Shore & Atlantic (11); El Paso & Southwestern; Erie (5); Fort Worth & Denver City; Lake Shore & Michigan Southern; Lehigh & Hudson River; Lehigh Valley; New York, New Haven & Hartford Railroad; Pere Marquette; Philadelphia & Reading; Pittsburg, Cincinnati, Chicago & St. Louis; Toledo & Ohio Central; Wabash.

### Government Investigation of Freight Car Situation.

The Interstate Commerce Commission has decided to at once begin an investigation into the question of car shortage throughout the United States. Commissioner Lane says that hearings will be held in the Northwest with relation to shipments of wheat. He calls this the most serious problem which faces the shipping public to-day. There are millions of tons of freight awaiting shipment which the railroads confess themselves unable promptly to handle. In North and South Dakota and Minnesota the elevators along the railroads are full and farmers are stacking their wheat in great bins 20 or 30 feet deep and covering an acre or more of ground. At the same time there is ample room for all of this wheat in the terminal elevators at Chicago, Milwaukee, Minneapolis, Duluth and Superior.

At the recent hearing of the commission in Minneapolis, President Hill, of the Great Northern, laid the responsibility for this on the terminal elevator companies, but these companies came before the commission and showed that they had capacity for over 80 millions of bushels more than they were already using. Many line elevators are closed and bear signs saying, "This elevator is full. We can buy no more grain because we cannot get hauled to market the grain we already have." Mr. Lane further says that the farmers who are unable to sell their grain complain that the railroads are hauling other traffic and preferring it, knowing that they are bound in time to get the hauling of the wheat. Meanwhile, however, the price of wheat will fall and the farmer will be the

sufferer. The Commission already has representatives in the Northwest making investigation, but all who have complaint to make are invited to write or telegraph to the commission, giving full particulars.

Speaking of the misuse of cars while away from their owners' roads, Mr. Lane says that the Pennsylvania Railroad declares that approximately 80 per cent. of its cars are not on its own lines. [A more illuminating statement would be that of the percentage on roads not affiliated with the Pennsylvania.] Mr. Lane also hears that loading engines to their full capacity has reduced the average speed of freight shipments from shipper to consignee.

### Industrial Development on the Erie.

The industrial department of the Erie Railroad has just issued its annual summary of new industrial establishments on the road. It shows that during the fiscal year ended June 30, 1906, 122 such plants were located on the lines, 79 of them with direct side track connection. Of the total number, 89 are manufacturing plants and 33 grain elevators, wholesale houses, etc. Side tracks have been built to 12 industries not previously reached and extended to 23 industries to take care of increased business. The pamphlet is illustrated with 19 photographs of new manufacturing plants recently built or in course of construction on the road, and contains a detailed list of the new establishments, as well as of a number of plants on which work has been begun since the close of the fiscal year. The pamphlet is issued under the direction of Luis Jackson, Industrial Commissioner, whose successful methods of attracting new industries it well illustrates. Mr. Jackson sums up the past year's development and the industrial policy of the company as follows:

These many industries have been attracted to the territory on account of its merits, or established by local parties. The company endeavors to create conditions favorable to the securing of factories and further development. By effective methods it makes the resources and advantages of its territory thoroughly known in general, while the business organizations and others along the line make it known in particular. Together the organization, co-operation and resultant information are so complete that results are obtained. The company tries to be in immediate touch with the business men along its entire system. Its general, divisional and local officials are so thoroughly alive to the advantages of securing manufacturing plants that prompt and comprehensive action is taken when some project is on foot, or when the company can help engender a movement for the development of latent resources. The company has all its territory districted in relation to resources, advantages and markets, so that it can immediately furnish, to manufacturers of a specific product, current information of a comprehensive nature dealing with the project in its full relation to manufacture and commerce.

Every section of the Erie Railroad has its particular merits. Profitable locations exist. Prompt attention is given to inquiries from manufacturers contemplating new establishments. The information furnished covers matters in relation to resources, traffic, side tracks, and the general data required by them. The constant handling of matters pertaining to the location of various industries and the development of resources gives the company's officials experience. Parties contemplating the establishing of an industry can secure information either by applying to the company's agents, who will take up the matter, or they can write direct to the undersigned. Manufacturers' inquiries as to locations are treated in strict confidence and absolutely reliable information, so as to promote permanent traffic, is furnished.

### Conditions on the Northern Pacific.

The *Wall Street Journal* quotes officers of the Northern Pacific as follows in regard to general conditions on that road:

J. M. Hannaford, Second Vice-President in charge of traffic, who has just returned from an extended tour to the coast, says:

"Following heavy snows in November, there came warm Chinook winds, and floods fell on both sides of the Cascades, spreading over the Yakima valley, the Green river canyon and a wide area beyond. The hop fields on the Palouse side were converted into lakes. Traffic has been delayed and we have been put to great inconvenience, but I do not look for much affect on the month's earnings. Agricultural interests will suffer little.

"Northern Pacific is doing the heaviest business in its history. We have more facilities than ever before, but there has been greater investment of every kind by the people along the line, with the result that we cannot handle all the business offered. Our road must be double-tracked, practically from one end to the other, and we must have facilities at terminals in proportion. This will mean a big call on capital. I would not be surprised to see capital hesitate on account of adverse legislation.

"The railroad commissioners are stirring up rate questions all the while. They would do better to devote attention to the matter of facilities. I believe the railroads are doing all they can to move freight and that nothing in the way of legislation could make them do more, but the railroad commissioners could do a lot of good by educating the shipping public. Shippers are not objecting to the rates they pay—rates lower than in any other country, and steadily declining. They are worried about inadequate facilities. And they themselves could eliminate a lot of waste in transportation. One excellent feature of the railroad situation is the elimination or reduction of empty haul, which is the smallest ever seen. Our country is very prosperous, and our railroad is in good shape physically. I think, however, that we should spend more money next year than we did this year, if we can."

A. M. Cleland, General Passenger Agent, says:

"We have had a record fall movement of immigration. Most settlers are Americans and good farmers. We have lost very few people to Canada this year. To show you how our country is settling up, there are 50,000 people scattered along the 200 miles between Glendive and Mandan, supposed to be a semi-arid country, fit only for cattle. I think that we have received 15,000 families this year."

### New Tennessee Railroad Commissioners.

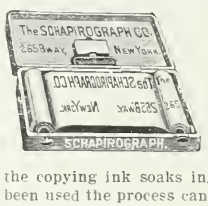
General Harvey H. Hannah and Frank Avent have been appointed members of the Tennessee Railroad Commission, effective January 1. Gen. Hannah is to serve for a full six-year term, succeeding Col. Thomas Williams; Mr. Avent will serve the two years remaining of the unexpired term of Col. J. N. McKenzie, deceased.

Gen. Hannah was born in Louisville, Ky., 38 years ago. He was educated in the Georgia A. and M. College at Dahlonega, Ga., and later studied law in the University of Tennessee, from which he graduated in 1891. After practising at Clinton, Tenn., and at Oliver Springs, he was, in 1893, appointed United States Commissioner. He was a presidential elector on the Democratic ticket in 1896, and in 1897 became private secretary to Gov. R. L. Taylor. At the beginning of the Spanish-American war, Gen. Hannah was made Lieutenant-Colonel of the Fourth Tennessee Volunteer Regiment. His regiment was sent to Cuba and he became Military Governor of the Province of Sancti Spiritus. He returned to Tennessee after his regiment was mustered out and resumed his law practice. In 1900 he ran for Congress on the Democratic ticket but was defeated. In 1903 he was appointed Adjutant General of Tennessee, which office he still holds, having been reappointed in 1905.

Mr. Avent was born in Murfreesboro, Tenn., and graduated from the law department of Cumberland University at Lebanon, Tenn. He practiced law at Murfreesboro and in 1889 represented his county in the lower house of the legislature, refusing two years later the renomination which was unanimously tendered him. In 1899 he was appointed Secretary to the State Railroad Commission, and has held that position ever since.

### A New Copying Machine.

The "Schapirograph," made by the Schapirograph Company, New York City, is illustrated herewith. It consists of 5½ yards of paper, coated with a gelatinous composition, stretched between two rollers. Fifty copies can be made from one letter written with copying ink. The surface of the ribbon is dampened with water and the original pressed lightly on it and left for one or two minutes; it is then removed and the copies made on blank paper. The used portion of the ribbon is then rolled up on one roller and after a short time the copying ink soaks in, so that by the time the whole ribbon has been used the process can be repeated without the old ink reprinting.




### Course in Reinforced Concrete Design at Columbia University.

In addition to the evening technical courses to be given at Columbia University as announced in our issue of November 23, an evening course in the design of reinforced concrete structures began on December 4. The course includes the analysis of stresses in steel concrete beams and columns; the design of steel floors, foundations, retaining walls, etc., and a study of the characteristics of concrete mixtures. Classes are held Tuesday and Thursday evenings from 7.45 p.m. to 9.45, and will continue for 20 weeks. The fee for the whole course is $15, payable in two instalments.

### Train Robberies.

Train robberies, besides becoming frequent, all of a sudden, are richer in details. The Sunday supplements might well give their readers a rest from cosmetics, crazy pictures and articles about the Paleozoic age, and write up these romances and tragedies in real life. A despatch from Topeka last Tuesday says:

A lone robber attempted to hold up a westbound Santa Fe train out of Kansas City last night, after having boarded the train at that place, but was foiled. When he ordered the passengers to hold up their hands, B. E. Wood, a passenger, jumped through a car window. Charles Ward, of Purcell, Ind. T., attacked the robber from behind and grappled with him. The robber turned upon Ward and shot him through the leg, breaking the bone. This happened at a station, and in the confusion following the shot it was thought that the robber had escaped. The train proceeded after a few minutes, when it was found that the man was still on the train, having entered the smoking car at the front end. Suddenly rising from his seat at the front of the car, he ordered the passengers to throw up their hands. The passengers obeyed, with the exception of a cowboy, who showed fight. The robber fired one shot, pulled the bell cord and ran to the front platform. As the train slowed down

he jumped just in time to escape a bullet from the cowboy's gun. Nothing of value was obtained by the robber.

Near Eylau, Texas, on the night of December 1, the express car of a train of the St. Louis Southwestern was robbed by a single robber. He gained entrance to the car unknown to any of the trainmen and assaulted the messenger, throwing him out of the car while the train was moving, and then making his escape. The messenger's injuries are said to be fatal. The newspapers say that the amount of money taken from the safe by the robber was $110,000.

### Mississippi Forbidden to Stop Interstate Expresses.

The Supreme Court of the United States, in an opinion by Justice Peckham, December 3, has nullified an order of a state railroad commission to compel trains running from one state to another to stop at designated stations. The case was that of the Mississippi Railroad Commission against the Illinois Central. The commission ordered that certain through trains on that road stop at the town of Magnolia, a place of 1,200 inhabitants, about a hundred miles from New Orleans, and the county seat of Pike County. The contention was made on behalf of the railroad that the town has already three trains daily to New Orleans, and it was urged that to make the through trains stop would disarrange schedules, break connections and prevent compliance with the terms of the road's contract for the expeditious carrying of the mails. The state law was attacked as in contravention of the interstate clause of the Federal Constitution. The Circuit Court of the United States for Mississippi, in which the case was tried, upheld the law, but the Court of Appeals took the opposite view, declaring the exaction unreasonable. That decision is upheld by Justice Peckham's opinion. He held that the railroad offered sufficient facilities to Magnolia without the stoppage of the fast trains.

### "Car Hire Agreement."

The following is a list of the more important companies who had, on December 1, signed the agreement to pay each other 50 cents a day for interchanged freight cars (*Railroad Gazette*, Nov. 16). Others will probably enter into the agreement soon.* The lines that have joined own or control 1,353,313 cars.

Atchison, Topeka & Santa Fe.
Baltimore & Ohio.
Baltimore & Ohio Southwestern.
Bessemer & Lake Erie.
Buffalo & Susquehanna.
Buffalo, Rochester & Pittsburg.
Central of New Jersey.
Chesapeake & Ohio.
Chicago & Alton.
Chicago & Eastern Illinois.
Chicago & North-Western.
Chicago, Burlington & Quincy.
Chicago, Indianapolis & Louisville.
Chicago, Milwaukee & St. Paul.
Chicago Rock Island & Pacific.
Detroit, Toledo & Ironton.
Galveston, Harrisburg & San Antonio.
Grand Trunk.
Great Northern.
Hocking Valley.
Illinois Central.
Kansas City, Mexico & Orient.
Kansas City Southern.
Lehigh Valley.
Minn., St. Paul & Sault Ste. Marie.
Missouri, Kansas & Texas.
Missouri Pacific.
Mobile & Ohio.
Nashville, Chattanooga & St. L.
Norfolk & Southern.
Norfolk & Western.
Northern Pacific.
Oregon Railroad & Navigation.
Oregon Short Line.
Pecos Valley System.
Pennsylvania Lines East.
Pennsylvania Lines West.
Pere Marquette.
Philadelphia & Reading.
St. Louis & San Francisco.
St. Louis Southwestern.
San Antonio & Aransas Pass.
Southern Pacific.
Union Pacific.
Vandalia.
Wabash.
Western Maryland.
Wheeling & Lake Erie.
Wisconsin Central.

### Electro-Pneumatic Interlocking at Washington.

The Union Switch & Signal Co., Swissvale, Pa., has taken the contract for the interlocking at the new union passenger terminal in Washington, D. C. There will be two machines. The two together will aggregate 210 working levers for the control of 282 signals, 74 single switches and 41 sets of double slip switches with movable point frogs. The signals will be three-position, working in the upper quadrant, and electrically lighted. All high signals will be semi-automatic in their control. No detector bars are to be installed, the switch levers being locked in the machine through the medium of track circuits. Storage batteries will be used exclusively, energizing the track circuits (of which there are 200), as well as the interlockings proper. Elaborate means of communication between the tower director, the train conductors and the gatemen is to be provided, the indications being given by specially designed light signals.

### Bolivian Railroads.

A New York syndicate, formed for the purpose of building railroads in Bolivia, has started work on one line. The Bolivia Railway Co., under which name the work is being carried out, is being financed by the National City Bank, New York, Speyer & Co. and W. R. Grace & Co. The lines are to cost $35,000,000. Plans have been made for building 1,000 miles, which will furnish four separate outlets to the seaboard, through Chili, Peru, the Argentine Republic and Brazil. Ten thousand tons of rails, it is said, have been ordered from the United States Steel Corporation, to be used on the Viacha-Ouro line, which is the first to be completed. This line will pass through a rich silver and tin mining section. A line is also to be built from the rubber lands in the Oriente country to Port Pando on the Rio Beni, which empties into the Amazon.

According to the *Brazilian Review* the new administration of the Government will prosecute work on new through lines north and south, also east and west throughout the country. Some of the work is to be carried out by the Ethelberga syndicate, composed of London and French bankers, who financed loans for the Government in 1904 and 1905, and by the Great Western Brazil Railway. The latter is already making preliminary surveys between Pesqueria, the terminus of the old Government line, and Tocantins, with the intention of extending ultimately to Arica on the Pacific.

### Sale of Cassier's Magazine.

*Cassier's Magazine* has been sold by the estate of the late Louis Cassier to Mr. Henry Harrison Suplee, for many years the technical editor of the *Engineering Magazine*, and Mr. James Van Vorst Colwell, recently works manager for the C. W. Hunt Company, and the publication will be continued as heretofore by the Cassier Magazine Company at No. 3 West Twenty-ninth street, New York. The editorial conduct of the magazine will be in the hands of Mr. Suplee, who brings to this work a wide experience both in the practice of mechanical engineering and of technical journalism, while the business department will be directed by Mr. Colwell. The first issue of the magazine under the new management will be the January number.

### New Buildings at Rensselaer Polytechnic Institute.

The number of students at the Rensselaer Polytechnic Institute, Troy, N. Y., has doubled in the past five years and the school has been enlarged to provide for them. The trustees recently bought ten acres of land adjacent to property owned by the institute and two new fireproof buildings have been built. One was given by Mr. Carnegie and cost about $130,000; the other, a new chemical laboratory, was built by subscriptions from graduates and friends of the school and cost $110,000. The Carnegie building contains, beside recitation and lecture rooms, what is probably the largest drafting room used for educational purposes in the country. It has a clear floor space of 60 x 100 ft. The chemical laboratory building contains a qualitative chemical laboratory covering a space 50 x 80 ft. Much of the equipment for these buildings is new, and new equipment, including a steam turbine, has also been added to the electrical laboratory. Football and baseball fields and tennis courts have been laid out on the new property and a club house is to be built in the spring.

### Technical Publicity Association.

The Technical Publicity Association held a meeting on November 22 at the rooms of the Aldine Association, New York, and heard the report of its circulation committee, consisting of H. M. Davis, of the Sprague Electric Co.; C. N. Manfred, of the H. W. Johns-Manville Co., and Paul M. Wade. The committee submitted a plan by which the association will collect information about trade and technical magazines which will be treated confidentially and be used by T. P. A. members only. It is believed that this plan will save time and trouble for magazine publishers as well as the advertisers.

## TRADE CATALOGUES.

*Friction Draft Gear.*—The Frost Railway Supply Co., makers of the Harvey friction draft spring, are sending, to railroad men who ask for it, a pamphlet entitled "The Draft Gear Problem." It consists of a reprint of an address on "Friction Draft Gear on Cars and Locomotives" given by W. O. Thompson before the Central Railway Club last May, and an article on "Functions of a Good Draft Gear" by A. Stucki, reprinted from the *Railroad Gazette* of February 23, 1906. The Frost company have made marginal notes pointing out in what respects the functions spoken of in these articles as being desirable are fulfilled in the Harvey draft gear.

*Ideal Power.*—The November number of the Chicago Pneumatic Tool Co.'s monthly reprints from contemporaries articles on "The Cost of Leakage in Compressed Air Plants"; "Righting a Tilted Pneumatic Caisson for a Bridge Pier"; "A Handy Kilowatt Table"; "A Magnetic Indicator for Hardening Steel," and "Gas Engines: Relative Efficiency—Cost Data." There are also short articles on the "Little Giant Corner Drill"; "Miniature Air Drill"; "Large Generators for Montreal Light, Heat and Power Co.'s Soulanges Canal Power Station"; "Allis-Chalmers Blowing Engines," and "A Monster Rolling Mill Engine."

*The Obermayer Bulletin.*—The current number contains as special articles, "The Coke Question in the Foundry"; "Cupola Practice"; "The Right Way to Run a Foundry"; "A New Method of Strengthening Castings"; "How Bill Cooled the Gear," and "Mistakes of Some Foundrymen."

*There is as yet no indication that any of the New York Central lines will join. Other lines conspicuous by their absence are: Atlantic Coast Line; Boston & Maine; Delaware, Lackawanna & Western; Louisville & Nashville; New York, New Haven & Hartford; Seaboard Air Line, and Southern.

*Rails and Equipment.*—The Walter A. Zelnicker Supply Company, St. Louis, sends a complete list of new rails, relaying rails and rail fittings, as well as locomotives of different gages, many types of cars and other rolling stock which the company offers for sale.

*Allis-Chalmers Company.*—This company is distributing an index of revised catalogues and bulletins published and about to be published. The index also lists instruction books, leaflets and special publications.

### Manufacturing and Business.

The United Engineering & Foundry Co. has allotted to a subsidiary, the Lloyd Booth Co., Youngstown, Ohio, a contract for a blooming mill, rail mill, saws and auxiliary machinery for the Gary Steel Co., Gary, Ind.

The Boston branch of the H. W. Johns-Manville Co. will move, early in December, into a new building at Nos. 55, 57 and 59 High street, Boston. The entire building, seven floors, will be occupied by the offices and sales and shipping rooms of the company.

The American School of Correspondence, Chicago, is erecting a four-story building, 90 ft. x 120 ft., at 58th street and Drexel avenue, within two blocks of the University of Chicago. It will cost $75,000 and is expected to be ready for occupancy June 1, 1907.

### Iron and Steel.

The Brooklyn Heights Railroad will soon order from 5,000 to 7,000 tons of rails.

The International & Great Northern has given a contract for 5,000 tons of rails; the Milwaukee & Northern 1,000 tons, and the Delaware & Magnetic 2,000 tons.

The New York Central is giving orders for structural steel for new stations; the company will need 40,000 tons or more. The American Bridge Company booked orders, in November, for 50,000 tons of bridge material and has since taken an order for 5,000 tons for the Philadelphia Rapid Transit.

## OBITUARY NOTICES.

George L. Bradbury, formerly Vice-President and General Manager of the Lake Erie & Western, died in Chicago on November 30. Mr. Bradbury was born in Nova Scotia in 1843 and served through the Civil War in a cavalry regiment; he then began railroad work and in 1882 was made General Manager of the Michigan & Ohio, now the Detroit, Toledo & Milwaukee, which is operated by the Lake Shore. In 1886 he was elected Vice-President of the Toledo, St. Louis & Western, and the next year was made Vice-President and General Manager of the Lake Erie & Western. He retired in 1900 when control of the L. E. & W. was acquired by the Lake Shore.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Canadian Society of Civil Engineers.

At a meeting of this society in Montreal, November 29, Dr. J. B. Porter lectured on "Mineral Resources, Mines and Furnaces of the Boundary District of British Columbia," with illustrations.

### American Society of Civil Engineers.

At a regular meeting of this society December 5 two papers were presented for discussion, one on "The Atchafalaya River: Its Peculiar Physical Characteristics," by J. A. Ockerson, and the other on "The Naval Floating Dock," by Leonard M. Cox. The paper by Mr. Ockerson was printed in the "Proceedings" for September, and Mr. Cox's in "Proceedings" for October.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Atlanta & West Point.*—F. A. Healey, Auditor of this road and of the Western of Alabama, has resigned, effective January 1, to go to a traction company at Cincinnati, Ohio.

*Cleveland, Cincinnati, Chicago & St. Louis.*—See New York Central Lines.

*Jamestown, Chautauqua & Lake Erie.*—F. L. Chase, President and General Manager, has resigned.

*Kansas City Southern.*—Edward F. Cost, Second Vice-President and Traffic Manager of the Seaboard Air Line, has been elected Vice-President in charge of traffic of the Kansas City Southern, effective December 15.

*Lake Erie & Western.*—See New York Central Lines.

*Lake Shore & Michigan Southern.*—See New York Central Lines.

*Michigan Central.*—See New York Central Lines.

*Missouri, Kansas & Texas.*—J. M. Wallace, President of the Central Trust Co., and J. G. Metcalfe have been elected Directors and members of the Executive Committee.

*New York Central Lines.*—G. J. Grammer, Vice-President in charge of traffic of the lines west of Buffalo, has been elected Vice-President in charge of freight traffic on all New York Central lines, with office at Chicago, Ill. Nathan Guilford, Vice-President in charge of traffic, has resigned on account of ill health. C. F. Daly, Passenger Traffic Manager of the New York Central & Hudson River, has been elected Vice-President in charge of passenger traffic. Ira A. Place, General Counsel of the N. Y. C. & H. R., has been elected Vice-President in charge of the Legal Department. A. H. Harris, General Attorney of the N. Y. C. & H. R., has been elected Vice-President of the Cleveland, Cincinnati, Chicago & St. Louis, the Lake Shore & Michigan Southern, the Michigan Central and the Lake Erie & Western.

*Seaboard Air Line.*—Alfred Walter, President, has been elected Chairman of the Executive Committee, succeeding James A. Blair.

See Kansas City Southern.

*Southern.*—W. W. Finley, Second Vice-President, has been elected President, succeeding Samuel Spencer, deceased.

### Operating Officers.

*Baltimore & Ohio.*—C. W. Galloway, Superintendent of the Baltimore division, has been appointed to the new office of Superintendent of Transportation, with office at Baltimore, Md.

*Canadian Pacific.*—George Spencer, Superintendent of the division from Toronto, Ont., east to Smith's Falls, has been appointed Superintendent at North Bay, Ont., succeeding J. R. Nelson, who takes Mr. Spencer's place at Toronto.

*Missouri Pacific.*—A. DeBernardi, General Superintendent of the Central division, has been appointed General Superintendent of the Southern division, with office at Little Rock, Ark., succeeding Horace Baker, resigned to go to the Cincinnati, New Orleans & Texas Pacific. W. J. McKee, Superintendent at Sedalia, Mo., succeeds Mr. DeBernardi, with office at Coffeyville, Kan. H. G. Clark, Superintendent at Aurora, Mo., succeeds Mr. McKee. J. W. Daniels, Superintendent at De Soto, Mo., succeeds Mr. Clark. J. Cannon, Superintendent at Coffeyville, Kan., succeeds Mr. Daniels. J. E. Snedeker, trainmaster at Sedalia, Mo., succeeds Mr. Cannon.

*Union Pacific.*—See Yellowstone Park Railroad.

*Yellowstone Park Railroad.*—L. S. Sears has been appointed General Superintendent and Traffic Manager of this new road under construction by the Union Pacific.

### Traffic Officers.

*Canadian Northern Ontario.*—William Phillips, general agent of the Canadian Northern, has been appointed General Passenger and Freight Agent of the Canadian Northern Ontario.

*Missouri Pacific.*—W. D. Hurlbut has been appointed General Freight Agent, with office at St. Louis, Mo.

### Engineering and Rolling Stock Officers.

*Erie.*—R. E. Woodruff has been appointed Division Engineer at Meadville, Pa., succeeding L. P. Baker, transferred to the Mahoning division to succeed W. M. Dawley, assigned to other duties. A. E. Jamieson succeeds Mr. Woodruff as Assistant Engineer at Youngstown, Ohio.

*Illinois Central.*—D. R. Burbank has been elected Assistant Secretary, succeeding C. H. Wenman, resigned.

*Philadelphia & Reading.*—F. F. Gaines, Mechanical Engineer, has resigned to go to another company.

*Southern.*—W. H. Hudson, General Master Mechanic of the Western division, with office at Knoxville, Tenn., has resigned to go into other business. W. S. Murrian, Master Mechanic at Spencer, N. C., succeeds Mr. Hudson.

## LOCOMOTIVE BUILDING.

*The Cuban Central* will shortly be in the market for several locomotives. The contracts will be placed by the Cuba Company, 80 Broadway, New York.

*The Lehigh Valley*, it is reported, has ordered 50 freight and switching locomotives from the American Locomotive Co. and the Baldwin Locomotive Works.

*The Manila Railway Company*, which is controlled in the in-

terest of Speyer & Company, New York, is about to place contracts for a number of locomotives.

*The Bolivia Railways Company* is about to buy some locomotives. The contracts will be placed through W. R. Grace & Company, 1 Hanover Square, New York.

*The Missouri Pacific* has ordered 25 simple Atlantic (4-4-2) locomotives from the American Locomotive Co., for March, 1907, delivery; and 50 simple consolidation (2-8-0) locomotives, for March, 1907, delivery, and 25 simple six-wheel switching (0-6-0) locomotives, for January, 1907, delivery from the Baldwin Locomotive Works. The specifications are as follows:

| | Atlantic. | Consolidation. |
|---|---|---|
| Types of locomotive | | |
| Weight, total | 199,600 lbs. | 207,000 lbs. |
| Weight, on drivers | 121,600 lbs. | 183,500 lbs. |
| Diameter of drivers | 79 in. | 63 in. |
| Cylinders | 21 in. x 26 in. | 22 in. x 30 in. |
| Boiler, type | Extended wagon top, radial stayed | |
| " wkg. steam press. | 200 lbs. | |
| " number of tubes | 362 | 340 |
| " diameter of tubes | 2 in. | |
| " length of tubes | 16 ft. ⅛ in. | 15 ft. 6 in. |
| Firebox, length | 97 in. | 108 in. |
| " width | 68 in. | 66 in. |
| " grate area | 44.5 sq. ft. | 50 sq. ft. |
| Heating surface, total | 3,199.0 " | 3,264 " |
| Tank capacity | 7,000 gals. | |
| Coal capacity | 14 tons. | |

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 150,000 lbs. |
| Diameter of drivers | 51 in. |
| Cylinders | 20 in. x 26 in. |
| Boiler, type | Straight top |
| " working steam pressure | 190 lbs. |
| " number of tubes | 274 |
| " material of tubes | National iron |
| " diameter of tubes | 2 in. |
| " length of tubes | 11 ft. 6 in. |
| Firebox, length | 108⅛ " |
| " width | 41⅛ " |
| " material | Worth steel |
| " grate area | 31.4 sq. ft. |
| Heating surface, total | 1,810 " |
| Tank capacity | 6,000 gals. |
| Coal capacity | 12 tons |

*Special Equipment.*

| | |
|---|---|
| Air brakes | Westinghouse |
| Boiler lagging | Magnesia |
| Brake-beams | Simplex |
| Couplers (for switching) | Janney |
| Headlights (for Atlantic) | Pyle-National electric |
| Injector (for Consolidation and switching) | Hancock |
| Piston rod packings | United States |
| Valve rod packings | United States |
| Sanding devices | Leach |
| Sight-feed lubricators: | |
| For Atlantic | Bull's eye |
| For Consolidation and switching | Nathan's bull's eye |
| Steam heat equipment (for Atlantic) | Gold |

## CAR BUILDING.

*The Canadian Pacific* is in the market for 25 passenger train cars.

*The Lehigh Valley* is in the market for about 10 passenger coaches.

*The Erie*, it is reported, may soon be in the market for steel passenger cars.

*The Tonopah & Goldfield* has ordered 100 gondola cars from the Pullman Company.

*The St. Louis & North Arkansas* is reported to be in the market for 30 freight cars.

*The Chicago Great Western* is in the market for 300 box cars of 60,000 lbs. capacity.

*The New York Central*, it is reported, may soon be in the market for steel passenger cars.

*The Indianapolis, Columbus & Southern Traction* is reported as in the market for three 60-ft. cars.

*The Guayaquil & Quito*, Broad Exchange Building, New York City, will soon ask for bids on a number of cars.

*The Chilian State Railways Administration* has ordered six steel underframe box cars from the Middletown Car Works.

*The Pennsylvania* has ordered 200 50-ton steel hopper cars, for May and June delivery, from the Middletown Car Works.

*The German-American Car Lines* will build 300 tank cars of 80,000 lbs. capacity; the tank capacity will be 8,000 gals.

*The Chinese Government* has ordered 30 steel underframe box and 10 flat cars from the Middletown Car Works for lines in North China.

*The Bessemer & Lake Erie* has ordered 250 steel hopper cars from the Standard Steel Car Co. in addition to the 250 cars reported in our issue of October 5.

*The Philippines Railway*, which is being built by J. G. White & Co., New York, has ordered 50 steel underframe platform cars from the Middletown Car Works.

*The Cuban Central* will shortly be in the market for several passenger and freight cars. Contracts will be placed by the Cuba Company, 80 Broadway, New York.

*The Manila Railway Company*, which is controlled in the interest of Speyer & Co., New York, is about to place contracts for a number of passenger and freight cars.

*The Bolivia Railways Company* is about to purchase freight and passenger cars. The contracts will be placed through W. R. Grace & Company, 1 Hanover Square, New York.

*The Northern Ohio Traction & Light Co.*, Akron, Ohio, has ordered six city passenger and eight or ten semi-convertible interurban cars from the Kuhlman Car Company.

*The Indianapolis, Newcastle & Toledo Electric*, Indianapolis, Ind., has ordered through the Electrical Installation Co., Chicago, eight interurban cars and two express cars from the Jewett Car Company.

*The Wabash* is asking bids on 2,000 low side drop end gondola cars of 100,000 lbs. capacity. These cars will be 40 ft. 8¾ in. long and 9 ft. 6¼ in. wide, inside measurements. These cars are in addition to the 4,000 steel hopper and 3,000 box cars reported in our issue of November 16.

*The Hocking Valley*, as reported in our issue of November 30, has ordered 1,000 steel underframe gondola cars of 100,000 lbs. capacity from the Ralston Steel Car Co. The special equipment includes:

| | |
|---|---|
| Axles | Block-Pollak |
| Bolsters | Simplex |
| Brake-beams | Simplex |
| Couplers | Tower |
| Dust guards | American |
| Journal boxes | McCord |
| Springs | Railway Steel Spring Co. |
| Wheels | Griffin |

*The Trinity & Brazos Valley*, as reported in our issue of November 30, has ordered 200 flat cars of 60,000 lbs. capacity from the American Car & Foundry Co. These cars will be 36 ft. 9¾ in. long and 8 ft. 10¼ in. wide, over all. The special equipment includes:

| | |
|---|---|
| Axles | American Car & Foundry Co. |
| Bolsters | American style pattern. |
| Brake-beams | National-Hollow |
| Brakes | Westinghouse |
| Brasses | Hewitt |
| Couplers | Janney |
| Dust guards | Franklin |
| Journal boxes | Symington |
| Springs | Railway Steel-Spring Co. |
| Trucks | American steel bolster |
| Wheels | American Car & Foundry Co. |

*The Grand Rapids & Indiana* is asking bids on eight passenger cars for May, 1907, delivery. These cars will weigh 100,000 lbs., and will measure 52 ft. long, 9 ft. 8¾ in. wide and 14 ft. 1¾ in. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Axles | Pennsylvania R. R. specifications |
| Bolsters | Pennsylvania R. R. specifications |
| Brakes | Westinghouse |
| Brake-beams | Diamond Special |
| Brasses | Pennsylvania R. R. specifications |
| Couplers | Buboup |
| Curtain fixtures | Forsyth |
| Curtain material | Pennsylvania R. R. standard |
| Doors | Pennsylvania R. R. standard |
| Door fastenings | Pennsylvania R. R. standard |
| Draft rigging | Westinghouse Friction |
| Journal boxes | Pennsylvania R. R. standard |
| Paint | Pennsylvania R. R. standard |
| Roofs | Pennsylvania R. R. standard |
| Springs | Pennsylvania R. R. specifications |
| Trucks | Pennsylvania R. R. standard |
| Vestibules | Pennsylvania R. R. standard |

## RAILROAD STRUCTURES.

ATLANTA, GA.—A building permit has been given to the Southern to put up iron freight sheds at Peters and Nelson streets, at a cost of $26,000.

CHATTANOOGA, TENN.—Plans for putting up a new passenger station here have been submitted to the various railroads interested in the project.

DANVILLE, VA.—The Southern Railway passenger station at this place, recently destroyed by fire at a loss of about $25,000, is to be replaced by a new structure.

DENISON, TEX.—Plans for the new union passenger station, which has been under consideration for a number of years, have been submitted to the Texas Railroad Commission for approval. The plans, which were drawn by Henry R. Phelps, of San Antonio, Tex., call for a station building to cost $130,000. With sheds and rearrangement of tracks the total cost is to be about $250,000.

MACKEY'S FERRY, N. C.—The Norfolk & Southern has applied for permission to alter its plans for the proposed drawbridge, which is to be built over Albemarle Sound. The structure is to have two openings each 140 ft. wide instead of 70 ft. as originally planned.

MESABE, MINN.—The Duluth & Iron Range is putting up a new passenger station 62 ft. x 30 ft. at this place.

New Haven, Conn.—It is officially announced that the New York, New Haven & Hartford will build its new passenger station on the land which it owns at the "Farm," which is southwest of the present station. The cost of the proposed structure will be approximately $600,000.

New York, N. Y.—Plans for the terminal buildings now under construction for the New York & New Jersey Railroad (tunnels) have been made public by President William J. McAdoo. There are to be two buildings in Church street, one from Cortlandt to Dey street, and the other from Dey to Fulton street. One is to be known as the Fulton, and the latter as the Cortlandt. Each is to be 22 stories high above the surface, and 75 ft. below the street line.

Work will be started at once on a new power house for the New York, Westchester & Boston. It will cost $500,000. The structure is to be built on the sound shore, north of Pelham Bay Park.

Pittsburg, Pa.—Plans have been approved for the enlargement of the passenger station of the Pittsburg & Lake Erie. They provide for enlarging the left wing of the present structure, increasing the capacity about one-fourth. Contracts for steel to be used have been let to the American Bridge Co., and other contracts will shortly be let.

Prince Rupert, B. C.—Plans are being made by Architect F. M. Rattenbury, for the Grand Trunk Pacific, for a hotel to be built at this place, the proposed western terminus of the road, to cost $40,000.

Scranton, Pa.—Revised plans have been made by the Delaware, Lackawanna & Western for a new station to be put up at Platt Place. The building is to be four stories high, and will hold the offices of all the Scranton officers of the road. The present freight house is to be replaced by a new structure. Plans are being prepared for building large machine shops near South Washington avenue and Mattes street.

Trinidad, N. Mex.—The Atchison, Topeka & Santa Fe, it is said, will spend $60,000 for improvements to its yards at this place. The present freight house is to be moved to a new location and two stories are to be added. Additional tracks will be laid in the yard.

Vancouver, B. C.—C. E. Bell, Civil Engineer, appointed by the government to estimate the cost of bridging the narrows with a bridge to connect the mainland with Vancouver Islands, has submitted his report. It calls for an expenditure of $25,500,000. The plan includes seven bridges varying in length from 700 to 1,500 ft. each, in addition to a span of 2,800 ft. over the narrows.

Victoria, B. C.—An officer of the Canadian Pacific writes that the appropriation of $132,000 is to be divided to pay for the cost of making fills, putting in concrete arches and replacing temporary wooden structures with steel spans on the Esquimault & Nanaimo. Contracts have already been let for four half-deck plate girder bridges each 40 ft. long.

Wilkesbarre, Pa.—An agreement, it is said, has been reached between the city officials and the Lehigh Valley, the Pennsylvania, the Central of New Jersey and the Delaware & Hudson railroads to abolish grade crossings at many of the principal streets of this city.

Winnipeg, Man.—The Canadian Northern and the Grand Trunk Pacific, it is said, have reached an agreement to have the former build its terminals here at an approximate cost of $3,500,000. The Grand Trunk Pacific is to pay a yearly rental of $65,000 for the use of a part of the terminals and for trackage rights into the city.

Bids have been received by the City Council for building the Redwood bridge over the Red river as follows: Dominion Bridge Co., $88,800; Algoma Steel Bridge Co., $92,000; Ontario Bridge Co., $97,200; Heenan & Froanda, of Manchester, England, $192,144, and William Jackson, $278,000.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Alberta Railway & Irrigation Co.—Application, it is said, will be made by this company for incorporation under the name of the Crawford Bay & St. Mary's, to build a line from the terminus at Lethbridge, Alb., east to Pakowki Lake, thence east through Alberta and Saskatchewan.

Atlantic Coast Line.—Work has been started by this company at Waycross, Ga., on its new freight yards. The new yards will extend about a mile beyond the present yards, and contain 15 miles of tracks. The Pennsylvania Bridge Co., which is building the shops for the company at this place, has the contract for the yard work, and is already laying tracks. One of the shop buildings, it is said, will cover four acres of ground, and is to be of brick, three stories high.

Birmingham Southern.—The Tennessee Coal, Iron & Railway Company is reported to have given a contract for construction of a five-mile extension of this road so as to reach new mine territory near Pratt City, Alabama.

Broxton Air Line.—Application is to be made in Georgia for incorporation, by a company under this name, to build a line from Broxton north via McRae to Helena, approximately 30 miles. W. R. Frier, E. S. Cotton, E. H. Moore and T. M. Cheatham, all of Broxton, are interested. The work includes building a drawbridge over the Ocmulgee river.

California Roads.—Plans are about ready and final surveys made by the Mammoth Copper Co., of Kennet, Cal., to build a four-mile narrow gage line from the Quarter Hill Mine to the central spur. The work will include a long bridge over the Sacramento River.

Canadian Pacific.—Trains on the new Boston and Wolseley branch, which is to be 122 miles long, were put in operation November 24 as far as Windthorst, 98 miles from the Reston end. The rest of the line is to be finished next spring. The Moose Jaw line north has also been put in operation as far as Tuxford, and the Lauder extension, which has been completed as far as Broom Hill, 16 miles. Track-laying is being pushed on the Winnipeg Beach line, and has been also started at Strassburg, on the North Pheasant Hills extension. Work on the double-tracking of the main line east of Winnipeg will be carried on all winter. About 60 per cent. of the grading on the new branches has been completed.

Canadian Roads.—Hood Bros., of Spokane, Wash., owning timber lands near Crazy Creek, B. C., are said to be planning to build a line three miles long from their property to the main line of the Canadian Pacific.

Canadian Southern & New York.—Incorporated in Oklahoma with $1,000,000 capital by G. V. Pattison, H. W. Pentecost, L. E. Pentecost, H. L. Pattison and N. D. McGinley, all of Guthrie, Okla. The company proposes to build a line from Salisbury, New Brunswick, southwest to St. John. Both these points are reached by the Intercolonial, and such a line will parallel that road.

Chicago, Burlington & Quincy.—Official confirmation has been given to the report that this company will spend several thousand dollars for increasing its freight facilities in St. Joseph, Mo. Plans for the improvements are being made, and it is expected that the work will be started early next spring.

Chicago, Milwaukee & St. Paul.—Contracts are reported let to Nelson Bennett, of Spokane, Wash., to pierce a tunnel 8,750 ft. long through the Bitter Root mountain range between the states of Montana and Idaho. Contracts have also been let to the same man for grading both east and west of the tunnel in Montana and Idaho, averaging about 100,000 cubic yards to the mile, nearly all of which is solid rock. The work includes a number of small tunnels and much trestle work.

Cleveland, Brooklyn & Elyria (Electric).—Rights of way, it is said, have been secured by this company for building its proposed electric line from Cleveland, Ohio, southwest to Elyria. Bids for the work are to be asked for shortly. The proposed route is via Strongsville, Vigil, Columbia, and North Eaton to Elyria. All the preliminary engineering work has been completed, and negotiations are pending for some of the necessary franchises. The company is incorporated for $100,000 capital, with officers as follows: J. J. Breitenger, president; B. E. Ottman, treasurer, and J. H. Knieseley, Jr., secretary.

Covington & Southwestern.—At a recent meeting of this company in Covington, Ind., W. G. Ruhl was elected President; H. M. Campbell, Vice-President and Treasurer, and C. W. Winkler, Secretary. The company proposes to build a line from Covington southeast to Kingman, thence east via Wallace, Alamo and Yountsville to Crawfordsville, about 40 miles. The project has been financed and contracts for the work will be let shortly. Grading work has been completed from Covington to Coal Creek, eight miles, and it is expected to have this section in operation to the coal fields south of Covington this winter.

Crawford Bay & St. Mary's.—See Alberta Railway & Irrigation Co.

Crystal River & San Juan.—An officer writes that this company has built eight miles of road from Placita, Colo., to Marble. The company is planning to extend the road next year from the latter place to marble quarries, an additional three miles. The work includes a trestle 350 ft. long over the Crystal River. C. A. Meek, of Marble, Colo., is President. (Nov. 16, p. 136.)

Denver & Rio Grande.—Two important projects, it is said, are being considered—the construction of a connection with the Denver, Northwestern & Pacific and the broad-gaging of the line between Salida and Montrose. For some time the Denver & Rio Grande has been planning to shorten the distance from Denver to Salt Lake City. The plan under consideration, it is said, is to make

joint arrangements with the D., N. W. & P. to build from Dotsero, on the Rio Grande, to Kremmling, on that road, following the Grand river. The work of changing the Rio Grande across Marshall Pass from narrow to standard gage may soon be started. The line has been made standard between Grand Junction and Montrose, leaving a gap to be broad-gaged from Salida to Montrose, 136 miles. With the completion of this, the Rio Grande would have two standard-gage roads from Denver to Grand Junction.

ERIE.—The electrification of 39 miles of the Rochester division of this road is to be completed by the first of next year. The company, it is said, has decided to electrify the remaining 70 miles of this division, to Corning and the branch to Dansville. From the latter place it is proposed to extend the line towards Hunts on the Buffalo division.

GEORGIA, FLORIDA & ALABAMA.—Contracts are reported let for work on this road. The first section will begin at the crossing of the Central Railroad and run to the terminal, for which a site was recently bought by the company on College Hill, in Cuthbert, Ga. A line will also be built from the terminal at Depot street to the freight house at that point. On the completion of this work an extension of the road from Cuthbert north to a connection with the Seaboard Air Line will be built.

GILA VALLEY, GLOBE & NORTHERN.—See Southern Pacific.

GRAND TRUNK PACIFIC.—This company has submitted detailed plans to the Railway Commission for its proposed route through the Yellowhead Pass. The plans show that the line over the summit of the Rocky Mountains at this point will have a maximum grade of about 4/10 per cent., and it is expected that this will be the heaviest grade on the entire line to the Pacific Coast. The work will necessitate some heavy cuts and fills.

The Transcontinental Railroad Commission, it is said, will at once ask for bids for building from La Toque west to Lake Superior Junction.

GULFPORT & NORTHWESTERN.—An officer writes that surveys are being made by this company for building its proposed road from Gulfport, Miss., northwest to Poplarville, about 45 miles. As soon as surveys are completed, construction will be started. (Nov. 30, p. 153.)

HARRISBURG & OHIO RIVER.—D. E. Baxter & Co., Inc., New York, tell us they have contracts for constructing this proposed line from Galatia, Ill., on the Illinois Central southeast to Harrisburg, on the Cleveland, Cincinnati, Chicago & St. Louis. It has been fully financed and work will begin December the 3d. T. Edwin Bell, of Hammond, Ind., is President, and C. W. Ferguson, of Harrisburg, Ill., Secretary. (See Construction Record.)

ILWACO RAILWAY & NAVIGATION CO.—See Oregon Railroad & Navigation Company.

LAKE SUPERIOR SOUTHERN.—D. E. Baxter & Co., Inc., New York, tell us they have contracts for the construction and equipment of this proposed line from Madison, Wis., north to Huron Bay, Mich., 290 miles. M. C. Phillips, President; W. K. Rideout, Secretary and Treasurer; E. B. Priest, Chief Engineer, Oshkosh, Wis. (Oct. 26, p. 115.)

LAS VEGAS & TONOPAH.—This company has filed an amendment to its charter in Utah, which permits the company in addition to its main line now building from Las Vegas to Tonopah in Nevada, to build a number of extensions into any county in Nevada or California. The purpose of the company is to at once build a branch into the Greenwater mining district of Inyo County, Cal.

LORAIN & ASHLAND.—This road, which is practically completed from Lorain to Wellington and surveyed south to Ashland, is said to be now making arrangements to extend south to the Ohio River. It is also said that plans are being made to extend the road into Pennsylvania next year.

LOUISVILLE, NEW ALBANY & CORYDON.—At a recent meeting of the stockholders of this company, which operates a steam railroad from Corydon, Ind., north to Corydon Junction, eight miles, where connection is made with the Southern, an extension was authorized to be built east via Lanesville to New Albany, about 20 miles. The new line is to be operated by electricity. Surveys are now being made and work is soon to be started.

MADRAS & EASTERN.—An officer writes that this company was incorporated in Oregon to build a line from Madras, Oregon, east to Hay Creek Coal Mines, and thence through the yellow pine timber belt towards Port Ontario. Contracts for the work, which will not be difficult, are to be let next year. Both steam and electricity are to be used as motive power. W. H. Huston, of Prineville, is President. (Nov. 16, p. 137.)

NEW YORK, WESTCHESTER & BOSTON.—The Common Council of New Rochelle, N. Y., has granted a franchise to this company to build its proposed line across various streets in that city either by overhead structures or underground passages. Two routes are at the option of the company, one of which must be selected within three months.

NEW YORK CITY SUBWAYS.—The Rapid Transit Commission and the Board of Estimate and Apportionment have decided to prepare forms for bids to be advertised for the three proposed new rapid transit subway lines in Manhattan, together with two new lines in the Bronx and the line to Fort Hamilton and Coney Island in Brooklyn. There will be three classes of contracts advertised early next year. One will call for bids for construction only, another will call for operation only and the third will be for construction and operation. The proposed lines in Manhattan are the Third, Lexington, Seventh and Eighth avenues.

OREGON RAILROAD & NAVIGATION CO.—An officer of the Ilwaco Railway & Navigation Co. writes that the proposed extension of this road is east along the Washington side of Columbia river, 17 miles from the present southern terminus at Ilwaco, Wash., via Chinook, Fort Columbia, Point Ellice and Hungry Harbor to Knappton. Contracts for about 14 miles from Ilwaco to Cook Station have been let to Erickson & Peterson, of Portland, Oregon. The work will be light. (Nov. 16, p. 137.)

PENNSYLVANIA.—Most of the work in the Pittsburg district in connection with the terminals of this company at the Point has been completed, and the large warehouse on Duquesne way, opposite the Pittsburg Exposition building, has been opened for service. Robert S. Spencer, of Baltimore, has been appointed general superintendent of the Duquesne Warehouse Company, which was formed to operate the Point terminals. This is a very large freight terminal and was built at a cost of more than $3,000,000.

PEORIA & CANTON (ELECTRIC).—Under this name a company has been incorporated in Illinois by the McKinley Syndicate, with a capital of $25,000. Preliminary surveys are being made for a line to connect with the McKinley system, over routes not yet determined upon. The incorporators include C. Zilly, C. R. Little and others. The directors are W. M. McKinley, R. H. Watson, S. L. Nelson, General Manager of the Peoria Railway, and others.

PERTH AMBOY & STATEN ISLAND (ELECTRIC).—Application has been made in New Jersey for incorporation by a company under this name, with a capital of $175,000, by F. W. Schnitz, E. White, M. F. Reiff and H. Lowerself, of New York; E. Biesenbach, of Newark, and J. W. Humphreys, of New York. The office of the company is at New Brunswick, N. J. The new corporation proposes to build an electric line from Richmond, S. I., to Tottenville, and operate ferry service between that place and Perth Amboy, at which place negotiations are under way for water front property. Frederick Griffen and W. J. Lally, of New York, are carrying out the preliminary work.

PITTSBURG RAILROAD.—A number of Boston capitalists, it is said, have been given a charter in Massachusetts to build a belt road around Pittsburg, Pa., also a terminal in that city at a cost of $20,000,000. The directors, whose names are not given, are said to be securing the necessary franchises to carry out the work.

ST. LEON.—Under this name a company with office at Louisville, Que., is asking for incorporation to build a line from St. Leon, Que., north to St. Elie, about 20 miles, with a branch east to Three Rivers; also one west to Lake Maskinonge, aggregating 40 miles additional.

SAN PEDRO, LOS ANGELES & SALT LAKE.—This company has filed with the Federal land office at Salt Lake, Utah, a map of its surveys for a proposed branch line into the Deep Creek mining region in the western part of Utah. The proposed route is from a point on the main line near Tintic Junction west, passing near Fish Springs, to Deep Creek, about 115 miles. This new line is eventually to be extended southwest to Ely, Nev., an additional 60 miles.

SOUTHERN.—Announcement is made that this company has given contracts to the W. J. Oliver Co., of Knoxville, Tenn., for laying a second track from Charlotte, N. C., to Atlanta, Ga., 260 miles. The contract calls for the beginning of the work by the first of next year, and its completion within five years. The line is also to be straightened and the grades reduced.

SOUTHERN PACIFIC.—According to reports from Clifton, Ariz., this company has decided to build an extension of the Gila Valley, Globe & Northern east to that place and Morenci.

YELLOWSTONE PARK.—This company, which was incorporated in 1905 to build a line from the Northern Pacific at Bridger, Mont., has completed the Bear Creek division, and it is now in operation. It extends from Bridger, Mont., where connection is made with the Northern Pacific, southwest via Jennings, Golden Belfry, Bear Creek, Smith and McCarthy, to Amalgamated, 26 miles. F. E. Hall, Belfry, Mont., is President. This line has no connection with the company incorporated by the Union Pacific under the same name. (See Construction Record.)

## RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—A meeting of the stockholders has been called for January 30 to authorize an issue of about $25,000,000 additional capital stock. There is now outstanding $101,955,500 of an authorized issue of $152,000,000. After this meeting the Board of Directors will decide whether to issue new stock direct to the stockholders or to issue an equal amount of convertible bonds. The proceeds are to be used for buying additional equipment and branch lines and to pay for a connection from Texico, N. Mex., south to the Gulf, Colorado & Santa Fe, probably at Brownwood, Texas.

Gross earnings for the month of October, 1906, were $8,462,883, an increase of $1,433,426; net earnings $3,692,611, an increase of $807,126.

ATLANTA & CHARLOTTE AIR LINE.—This company, which is operated by the Southern, has arranged with J. P. Morgan & Co. to extend to January, 1910, the following securities, which were to mature January 1, 1907: $500,000 outstanding preference mortgage bonds (originally 7 per cent. but extended from 1897 at 4 per cent); $4,250,000 first mortgage 7 per cent. bonds, and $750,000 non-cumulative income bonds (extended at 4 per cent. from 1900). All the bonds are to draw interest hereafter at the rate of 4½ per cent. a year, and the holders who deposit their bonds for extension on or before January 2, 1907, are to be given three-quarters of 1 per cent. in cash, and are to surrender their voting power of 10 votes on each $1,000 first mortgage bond.

CANADIAN NORTHERN.—It is reported that interests identified with this company have bought control of the Quebec & Lake St. John, which has $4,303,500 outstanding capital stock; it runs from Quebec to Roberval, Que., 189 miles, and from Chambord to Chicoutimi, Que., 51 miles. The dock and terminal properties of the company at Quebec and Chicoutimi would be valuable to the Canadian Northern.

CENTRAL OF GEORGIA.—The New York Stock Exchange has listed an additional $1,000,000 consolidated mortgage 5 per cent. bonds of 1945 of this company, being part of an authorized issue of $18,500,000. The additional securities were issued to reimburse the company in whole or in part for land bought at Savannah, Albany and other places in Georgia and Alabama; for additional yards and terminals; for making standard gage the 50-mile narrow gage Columbus & Rome Railroad, which runs from Columbus, Ga., to Greenville; for new equipment, and for new shops and shop improvements.

CHESAPEAKE & OHIO.—See Pennsylvania.

CLEVELAND & SHARON ELECTRIC.—This company has been incorporated in Ohio with $2,500,000 capital stock as the successor to the Cleveland & Sharon Traction, which has been in the hands of a receiver since September, 1904.

CLEVELAND & SHARON TRACTION CO.—See Cleveland & Sharon Electric.

CONSOLIDATED RAILWAY (N. Y., N. H. & H. ELECTRIC LINES).—It is reported that this company has bought the Rhode Island Securities Company, which has outstanding $12,000,000 capital stock, and $5,000,000 bonds. It controls the street railway companies, gas and electric light properties in and near Providence, R. I.

DELAWARE, LACKAWANNA & WESTERN.—An extra dividend of 10 per cent. has been declared on the $26,000,000 outstanding stock payable December 20 to holders of record on December 5. Since April, 1905, the dividend rate has been 10 per cent. per year, before which, since 1886, it was 7 per cent. Extra dividends of 10 per cent. were paid in 1904 and 1905.

ERIE.—Gross earnings for October, 1906, were $4,877,066, an increase of $464,437; net earnings, after taxes, $1,594,375, an increase of $317,649.

INTEROCEANIC OF MEXICO.—Dividends have been declared as follows: Two and one-quarter per cent. on the $5,750,000 outstanding 4½ per cent. second debenture stock, on which 2¼ per cent. was paid last May; 7 per cent. on the $2,347,295 outstanding 7 per cent. "B" debenture stock. The directors have decided to recommend a dividend of 2 per cent. on the $5,000,000 outstanding 7 per cent. preferred shares, after providing for the payment of $73,230 back dividends on this stock. In 1905, 4½ per cent. was paid on the "B" debenture stock, and in 1904, 6 per cent. The National of Mexico owns $5,000,000 of the second debenture stock. The road runs from Vera Cruz to Mexico City, 342 miles, and also operates 394 miles of branches. Gross earnings for the year ended June 30, 1906, were $3,230,165, an increase of $187,112; the operating expenses decreased $90,639, leaving net earnings of $942,924, an increase of $277,750.

LAKE SHORE & MICHIGAN SOUTHERN.—A semi-annual dividend of 6 per cent. has been declared on the $49,466,000 outstanding capital stock, of which all but $4,177,000 is owned by the New York Central & Hudson River. Previous annual dividends have been: 1898, 6½ per cent.; 1899 to 1903, inclusive, 7 per cent.; 1904 and 1905, 8 per cent.

Gross earnings, partly estimated, for the six months ending December 31, 1906, are $21,843,800, an increase of $1,410,600; net earnings $4,855,200, an increase of $1,908,000. Gross earnings for the year ending December 31, 1906, are $42,450,900, an increase of $3,850,100; net earnings $9,051,200, an increase of $1,781,900. The net income is $5,511,200, an increase of $1,043,200, and the surplus after the 10 per cent. dividend is $564,600, an increase of $53,900.

LOUISVILLE & NASHVILLE.—Gross earnings for October, 1906, were $4,139,835, an increase of $560,063; net earnings $1,176,247, an increase of $118,799.

MICHIGAN CENTRAL.—A semi-annual dividend of 3 per cent. has been declared on the $18,738,000 outstanding capital stock. The annual rate has been 4 per cent. since 1895; 5½ per cent. was paid from 1892 to 1894, inclusive, and 5 per cent. in 1890 and 1891. The New York Central & Hudson River holds $16,814,300 of the capital stock.

Gross earnings, partly estimated, for the six months ending December 31, 1906, are $13,468,000, an increase of $911,300; net earnings $2,281,100, a decrease of $25,800. The estimated gross earnings for the year ending December 31, 1906, are $26,087,100, an increase of $2,803,200; net earnings $4,566,300, an increase of $148,300. The net income is $987,100, an increase of $13,600, so that the increased dividend leaves a surplus of $50,200, a decrease of $173,800.

NATIONAL OF MEXICO.—See Interoceanic of Mexico.

NEW ORLEANS & NORTH-EASTERN.—A dividend of 5 per cent. has been declared on the $6,000,000 outstanding capital stock, payable December 1 to holders of record November 30. In 1905, 3½ per cent. was paid, and in 1903 and 1904, 3 per cent.

NEW YORK CENTRAL & HUDSON RIVER.—A quarterly dividend of 1½ per cent. was declared, on December 5, on the $149,442,500 outstanding capital stock. The annual dividend rate has been 5 per cent. since 1900, and for four years before that time it was 4 per cent. The gross earnings, partly estimated, for the quarter ending December 31, 1906, are $24,736,900, an increase of $1,218,700; net earnings $6,124,200, a decrease of $130,000. The partly estimated gross earnings for the year ending December 31, 1906, are $92,399,100, an increase of $6,303,500; net earnings $25,716,400, an increase of $1,121,600. The net income increased $2,292,600, a large part of this being on account of the increased dividends paid on the Michigan Central and the Lake Shore & Michigan Southern stock held by the New York Central. The surplus after dividends (5¼ per cent. for the year) is $3,185,500, an increase of $1,072,200.

A dividend of 5 per cent. has been declared, payable December 31, on the $1,615,000 capital stock of the St. Lawrence & Adirondack, being the first dividend since July, 1903, when 3 per cent. was paid. The New York Central owns the entire capital stock of the St. L. & A., and operates it as that part of its Adirondack division running between Malone Junction, N. Y., and Valleyfield, Que., 30 miles.

See Michigan Central; also Lake Shore & Michigan Southern.

NEW YORK, NEW HAVEN & HARTFORD.—The United States Supreme Court recently decided that it was constitutional for a railroad company in Connecticut to condemn the outstanding shares of a corporation, three-quarters of the stock of which it owned. The case was that of the N. Y., N. H. & H. vs. a holder of two shares of the New Haven & Derby, the N. Y., N. H. & H. owning the rest of the stock.

PENNSYLVANIA.—This company and its subsidiary companies have sold to Kuhn, Loeb & Company all of their holdings (156,300 shares) of Chesapeake & Ohio stock. The market value of this stock is about 60. There is outstanding $62,799,100 C. & O. capital stock.

PHILADELPHIA & READING.—Gross earnings for October, 1906, were $3,828,428, an increase of $139,091; net earnings, $1,556,900, a decrease of $56,758.

QUEBEC & LAKE ST. JOHN.—See Canadian Northern.

ST. LAWRENCE & ADIRONDACK.—See New York Central & Hudson River.

RHODE ISLAND SECURITIES COMPANY.—See Consolidated Railway.

SOUTHERN.—See Atlanta & Charlotte Air Line.

WISCASSET, WATERVILLE & FARMINGTON.—This narrow gage road, which runs from Wiscasset, Me., to Albion, 42 miles, and has been in the hands of a receiver since October 7, 1905, has been sold under foreclosure to Carson C. Peck, of New York, for $93,000.

# GENERAL NEWS SECTION

## NOTES.

Sir Thomas G. Shaughnessy announces that the Canadian Pacific proposes to clear 150,000 acres of land on Vancouver Island, with a view to promoting the settlement of the island.

The State Railroad Commission of Indiana has ordered a reduction of 33⅓ per cent. in freight rates on commercial fertilizers. The order apparently applies to all of the roads of the state.

The Federal government has renewed its prosecution of the Louisville & Nashville for alleged discrimination against employees for belonging to labor unions, and on December 5 the superintendent at Mobile was arrested.

The Southern Pacific is preparing to build a large new hospital in San Francisco, and it is said that land costing $200,000 has been bought as a site. The company lost a large brick hospital in the great fire of last April.

Railroads centering in Chicago have organized the Illinois Freight Association, to supervise the making of freight tariffs on intrastate shipments. The chairman of the Association is W. H. Hosmer, and Horace Tueker is Secretary.

According to the New York *Herald* certain railroad interests are not satisfied with the bill of Representative Esch, introduced in Congress last year, to require the use of the block system on American railroads, and will have another bill introduced.

Representative Pearre, of Maryland, has introduced in Congress a bill to require railroad telegraph operators handling block signals or despatchers' orders to be examined by the Interstate Commerce Commission; and to forbid, under severe penalties, the employment of operators not duly licensed.

The State Railroad Commission of Wisconsin, acting on complaints from a number of places, has ordered a reduction of 20 per cent. in freight rates on sugar beets, which applies, it appears, to the whole state; and the railroads must not stipulate more than 15 tons as the minimum carload.

The Brooklyn Rapid Transit Company, operating surface street cars in Brooklyn, N. Y., has enlarged one of its power houses, so that an addition of about 25 per cent. has been made to the number of cars running, thus relieving congestion at the Williamsburg bridge, the Brooklyn bridge and other important points.

The American Railway Association committee to investigate the freight car situation consists of Arthur Hale, Julius Kruttschnitt, F. A. De'ano, Samuel Higgins (N. Y., N. H. & H.), and J. R. Kenly (A. C. L.). The first three members also constitute the committee having in charge the affairs of the Car Hire Agreement.

Leading men in the Republican party of New York City say that at the coming session of the state legislature they expect to secure the passage of a radical railroad bill increasing the powers of the State Railroad Commission and providing for the appointment to the board of men well fitted for the office of commissioner.

A press despatch from Washington says that on January 5 the Southern Railway, on account of increased traffic, and the delays due to the construction of new main tracks, will take off mail train No. 97. By this act the company will lose about $140,000 annually, which it has received from the government as special compensation for fast time.

The Interstate Commerce Commission has ordered an investigation of the relations between the Union Pacific and Southern Pacific Railway Systems growing out of their common management and control. Messrs. Frank B. Kellogg and C. A. Severance, of St. Paul, have been retained to take charge of the investigation, which will extend from New York to San Francisco. Dates for hearings have not yet been fixed.

According to an Illinois paper passengers on the Illinois division of the Wabash railroad will hereafter be asked to enter trains by the front door and leave by the rear. Success to the effort! The plan to have passengers enter by the rear door and go out at the front has been more or less energetically prosecuted for the past 35 years, and still seems to be about where it was when it was started. Possibly the reversing of the process will bring success.

The Pacific Fruit Express Co., with a capital of $12,000,000, has been incorporated in Utah by Harriman interests to develop the plan of supplanting Armour refrigerator cars with the company's own cars. It will be recollected that 6,000 refrigerator cars were ordered from the American Car & Foundry Co. for this purpose last September. W. H. Bancroft, Vice-President and General Manager of the Oregon Short Line, is President of the new Company.

Chicago newspapers say that the Illinois Manufacturers' Association and other organizations of shippers have secured what they wanted from the railroads in the way of a negotiable form of bill of lading, and the abrogation or modification of the rule under which many kinds of freight, when carried at carriers' risk, are charged at 20 per cent. above the normal rates. The shippers expect that the railroads will next month adopt a new form of bill of lading which will be satisfactory.

At Danville, Va., on the morning of December 8 about 4 o'clock a passenger train of the Southern Railway collided with a freight train standing on the main track at or near the station, and two men were killed. Several others, including postal clerks and passengers, were injured. Danville is not far from Lawyer, where occurred the disastrous rear collision of passenger trains on November 29, and, according to newspapers, two signalmen and the flagman of the freight who were held blameworthy for this last collision have been arrested and are held on a criminal charge.

Congress will not consider the Sherman two-cent fare proposition for a month or two at least. The House Committee on Interstate Commerce has postponed until January 8 consideration of the bill. In the meantime Representative Mann, of Illinois, will prepare a bill going further than that of Mr. Sherman and fixing two cents per mile as the maximum rate of passenger fare that can be charged on any train. There will probably be brief hearings on the two-cent fare question, but it is not at all probable that any bill affecting passenger fares will become a law during the present session. It is doubtful whether any such bill will even be reported from the House Committee.

Chicago reporters gather that all the railroads centering in that city expect to make general advances in wages about January 1, but they say that the negotiations with the men are not yet finished. At the same time some of the reports continue the old stories of big demands by the men, refusal by the road, and danger of serious strikes. It is reported in New York City that the yard conductors and brakemen throughout the switching district of New York harbor are demanding a large increase of pay, which is thus far refused, but an officer on one of the prominent roads says that the reports that a strike is imminent are not well founded. At Pittsburg the brotherhood of railroad trainmen is making demands on the Baltimore & Ohio, which, it is said, have been refused.

In the United States Court at Salt Lake City the Grand Jury on December 7 presented indictments against the corporations and individuals named below, based on evidence recently brought out by the Interstate Commerce Commission concerning discrimination against coal dealers and alleged illegal methods employed in acquiring coal lands: Union Pacific Railroad; Union Pacific Coal Company; Oregon Short Line; Everett Buckingham, General Superintendent of the Oregon Short Line; James N. Moore, General Sales Agent of the Union Pacific Coal Company; H. G. Williams, General Manager of the Utah Fuel Company; Robert Forrester, geologist for the Utah Fuel Company; William D. Foster; George A. Moore; Elroy H. Clark; Alexander Cawie; P. W. Spaulding, Union Pacific attorney at Evanston, Wyo.; and Theodore Schulte, of Salt Lake.

A suit has been begun in the United States Circuit Court by D. W. Burrows, of Chicago, to have declared illegal the formation of the Metropolitan Securities Company, of New York, the defendants being the Interborough-Metropolitan Company, the Interborough Rapid Transit Company, the Metropolitan Street Railway Company, the Metropolitan Securities Company, the Manhattan Railway Company, the New York City Railway Company, Thomas F. Ryan, August Belmont, Cornelius Vanderbilt, Edward J. Berwind, John D. Crimmins, Andrew Freedman, Thomas P. Fowler, Gardiner M. Lane, F. S. Gannon, R. W. Meade, Orin Root, Jr., Edward W. Sayre, H. H. Vreeland and Charles E. Warren. The complaint alleges that the merger of these interests is tantamount to a conspiracy in restraint of trade, and as a holder of 1,400 shares of stock in the Metropolitan Securities Company he asks that the combination be dissolved.

Congestion of freight continues general, and instances of obstruction, delay and serious inconvenience are literally too numerous to mention. The last two items published are from Burlington, Vt., and Goldfield, Nev., indicating the wide extent of the trouble. At Burlington the quantity of lumber brought from Canada by canal boats is larger than before for 10 years, and lumber yards are congested because cars cannot be found in which to ship it. At Goldfield, where freight is piling up hopelessly, the volume has doubled

in two months. A third item from another corner of the country, Florida, shows what is going to be done about it. The railroad commissioners of that state have fined the Seaboard Air Line $1,000, for not supplying shippers with cars, and threaten to pile up fines against all offending railroads "until they shall awaken to the realization that they must either supply themselves with cars or be swamped with fines."

### Fines for Sugar Rebates $312,000.

On Thursday last Judge Holt in the United States Court imposed fines aggregating $150,000 on the American Sugar Refining Company and the Brooklyn Cooperage Company for accepting rebates on sugar shipped to Detroit in 1902. Up to and including this decision, Judge Holt has imposed fines for illegal rates on sugar shipments aggregating $312,000, namely: New York Central & Hudson River Railroad, $108,000 and $18,000; F. L. Pomeroy, Freight Traffic Manager, $6,000; Goodloe and Earle, sugar jobbers of Detroit, $12,000; American Sugar Refining Company, previously $18,000. Messrs. Goodloe & Earle pleaded guilty December 10, and promptly paid their fines. These last fines of $150,000 followed pleas of guilty made December 11. Judge Holt, in passing sentence, said that the law did not contemplate excessive fines, and United States Attorney Stimson agreeing that the fines imposed would probably be large enough to deter rebaters in the future, consented to suspend action on other indictments pending against the defendants. The New York Central did not plead guilty, and it is supposed that it will appeal to the higher court.

### Electric Traction on the New York Central.

The New York Central is now running daily eight trains into the Grand Central Station and eight out, by electric power. This service was begun December 11. The trains run on the Hudson division to and from Yonkers, 15 miles, and the electric power is used between the terminal and High Bridge, six miles. These trains run into the old station on the old tracks, which have been fitted with the third rail. On December 13 all of the trains of the Harlem division began to run to and from the new temporary terminal at the east side of the enlarged yard. These trains, however, are propelled by electric power only within the yard limits, steam engines being attached and detached just south of the tunnel. This temporary passenger station is on Lexington avenue between 43d and 44th streets, in the basement and first story of the "Grand Central Palace."

### Extension of Elevated Railroad Runs.

The trains of the Manhattan Elevated Railroad of New York City, west side division, are to run through to High Bridge across the Harlem river. The northern terminus of the elevated line is at 155th street, which is the southern terminus of the Putnam division of the New York Central, and passengers change from one road to the other at that point. With the extension of the runs of the elevated trains northward, one mile, to High Bridge, the runs of the New York Central trains will be shortened to the same extent, and High Bridge will become the operating terminus for both roads. By this extension of the trips of the elevated trains a large number of passengers going downtown in the morning and uptown at night will save the time heretofore taken up in changing cars at 155th street.

## TRADE CATALOGUES.

*Electric Hoists.*—The Sprague Electric Company, New York City, sends a folder calling attention to several types of electric hoists and cranes made by the company. The illustrations show different combinations of the hoists for cranes, winches and winding drum hoists.

*Vises.*—The Fulton Machine & Vise Company, Lowville, N. Y., sends an illustrated catalogue and price list of swivel vises. Wood working and malleable pipe vises are also shown.

## Manufacturing and Business.

The American Car & Foundry Co.'s new steel car plant at Madison, Ill., is in operation and is turning out from 40 to 50 cars daily.

H. A. Flagg has been appointed Manager of Sales in charge of the New York office of the Shelby Steel Tube Company of Pittsburg, Pa.

The car department of the Lower Allegheny works of the Pressed Steel Car Co. recently closed down because of slow deliveries of steel.

The Central Inspection Bureau, New York, has an order from the American Railways Co. to inspect 10 truck cars to be built at the Jewett Car Co.

The St. Louis Car Company has increased its capital stock from $2,500,000 to $3,000,000, the additional stock being taken by the President of the company, G. J. Kobusch. The proceeds of the sal are to be used for improvements.

Nathaniel Haven has resigned as President of the Baltimor Bridge Co., which concern he organized five years ago. Before hi connection with the Baltimore Bridge Co. Mr. Haven was for som years with the Union Bridge Co., now a part of the American Bridg Co. of New York.

A dividend of ½ of 1 per cent. has been declared payable Janu ary 1, 1907, on the $30,000,000 outstanding common stock of th American Car & Foundry Co., being the first dividend on this stoc since 1904. The annual rates have been as follows: 1900, 1 pe cent.; 1901 and 1902, 2 per cent.; 1903, 4 per cent.; 1904, ½ of per cent.

The Midvale Steel Company, Philadelphia, has ordered fron the Allis-Chalmers Company a heavy duty cross compound engine with cylinders 30 in. and 46 in. x 48 in., for direct-connection to a electric generator, to be installed in its plant at Nicetown, Pa. Th engine is to be operated non-condensing and the normal capacity of the unit will be 1,000 k.w.

Fitzhugh Townsend, instructor in the electrical engineering de partment of Columbia University, died at his home in New York City, December 11, of typhoid fever. Prof. Townsend was consult ing engineer to the General Railway Signal Co., in connection with the signal installations now being made by that company on the New York Central and the New York, New Haven & Hartford.

Adreon & Co., St. Louis, Mo., have established an office in Chicago, with Edw. W. Hodgkins, Vice-President of the company in Chicago, in charge. The L. J. Bordo Co., Philadelphia, Pa., make of Bordo blow-off valves and Bordo swing joints, of which Mr Hodgkins is also Vice-President, has established a general western sales office in Chicago with Mr. Hodgkins in charge. His office will be 208 Western Union Building.

The directors of the Union Switch & Signal Company have de clared a quarterly dividend of 3 per cent. on the $497,600 preferred stock, and a quarterly dividend of 3 per cent. on the $1,748,700 com mon stock. The annual rates on the preferred stock have been: 1 per cent. in 1904, 1905 and 1906; 9 per cent. in 1903 and 8 per cent in 1902 and 1901. The annual rates on the common stock have been 8 per cent. in 1904, 1905 and 1906; 6 per cent. in 1903 and 4 per cent in 1902 and 1901.

N. P. Rogers, Secretary and Treasurer of the Haskell & Barker Car Company, Michigan City, Ind., died in Tucson, Ariz., on Decem ber 1. He was 68 years old, having been born in Plymouth, N. H. in 1838. He had been with the Haskell & Barker works since 1864 when he began as accountant. In 1871, when the Haskell & Barker Car Company was organized, he was made Secretary. He was given also the duties of Treasurer in 1883, at the time of the retirement of H. T. Haskell; he held the joint office until his death.

The American Car & Equipment Co., Chicago, has completed negotiations for the erection of a new plant. It will be located a Chicago Heights, Ill., and will cover 23 acres. The plant will in clude a large freight car erecting shop, coach shop, mill building machine shop, power house and locomotive erecting shop; all build ings will be new. Plans are being drawn by Hnehl & Schmidt architects, Chicago, and grading for the plant and installation o tracks has been begun. The work is being done under the super vision of C. R. Powell, Vice-President of the company. The head quarters of the company have been removed from 936 The Monad nock to 1537 and 1538 The Monadnock, Chicago, where much large offices are occupied.

### Iron and Steel.

The South & Western has given orders to the Pennsylvania Steel Co. for 6,900 tons of fabricated steel for bridges, and to the King Bridge Co. for 600 tons. The New York Central has given orders for 1,600 tons of structural material for station work, and will shortly let contracts for several thousand tons additional. The Chicago, Milwaukee & St. Paul has ordered 600 tons of fabricated steel; the Lehigh Valley 900 tons; the Pennsylvania Railroad an additional order for 200 tons, and the New York, New Haven & Hartford 300 tons. The Brooklyn Heights Railroad is still in the market for 5,000 tons of fabricated steel for elevated work. Another contract for about 2,500 tons of steel is pending for a Scherzer bridge of two 100-ft. spans for Fall River.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Franklin Institute.

At a meeting of the Sections, December 13, the programme included an address on "The Manufacture of Railway Car Axles," by Henrik V. von Z. Loss.

### Engineers' Club of Philadelphia.

At a meeting of this club to be held December 15 there will be a paper on "Bascule Bridges and the Construction of Arched Bridges Without Falsework" by J. B. Strauss.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Ashland & Western.*—The officers of this road are as follows.—Z. W. Davis, President; H. B. Stewart, Vice-President; R. N. Raff, Secretary; William Simpson, Treasurer; Z. T. Herndon, Chief Engineer, all with offices at Canton, Ohio, and J. W. Brown, Auditor, with office at Ashland, Ohio.

*Chicago, Burlington & Quincy.*—C. G. Burnham, Foreign Traffic Agent, has been appointed Assistant to the First Vice-President.

*Chicago, Cincinnati & Louisville.*—See Wisconsin Central.

*Cincinnati, Georgetown & Portsmouth.*—A. O. Herzog, Secretary, has been elected also Treasurer.

*Cincinnati, Hamilton & Dayton.*—F. A. Deverell has been appointed Auditor of Disbursements.

*New Orleans & Northeastern.*—D. D. Curran, General Manager, has been elected also Vice-President of this road and of the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific.

*Wisconsin Central.*—Henry C. Starr, Vice-President and General Counsel of the Chicago, Cincinnati & Louisville, has been elected Vice-President and General Attorney of the Wisconsin Central, succeeding Howard Morris, resigned.

### Operating Officers.

*Baltimore & Ohio.*—Charles W. Galloway, who was recently appointed Superintendent of Transportation, has done all his railroad work on the B. & O. His present position was created because of the need of an assistant to the General Superintendent of Transportation, most of whose time is now taken up by his service as a member of the new Car Hire Committee. Mr. Galloway was born in 1868, and began railroad work in 1883 as a messenger boy. He served as clerk and stenographer to the Master of Transportation, then to the Manager and finally to the General Superintendent. He was secretary, successively, to the Superintendent of Car Service, the Superintendent of Transportation and the General Superintendent. In 1897 he was appointed trainmaster of the Baltimore division, and two years later was made Assistant Superintendent of the First division. In 1901 he was appointed Superintendent of the Cumberland division, and since 1903 he has been Superintendent of the Baltimore division.

C. W. Galloway.

*Cincinnati, Georgetown & Portsmouth.*—E. W. White has been appointed General Manager and General Freight and Passenger Agent, with office at Cincinnati, Ohio.

*Colorado & Southern.*—S. S. Morris has been appointed Superintendent of the Northern division, with office at Denver, Colo.

*Denver, Enid & Gulf.*—G. C. Starkweather is Acting General Manager, with office at Enid, Okla. T.

*Lake Shore & Michigan Southern.*—Orin C. Smith has been appointed Car Accountant, with office at Cleveland, Ohio.

*Louisiana & Northwest.*—P. L. Mackey has been appointed Superintendent, with office at Magnolia, Ark., succeeding W. R. Haynes, resigned.

*Louisville & Nashville.*—J. M. Scott has been appointed Assistant Superintendent of the Louisville, Cincinnati & Lexington division, with office at Louisville, Ky.

*Midland Valley.*—G. S. Russell, Car Accountant, having been assigned to other duties, his former position has been abolished. C. E. Mandeville has been appointed Superintendent of Car Service.

*Trinity & Brazos Valley.*—W. O. Hamilton has been elected Treasurer, succeeding F. P. West, resigned.

### Traffic Officers.

*Bangor & Aroostook.*—C. C. Brown, General Freight Agent, has resigned to go to the Morse Steamship Lines.

*Canadian Northern.*—George Stephen has been appointed Assistant General Freight Agent and C. W. Cooper Assistant General Passenger Agent, both with offices at Winnipeg, Man.

*Cleveland, Cincinnati, Chicago & St. Louis.*—See New York Central Lines.

*Colorado Springs & Cripple Creek District.*—D. C. MacWatters, General Passenger Agent, has resigned, effective January 1.

*New York Central Lines.*—George J. Grammer, who was recently elected Vice-President in charge of freight traffic of all the New York Central Lines, was born in 1845 in Ohio. After several years' experience on western river steamship lines, he began railroad work, in 1881, as General Freight and Passenger Agent of the Evansville & Terre Haute. He was made Traffic Manager of that road and of the Evansville & Indianapolis two years later, and in 1886 was made General Traffic Manager of the two roads. Later his authority was extended over the Peoria, Decatur & Evansville, the Louisville, Evansville & St. Louis, and the Chicago & Eastern Illinois. In 1892 he was elected President of the Evansville & Terre Haute, the Evansville & Indianapolis, and the Evansville & Richmond. In 1894 he went to the Chesapeake, Ohio & Southwestern as General Manager, and, a few months later, was made General Freight Agent of the Lake Shore & Michigan Southern. He was appointed General Traffic Manager of the last named road in 1896, and in 1905 was elected Vice-President in charge of the New York Central Lines west of Buffalo, where he has been until his recent appointment. It is interesting to notice that the authority of Mr. Grammer and the three new Vice-Presidents extends over the New York, Chicago & St. Louis, which heretofore has been operated under an almost entirely separate organization.

G. J. Grammer.

Charles F. Daly, who was elected Vice-President in charge of passenger traffic of all New York Central Lines, was born in 1865 and began railroad work in 1878 as a telegraph operator on the Chicago, Burlington & Quincy. Until 1888 he was passenger and ticket agent at various points on that road, going finally into the General Passenger Agent's office; he then went to the Lake Erie & Western as chief clerk to the General Passenger and Ticket Agent. The next year he was made Assistant General Passenger Agent, and in 1890 was appointed General Passenger Agent. He was appointed Chief Assistant General Passenger Agent of the Lake Shore & Michigan Southern in 1902, and in 1905 was made Passenger Traffic Manager of that road and of the Michigan Central and the Lake Erie & Western. Since December, 1905, he has been Passenger Traffic Manager of the lines east of Buffalo.

C. F. Daly.

Ira A. Place, who has been made Vice-President in charge of legal matters on lines east of Buffalo, graduated from Cornell University in 1881. He began to study law in Syracuse in the office of the firm of Vann & McLennan, who were local attorneys for the New York, West Shore & Buffalo, then being built. Mr. Place was admitted to the bar in 1883, and then went to New York City with P. B. McLennan, General Counsel for the New York, West Shore & Buffalo. The West Shore soon went into a receivership, and when it was reorganized and leased to the New York Central & Hudson River, in 1886, Mr. Place was made Assistant to the General Counsel of the last named company. He was later made Chief Assistant to the General Counsel, and in 1902 was made General Attorney, being at the head of the legal department.

Ira A. Place.

Albert H. Harris.

Albert H. Harris, who has been elected Vice-President in charge of legal matters on the lines west of Buffalo was born in 1861 at Rochester, N. Y. He graduated from the University of Rochester in 1881, and began to practice law in that city in 1884. His practice was largely in connection with corporations, and he was for some time local counsel for the New York Central & Hudson River. He left an important practice in 1905 to go to New York as General Attorney of the New York Central, where he remained until his recent promotion. Mr. Harris is a trustee of several corporations in Rochester, and is a Director of the Rochester Railway.

*New York Central.*—B. B. Mitchell, Freight Traffic Manager of the lines west of Buffalo, has been appointed Freight Traffic Manager of the lines east of Buffalo, succeeding F. L. Pomeroy, deceased. George H. Ingalls, General Freight Agent of the Cleveland, Cincinnati, Chicago & St. Louis, succeeds Mr. Mitchell, with office at Chicago, Ill.

*San Pedro, Los Angeles & Salt Lake.*—Frederick W. Wann, formerly Vice-President of the Cincinnati, Hamilton & Dayton, has been appointed General Traffic Manager of the San Pedro, Los Angeles & Salt Lake.

### Engineering and Rolling Stock Officers.

*Algoma Central & Hudson Bay.*—K. J. C. Zinck has been appointed Engineer of Maintenance of Way and Construction.

*Central of Georgia.*—F. F. Gaines, heretofore Mechanical Engineer of the Philadelphia & Reading, has been appointed to the new office of Superintendent of Motive Power of the Central of Georgia.

*Erie.*—William Schlafge, Master Mechanic of the New York division, has been appointed Master Car Builder at Meadville, Pa., succeeding R. W. Burnett, resigned. J. J. Dewey, Master Mechanic of the Cincinnati division, succeeds Mr. Schlafge, with office at Jersey City, N. J. C. James, Master Mechanic of the Rochester division, succeeds Mr. Dewey, with office at Galion, Ohio. D. Van Riper, general foreman of the Meadville shops, succeeds Mr. James, with office at Avon, N. Y. G. A. Moriarity, general foreman of the Port Jervis shops, has been appointed Master Mechanic of the Delaware division, with office at Port Jervis, N. Y.

*Harriman Lines.*—The office of J. D. Isaacs, Consulting Engineer, has been removed from San Francisco to Chicago.

*New York Central & Hudson River.*—W. J. Crandall, road-foreman of engines, has been appointed to the new office of Master Mechanic at Syracuse, N. Y., in charge of that part of the Western division from Syracuse west to and including Rochester.

*Oregon Short Line.*—See Union Pacific.

*Philadelphia & Reading.*—W. G. Edmondson, Engineer of Tests, has been appointed Mechanical Engineer, succeeding F. F. Gaines, resigned. See Central of Georgia.

*Southern Pacific.*—Howard Stillman, heretofore Engineer of Tests, has been appointed Mechanical Engineer succeeding F. W. Mahl, resigned to go to another company.

*Union Pacific.*—R. B. Robinson has been appointed Division Engineer of the Utah division of the Oregon Short Line and of the Wyoming district of the Union Pacific lines west of Green river, with office at Salt Lake City, Utah, succeeding H. J. Harris, resigned.

## LOCOMOTIVE BUILDING.

*The Illinois Central* has ordered 50 locomotives.

*The Chicago, Milwaukee & St. Paul* has ordered two compound Atlantic (4-4-2) type locomotives from the Baldwin Locomotive Works.

*The Commonwealth Oil Company*, Sydney, New South Wales, has ordered a locomotive from the Lima Locomotive & Machine Company.

*The Stratford Railway Construction Co.*, Lima, Ohio, has ordered one mogul (2-6-0) locomotive from the Hicks Locomotive & Car Works.

## CAR BUILDING.

*The Illinois Central* has ordered 500 cars.

*The Pennsylvania* is reported to be asking bids on 5,000 or more freight cars.

*The Seaboard Air Line*, it is reported, is about to build 50 flat cars at its Portsmith, Va., shops.

*The Colorado & Southern* is reported to have ordered 2,200 box cars from the Pullman Company.

*The Buffalo, Rochester & Pittsburg* is reported to have ordered 500 box cars from the American Car & Foundry Co.

*The Lehigh Valley* is reported to have ordered 1,000 box cars from the Standard Steel Car Co., and 4,000 coal cars.

*The Tonopah & Goldfield* is said to be asking bids on from 100 to 200 drop bottom wooden coal cars of 80,000 lbs. capacity.

*The Chicago, Lake Shore & Eastern* has ordered 350 steel underframe gondola and 100 steel underframe flat cars from the American Car & Foundry Co.

*The Missouri, Kansas & Texas*, it is reported, will soon place an order for a large number of steel coal cars and probably for some steel underframe box cars.

*The Bolivia Railways Company* has ordered 50 steel underframe flat and 30 steel underframe box cars of 60,000 lbs. capacity, and eight tank cars and four cabooses from the Middletown Car Works.

*The Indianapolis, Crawfordsville & Western Traction Co.*, Crawfordsville, Ind., has ordered through the Electrical Installation Co., Chicago, eight interurban cars and two express cars from the Jewett Car Company.

*The Harriman Lines* have ordered five dining cars for the Southern Pacific, two dining cars for the Louisiana Western, one dining car for Morgan's Louisiana & Texas, and one dining car for the Texas & New Orleans from the Pullman Co.

*The Chicago, Rock Island & Pacific* is asking bids on 103 box cars of 80,000 lbs. capacity, 35 coal cars of 100,000 lbs. capacity, 18 stock cars of 80,000 lbs. capacity, three furniture cars of 60,000 lbs. capacity, and three flat cars of 100,000 lbs. capacity.

*The Wabash*, as reported in our issue of November 16, has ordered 2,000 steel hopper cars from the Standard Steel Car Co., 2,000 steel hopper cars from the Cambria Steel Co., 1,000 wooden box cars from the American Car & Foundry Co. and 1,000 wooden box cars from the Pullman Co.

*The Indianapolis, Columbus & Southern Traction*, as reported in our issue of December 7, has ordered three interurban cars from the Niles Car & Manufacturing Company for May, 1907, delivery.

These cars will weigh 60,000 lbs., and will measure 50 ft. long, 8 ft. 10 in. wide, over all, and 10 ft. high from bottom of sill to trolley board. The special equipment includes: Peter Smith heating system and Baldwin trucks.

*The Philippine Railway* is having built at the Middletown Car Works fifty 3-ft. 6-in. gage, 40-ton flat cars, which are to be delivered January 1, 1907. These cars will weigh 28,000 lbs., and will measure 35 ft. long, 8 ft. wide and 3 ft. 7½ in. high, all over all measurements. Bodies and underframes will be of wood. The special equipment is M. C. B. standard, except as follows:

| | |
|---|---|
| Bolsters | Rivetted box girder |
| Brake-beams | Buffalo I |
| Brakes | Westinghouse |
| Couplers | Janney-Kelso |
| Draft rigging | Miner tandem |
| Dust guards | Wooden |
| Trucks | Diamond frame; arch bar |

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ARKANSAS SOUTHERN.—See Chicago, Rock Island & Pacific.

ATLANTIC & NORTHERN CAROLINA.—See Norfolk & Southern.

ATLANTIC COAST LINE.—On the third division of this road the Newberry branch has been extended from Newberry, Fla., west to Wilcox, 20 miles.

BIRMINGHAM SOUTHERN.—According to reports from Birmingham, Ala., this company will shortly let contracts for extending its road five miles to new mines.

CANADIAN NORTHERN.—This company is applying to Parliament for permission to extend its line from Edmonton to Calgary, from Regina to the international boundary, from Edmonton west via the Yellow Head Pass to the Pacific coast, from Strathcona south to Calgary, from Saskatoon south to the South Saskatchewan river and from Athabasca southwest to the headwaters of the McLeod river.

The Ridgeville section of this road has been opened for business from South Junction, Man., west to Emerson Junction, 23 miles.

A new branch, known as the Thunderhill branch, has been opened for business from Thunderhill Junction, Man., west 20.1 miles to a point 1.3 miles beyond Benito.

CANADIAN PACIFIC.—This company will ask to be allowed to build new lines in Saskatchewan and Alberta as follows:

From a point in Township six, seven, eight or nine, Range 30, west of the second principal meridian, west to a connection with the Crow's Nest Pass Branch between Range 16 west of the fourth principal meridian and Lethbridge, about 350 miles.

From a point on the proposed revision of the Crow's Nest Pass branch in Township 10, Range 23 or 24 west of the fourth principal meridian, north to a point in Township 15, 16, 17 or 18, Range 22, 23 or 24, west of the fourth principal meridian, about 50 miles.

And to build a branch from Earl Grey or Bulyea on its Pleasant Hills branch, Saskatchewan, or from some point between those places, southwest to a point in Township 20 or 21, Range 21, west of the second meridian.

The Reston branch of the Central division of this road from Reston, Man., west to Kaiser, 98.2 miles has been opened for business.

The Guelph branch of the Ontario division has been extended from Elmira, Ont., 18 miles, west to Milverton.

CHESAPEAKE & OHIO.—This company has opened for business its White Oak branch from White Oak Junction, W. Va., to Scarbro, two miles, where connection is made with the White Oak Railway for Stuart.

CHICAGO, MILWAUKEE & ST. PAUL.—Announcement has been made by this company of the route of its proposed extension from Butte, Mont., west to the Pacific coast, a description of which is given elsewhere in this issue.

CHICAGO, ROCK ISLAND & PACIFIC.—According to reports from Denver, this company is planning an independent entrance into this city by building a new line from Limon to Colorado Springs, and thence to Resolis, about 10 miles west of Limon; from this point the surveys run northwest about midway between the Union Pacific and the Colorado & Southern lines, to a connection with the latter at Melvin, 10 miles southeast of Denver, from which point it is proposed to use the Colorado & Southern tracks into the city. Such a line would necessitate laying about 60 miles of track.

The Rock Island, Arkansas & Louisiana division of this road has been extended from Winfield, La., south to Wirand, 9.30 miles.

See Oklahoma & Canadian River.

COLORADO & SOUTHERN.—The Wichita Valley has been extended from Seymour, Tex., west to Stamford, 60.7 miles.

DELAWARE & EASTERN.—This company not long ago put in operation its road from East Branch, N. Y., on the New York, Ontario & Western, northeast to Arkville on the Ulster & Delaware, 37 miles. It appears that there are plans for extending the road in both directions, so as to make it a connecting line between the anthracite coal regions of Pennsylvania and Schenectady, where it would meet lines running into New England. The northern extension to Schenectady is to be built by the Schenectady & Margaretsville Railroad; part of the southern extension, by the Hancock & East Branch. On December 11 the New York State Railroad Commission granted permits to each of these companies to build their lines. On completion of both extensions the road would be a through line from Wilkesbarre, Pa., to Schenectady, N. Y.

DENVER, ENID & GULF.—This company is now operating its new line from Kiowa, Kan., north to Madison Lodge, 20 miles.

DULUTH & NORTHERN MINNESOTA.—This road has been extended from North Branch Junction, Minn., north to Schauff Lake, 12.4 miles.

FOURCHE RIVER VALLEY & INDIAN TERRITORY.—This road has been opened for business from Fourche, Ark., which is on the Chicago, Rock Island & Pacific, west to Bellevue, 18.4 miles.

GAINESVILLE MIDLAND.—This road has been extended from Jefferson, Ga., south to Athens, 19 miles.

GREAT NORTHERN.—On the Minot division of this road the Thorne line has been extended from Thorne, N. D., to Dunseith, seven miles.

GULF, COLORADO & SANTA FE.—It is reported that this company will build a line from Winnie, on its Gulf & Interstate division, to Houston, about 60 miles.

HANCOCK & EAST BRANCH.—See Delaware & Eastern.

HOUSTON, SABINE & RED RIVER.—The franchises and rights of this company, building a line from Houston, Tex., to Alexandria, Pa., have been sold to a syndicate of New York capitalists. It is stated that the new owners will build the road in accordance with the plans of the original promoters. (July 6, p. 5.)

HUNTINGTON & BROAD TOP MOUNTAIN.—This company has opened for business its Six-Mile Run branch, from Riddlesburg, Pa., to Coaldale.

ILLINOIS, IOWA & MINNESOTA.—This company has completed track laying between Rockford and Aurora, Ill., and is planning to at once build a new line from Aurora to Joliet.

INDIAN CENTRAL.—E. D. Chadick of Paris, Tex., is promoting the building of this line from Palestine, Tex., to Claremore, Ind. T. It is said that the town of McAlester, Ind. T., has agreed to give a bonus of $100,000 to the new road in consideration of which the shops and general offices of the road are to be located there.

LOUISVILLE & NASHVILLE.—This company has opened for business a new branch on its Atlanta division from Etowah, Tenn., south to Junta, Ga., 88 miles.

MINNEAPOLIS & RAINY RIVER.—This company's road now extends on the main line from Deer River, Minn., via Jessie Junction and Marcell Junction, to Big Fork, 30.2 miles, with a branch from Jessie Junction to Bass Lake, 17.8 miles; also one from Marcell Junction to Marcell, formerly Turtle Lake, 1.7 miles.

MINNESOTA & INTERNATIONAL.—See Northern Pacific.

MISSOURI PACIFIC.—Grading work on the Springfield Southwestern, under which name this company is building a branch from Springfield, Mo., southwest to Crane, on the White River Division has been completed. It was done by the Willier Construction Company, and track laying is to be started at once. Contracts were recently let for grading and construction work near and in the city of Springfield, where the company will have extensive terminals. The first contract for grading the right of way west two miles was given to R. N. Bush, a former sub-contractor of the Willier Construction Co., the work to be completed by February 15 of next year. The other contract is for work within the city of Springfield. It includes a cut 20 ft. deep, mostly through solid limestone, and was given to A. N. Hanson of Springfield.

NATCHEZ, COLUMBIA & MOBILE.—This road has been extended from Old Camp, Miss., formerly Roonville, to Loweton, 5.5 miles.

NEW YORK, NEW HAVEN & HARTFORD.—Announcement is made that the Providence division of this road is to be four-tracked throughout to accommodate the increased traffic. About half of the division is already four-tracked, leaving some 20 miles to be completed. This improvement, with the completion of the tunnel from East Providence to the passenger station in Providence, will relieve the present congestion through Pawtucket. The tunnel will also permit the operation of electric cars between Fall River and Providence union station, and may be used for a through all-rail passenger service between New York and Newport by way of Fall River.

NORFOLK & SOUTHERN.—The Atlantic & North Carolina has been extended from Moorhead City, N. C., to Beaufort, four miles.

NORTHERN PACIFIC.—A contract is reported let by this company to Doherty & Dempsey of Bemidji, Minn., to extend the Minnesota & International from Big Falls northeast to International Falls, 37

miles. The road follows an old survey to Bear Creek, from which point the new survey has been made. The contract calls for the completion of the work by July of next year.

Oklahoma & Canadian River.—Incorporated in Oklahoma with $7,350,000 to build a line from the Rock Island at El Reno, Okla., northwest to Meade, Kan., also on the Rock Island. The line would run about 245 miles through the counties of Canadian, Kingfisher, Blaine, Dewey, Woodward and Beaver in Oklahoma, and Clark and Meade in Kansas. The estimated cost of the work is $6,125,000. The incorporators include E. E. Blake, H. B. Low and C. O. Blake, of El Reno, and P. E. Walker and M. A. Low, of Topeka. It is believed that the new company has been organized in the interest of the Rock Island.

Oregon Short Line.—This company has opened for business the Wellsville branch on the Utah division, from Mendon, Utah, east to Logan Junction, 15 miles.

Paragould South-eastern.—See St. Louis South-western.

Rochester-Corning-Elmira Traction.—The New York State Board of Railroad Commissioners has denied the application of this company for a certificate of necessity to construct an electric line from Rochester to Elmira.

St. Louis South-western.—The Paragould South-eastern has been extended from Chickasawba, Ark., to Blythesville, one mile.

Savannah, Augusta & Northern.—This company has applied in Georgia for a charter to build a line from Savannah, Ga., northwest via Statesboro, Louisville and Athens to Rossville, on the Central of Georgia opposite Chattanooga, Tenn., 330 miles air line; also from a point on its proposed line in McDuffie county east through the counties of Columbia and Richmond to Augusta, about 30 miles additional. The incorporators include J. A. Brennan, J. R. Miller, R. F. Donaldson, E. B. Sorrier, S. L. Moore, of Bulloch county, Georgia, and E. M. Rice, of New York City.

Schenectady & Margaretsville.—See Delaware & Eastern.

Southern.—The Stoneville branch, on the Birmingham division of this road, has been extended from Delta City, Miss., 5.5 miles, to Richey, and a new branch on the same division has been opened for business from Itta Bena, Miss., south to Belzoni, 26.8 miles.

Southern Pacific.—This company is running a daily train between San Francisco and Napa, via Tiburon, over the California North-western to Wingo, thence over its own line to Napa and Calistoga. By the new line the running time between San Francisco and Napa is reduced 38 minutes.

Spokane International.—This company has opened its road for freight traffic from Coeur d'Alene Junction, Idaho, which is 21 miles east of Spokane, northeast via Sand Point and Bonner's Ferry to Eastport, on the Canadian border, 120 miles.

Springfield South-western.—See Missouri Pacific.

Wichita Valley.—See Colorado & Southern.

Wilkesbarre & Hazleton (Electric).—The stockholders of this company have decided to increase its bonded debt $500,000, to be used for terminal improvements in Wilkesbarre and in Hazleton.

Yosemite Valley.—This company has extended its road from Pleasant Valley, Cal., 12 miles, to Bagby.

Youngstown & Ohio River.—This company is making surveys for a new route from West Point to the Ohio river via Cannon's Mills and Calcutta to East Liverpool. R. W. Randolph of Pittsburg is in charge of the work.

## RAILROAD CORPORATION NEWS.

Canadian Pacific. The President of this company has brought action against F. A. Heinze to compel him to select one-half of the 750,000 acres of land owned by the Columbia & Western. This road, which runs from Robson to Midway, B. C., 100 miles, was built by Mr. Heinze and bought by the Canadian Pacific, Mr. Heinze retaining a half interest in the lands. The Canadian Pacific, it is now said, wants to sell its half interest, and therefore the action has been brought as above.

City Electric Railway (Rome, Ga.).—See Rome Railway & Light.

Columbia & Western.—See Canadian Pacific.

Cumberland Valley.—See Pennsylvania.

Great Northern.—Announcement has been made that this company is to offer $60,000,000 additional stock at par to holders of record on January 4, 1907, to the extent of 40 per cent. of their present holdings. There is now outstanding $149,563,690 stock and the proceeds of the new issue are to be used for new equipment, improvements, extensions and the acquisition of new lines.

Great Northern of Canada.—The main line of this road between Quebec and Montreal has been seized under a writ of attachment as a result of judgments given in favor of the Royal Trust Company, which sued the railroad for interest on the bonds issued by the Great Northern Elevator Company. An elevator was built in Quebec and leased by the railroad, which endorsed $300,000 bonds issued by the Elevator Company. The seizure does not affect the operation of the road and the railroad company will appeal the case.

New York Central Lines.—Gross earnings for the month of November were as follows:

| | 1906. | Change. |
|---|---|---|
| New York Central & Hudson River | $8,082,340 | Inc., $148,552 |
| Lake Shore & Michigan Southern | 3,435,556 | Inc., 24,115 |
| Lake Erie & Western | 115,402 | Inc., 56,152 |
| Chicago, Indiana & Southern | 202,666 | Inc., 13,401 |
| New York, Chicago & St. Louis | 806,107 | Inc., 52,488 |
| Michigan Central | 2,352,133 | Inc., 184,274 |
| Cleveland, Cincinnati, Chicago & St. Louis | 2,056,894 | Inc., 1,168 |
| Peoria & Eastern | 255,781 | Dec., 58,271 |
| Cincinnati Northern | 82,154 | Inc., 13,859 |
| Pittsburg & Lake Erie | 1,261,897 | Inc., 48,733 |
| Rutland | 233,120 | Inc., 18,945 |
| | $19,182,390 | Inc., $690,912 |

Norfolk & Western.—This company is about to offer to stockholders the right to subscribe to a block of the $34,000,000 convertible bonds, recently authorized, to the extent of one-sixth of their present holdings of stock. There are outstanding $64,469,200 common stock and $22,991,100 preferred stock, so that about $14,576,000 bonds will be issued.

Northern Central.—The directors have declared a stock dividend of 12½ per cent. on the $17,193,400 outstanding capital stock. A movement was started by the minority stockholders last August towards getting a larger distribution of profits on this stock. The annual dividend rate since 1901 has been 8 per cent.

Pennsylvania.—This company is offering three shares of its stock for each share of any class of Cumberland Valley stock. The offer is made on the condition that nearly all holders of Cumberland Valley stock assent to the proposal. The Pennsylvania already owns $975,850 of the $1,292,950 common stock, and large amounts of the first and second preferred.

Philippine Railway.—A syndicate headed by William Salomon & Co., New York, has been formed to underwrite $15,000,000 4 per cent. 30-year bonds of this company, the interest to be guaranteed by the Philippine Government. There are 300 miles of road to be built on the islands of Panay, Negros and Cebu. Construction began on Panay and Cebu in the middle of November and equipment and supplies have been shipped.

Pittsburg & Lake Erie.—A semi-annual dividend of 6 per cent. on the $10,000,000 capital stock has been declared payable February 1 to the stockholders of record on January 6. The annual rate has been 10 per cent. since 1892.

Pittsburg, Cincinnati, Chicago & St. Louis.—A semi-annual dividend of 2 per cent. has been declared on the $24,780,850 common stock payable February 15 to stockholders of record on February 5. The annual rate has been 3 per cent. since 1901, when 1 per cent. was paid.

Rome Railway & Light.—Permission has been asked to amend the charter of the City Electric Railway, of Rome, Ga., changing the name to the Rome Railway & Light Company. The property, consisting of an electric light and power plant and eight miles of road, was recently sold to a Louisville syndicate. It is proposed to increase the authorized capital stock from $300,000 to $500,000.

Seaboard Air Line.—A meeting of the stock and voting trust certificate holders has been called for January 10, 1907, to authorize an issue of $18,000,000 five per cent. bonds. Of this amount it is proposed to issue about $7,300,000 to the holders of stock and voting trust certificates, at 90 and interest, to the extent of 12 per cent. of their present holdings. The bonds are to be secured by a mortgage covering, subject to prior liens, all the property of the company; they may be additionally secured on such collateral as the directors deem advisable. The proceeds of the sale are to be used to retire short term bonds and notes issued by the company and affiliated corporations.

Southern Pacific.—Gross earnings for the month of October, 1906, were $10,913,951, an increase of $1,521,523; net earnings $4,566,071, an increase of $970,381.

Western Pacific.—According to the *Wall Street Journal*, the underwriters have as yet made no offering of the bonds of this company according to their agreement with the railroad. The Western Pacific is to finish its main line, 800 miles long, by September, 1908, and by that time the syndicate will have supplied about $45,000,000, for which they will have received about $8,750,000 in interest. The condition of the bond market and money rates is such that it is evidently cheaper for a strong syndicate to carry such a loan as this rather than sell the bonds.

# GENERAL NEWS SECTION

## NOTES.

Senator LaFollette, of Wisconsin, has introduced in Congress a joint resolution to require all railroads within one year to light mail cars with electricity.

The Canadian Pacific has made a reduction from four cents a mile to three and one-half cents in the passenger rates on certain of its lines west of Winnipeg, where business has rapidly increased.

Train robber Rumsey, who is credited with having robbed two passenger trains in Missouri in a single month, November 8 and November 25, has been brought to bar, pleaded guilty and been sentenced to 20 years' imprisonment.

The Chicago City Superintendent of Track Elevation, in his annual report says that since 1892 the railroads have raised the grade of 170 miles of main track in that city, and, including sidings and yards, 328 miles. The amount of money spent was $56,000,000.

Oliver & Company, the contractors who have been boring a tunnel through the Lookout mountain for the Southern Railway, report at Chattanooga that the tunnel, 3,600 ft. long, has been finished in 13 months and 15 days. This is claimed to be the record for quick work.

In connection with the coal shortage in the Northwest, reported in another column, it is said that the Duluth, Missabe & Northern has lent to the Northern Pacific 500 steel ore cars and eight locomotives to be used in hauling coal from Duluth to North Dakota to relieve the suffering in that state.

The New York Team Owners' Association has complained to the Interstate Commerce Commission that the Southern Pacific Company, at its freight receiving stations in New York City, discriminates in favor of Kelly & Buck, the trucks of this firm not being required to stand in line, as are those of the other parties bringing freight to the station.

The Interstate Commerce Commission has received a complaint against the Baltimore & Ohio from the Peabody Coal Company, alleging unfair distribution of coal cars for the past two years, and a similar one from the Powhattan Coal & Coke Company against the Norfolk & Western. In the last named it is charged that the Virginia coke makers are supplied with cars in proportion to their ovens, but as there are 11,000 ovens, while the market can be supplied by 5,000, there is gross inequality in the distribution of the cars, and a shipper, to get more cars, "must waste $500 on an unnecessary coke oven" for each additional car.

The Supreme Court of the United States, in a suit of the Alabama & Mississippi Railroad against the Railroad Commission of Mississippi, holds that the commission undoubtedly has the power to enforce equality in local rates; and continuing, says: While a state may not compel a railroad company to do business at a loss, and while a railroad company may insist, as against the powers of the state, upon the right to establish such rates as will afford reasonable compensation for the service rendered, yet when it voluntarily establishes local rates for some shippers, it cannot resist the power of the state to enforce the same rates for all. The state may insist upon equality as between all its citizens, and that equality cannot be defected in respect to any local shipments by arrangements made with or to favor outside companies.

The Delaware, Lackawanna & Western, which had already increased the pay of certain classes of men in the train service, has announced an advance of 10 per cent. on January 1, in the wages of station agents, telegraph operators and practically all employees in the transportation department not included in the former advance. The Louisville & Nashville has made an increase of about 4 per cent. in the wages of 2,000 shop men. The Central of New Jersey will increase the pay of trainmen and telegraph operators. The rate of increase is said to be 10 per cent. The New York, New Haven & Hartford, which has increased enginemen's pay 10 per cent., has advanced train despatchers from $25 a week to $27.50. The Lehigh Valley has increased the wages of employees in the transportation department from 10 to 20 per cent., beginning December 1.

In view of the complaints of car shortage, resulting, according to reports, in failure to transport the necessaries of life and coal for household use, the Interstate Commerce Commission on December 14 sent a telegram to the presidents of six northwestern railroads reciting that the commission is receiving numerous and importunate complaints of car shortage and failure to transport the necessaries of life, and that people are actually freezing because sufficient coal for household use cannot be procured. The commission therefore "urges you to make every possible effort to meet at once the needs and relieve the suffering of those dependent upon the facilities of your road." The six roads are the Great Northern, Northern Pacific, Minneapolis, St. Paul & Sault Ste. Marie, Chicago & North-Western, Chicago, Milwaukee & St. Paul, and Chicago, Burlington & Quincy. (See editorial pages.)

### Joining the Battery Tunnel.

The two shields of the north tube of the rapid transit tunnels under the East river from the Battery to the foot of Joralemon street, Brooklyn, met in the afternoon of December 14 and a party of engineers and workmen passed through from the New York end emerging in Brooklyn. On the 8th of December, while the shields were still 65 ft. apart, a 10-in. pipe was driven through and communication established to check up the surveys. The lines from each end varied less than a tenth of an inch. The south tube will probably be completed in six weeks. The Battery tunnels, or East river rapid transit tunnel extension, as it is known, will connect the present subway on Manhattan with the subway now building under Fulton street and Flatbush avenue in Brooklyn. The contract was originally let to Andrew Onderdonk in September, 1903. His death held up the work until the contract was transferred to the New York Tunnel Company, which has now completed part of the job. One of the most remarkable tunnel accidents on record occurred about a year ago in the Brooklyn heading. A bad blowout in front of the shield caught three men working there. One man in attempting to stop the hole was blown up through the river bottom and carried up above the water level by the spouting column of water. He was uninjured and kept afloat until rescued by a boat from the shore. The other two men escaped through the shield.

### Cape Cod Canal.

A controlling interest in the Boston, Cape Cod & New York Canal Co., which was organized to build a canal between Buzzard's Bay and Sandwich on Massachusetts Bay, has been acquired by August Belmont & Co., of New York. The old company had $6,000,000 authorized capital stock and $6,000,000 bonds, and the interests now in control expect to either increase the capital stock to $10,000,000 or to form a new company with that capital to take over the present company. William Barclay Parsons, formerly Chief Engineer of the New York Rapid Transit Commission, is to be in charge of the construction. The canal is to be without locks and will be 25 ft. deep at low water with a minimum width, at the bottom, of 125 ft., and, at the surface, of from 250 ft. to 300 ft. There are to be four long stretches 200 ft. wide at the bottom. The canal will be eight miles long, and it is expected that it will be opened for traffic within two and one-half years. Part of the right of way has been secured, surveys have been made, and application for permission to build has been made to the Massachusetts State Railroad Commission and the Massachusetts State Harbor and Land Board.

### New Advertising Manager of the Boston & Maine.

Walter H. Hayden, who for the last five years has been advertising agent of the Central of New Jersey, has been appointed Manager of the publicity and advertising departments of the Boston & Maine. Mr. Hayden began in the advertising department of the Boston & Maine 11 years ago, and became assistant advertising agent. He later went to the Central of New Jersey under C. M. Burt, then General Passenger Agent, and there, under Mr. Burt's direction, built up an efficient publicity and advertising department. Mr. Burt was made General Passenger Agent of the Boston & Maine last September, and Mr. Hayden now follows him.

### United States Steel Corporation Improvements.

The United States Steel Corporation announces the following details of the more important new construction authorized for 1907:

*Carnegie Steel Co.*—Ohio Steel Works—Two new blast furnaces; twelve open-hearth furnaces; blooming mill and bar mills of sufficient capacity to finish the product of the open-hearth plant. New mould foundry.

*Clairton Works.*—New 14-in. structural mill; new 22-in. structural mill; one 1,000-k.w. generator and gas engine.

*Duquesne Works.*—New 16-in. merchant bar mill; new electric power station.

*Bellaire Works.*—New river pumping plant.

*Indiana Steel Plant.*—Commencing work at Gary, Ind., on the second group of four blast furnaces, 28 open hearth furnaces, blooming and slabbing mills and other finishing mills sufficient to handle the steel produced.

*Illinois Steel Co.*—Construction of two 250-ton mixers for the Bessemer department; new 40,000,000-gal. pumping engine.

*National Tube Co.*—At Lorain works—One blast furnace and six open-hearth furnaces; new galvanizing plant.

*American Steel & Wire Co.*—New factory for the manufacture of insulating wire and cable at Waukegan works; extension to dock

at Central furnaces, Cleveland; new mill in Cleveland district for rolling flats for cold rolling; new rod mill at Worcester, Mass., plant.

*American Sheet Steel and Tin Plate Co.*—At the Guernsey works, four new hot mills; at New Philadelphia, Ohio, reconstruction of plant and addition of one jobbing mill and one sheet mill; at the Scottdale works, one new galvanizing plant and reconstruction of mills.

*Lorain Steel Co., Johnstown, Pa.*—Extensions and improvement that will practically double its capacity.

*American Bridge Co.*— New plant at Elmira, N. Y.

### New Japanese Steamships.

It is reported in Melbourne that the Nippon Yusen Kaisha (Japan Mail Steamship Company) is having built in Japan six steamships for the Australian trade, four of which are 8,500 tons each; also that the same company has placed orders in Kobé, Japan, for three steamers of 3,500 tons for the Yang-tse service, and two of 2,700 tons for the service between Japan and Shanghai.—*Consular Report.*

### Harbor Improvements for the Tehuantepec National.

The Mexican Congress has been asked to appropriate $10,000,000 to finish the harbor improvement works at Coatzacoalcos, the Atlantic terminus of the Tehuantepec National, and at Salina Cruz, the Pacific terminus. Contracts for these improvements were let five years ago, the total cost to be $32,500,000. So far, $20,000,000 has been spent, and the additional appropriation is asked to defray most of the cost of the rest of the work.

### Difficulties in Making Fast Time in Winter.

The railroads of Massachusetts are "up against it"—up against an order of the State Railroad Commission requiring them to report for one month—November 25 to December 25—the record of every passenger train arriving more than 10 minutes behind time, including, apparently, delays at way stations, even if they are made up before the train reaches the end of its run. Complaints are quite numerous and some of them have to do with suburban trains in the Boston district.

By way, perhaps, of heading off public criticism, or of mitigating the severity of passengers' complaints, somebody connected with the Boston & Albany has given to the *Springfield Republican* a column or two of his inmost thoughts concerning the troubles that afflict him. Whether or not this represents conditions on other roads also, we do not know, but it makes interesting reading either way. We quote a part only of this tale of woe:

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Passenger service on the three railroads which enter Springfield is poor these days, and there is small chance that it will be materially better before spring. Almost every through train between New York and Springfield and between Albany and Boston has come to a habit of rolling in anywhere from 5 to 30 minutes late. The through trains from Chicago are rarely less than half an hour behind time, and often one of them is over 2½ hours late. The unparalleled freight business is the principal cause of trouble for the Boston & Albany. Immense quantities of export freight are being rushed into every junction point. Almost every factory along its lines has greatly increased its output, and on every side factories are springing up at a rate undreamed of a year ago. The road has not been able to prepare to handle this huge volume of business, and so is staggering along trying to do a four-track business with two tracks. To-day freight yards are full of cars, other roads must hold back cars which they would gladly deliver to the Boston & Albany, the road is full of freight trains trying to get along and keep out of the way of passenger trains and of passenger trains trying to dodge freight trains and keep up to scheduled running time. A state of affairs which forces the road's general superintendent to give almost every minute of his time to untangling blockades in freight yards is serious, especially when it comes at the beginning of winter. The difficulty of shipping freight at all, to say nothing of getting it delivered, is bringing about a change in express shipments. Many manufacturers are shipping by express heavy cases, which formerly went by freight, and the result is delay after delay at stations, for the express car employees cannot throw out or load as rapidly as time tables require.

The Boston & Albany has barely enough engines to keep freight moving, and there is no prospect that the 22 new engines ordered will arrive before spring, so day after day freights get in the way of passenger trains and schedules are continually being deranged. The situation will apparently be gotten well in hand, when, behold, two freights arrive at a siding and start to get out of the way of a passenger train only to find that there is not room enough to accommodate them. Consequently, the passenger train must stop and allow one freight to run around it. The delay is perhaps 10 minutes, but it is sufficient to start things going wrong, and soon, according to the railroad law of cumulative troubles, the whole system has been thrown out of gear, yards are piling full of freight cars, shippers are "kicking," and train despatchers are frothing at the mouth.

Another fruitful cause of delays and loss of time is scarcity and poor quality of coal. The Boston & Albany is living from hand to mouth, and the New Haven road is little better off. The Boston & Maine has a supply of good coal for its passenger engines, but is forced to use a poor quality in its freight engines. There is being used, of sheer necessity, in Boston & Albany passenger and freight engines coal of a quality such as formerly was not considered fit for switch engines. Some it is mottled with clay; some is part shale; much of it is part dust. Last May the road had a 60-day supply of coal; to-day that surplus has been wiped out and the road's 270 engines, which eat up 18,000 tons of coal every 30 days, would be practically useless were the Albany end of the road to be tied up by snow for two days. There is an alarming scarcity of coal at the Great Lake ports, and the mines are shipping coal to these cities as fast as they can, and are obtaining better prices than they can in the East. Accordingly, eastern consumers, whether they be railroads or manufactories, are having great difficulty in securing a coal surplus, and the mines are mining outcroppings, anything that looks like coal, and are shipping some stuff that clogs grates, won't make steam fast and is fit for the dump. Only recently the Boston & Albany tried to place large orders with the Pocahontas and New River companies, which send out fine steaming coal, but neither company would consider an order.

A spell of zero weather causes a railroad more trouble than 10 inches of snow, for snow can be plowed out, while chilly weather bothers the engines until it moderates. Zero temperatures solidify the lubricants in the journal boxes, so that the engines must drag against a stiffer pullback. They necessitate the waste of much steam in warming cars and the leakage of more from coupling joints in the steam hose. They interfere with the engine drafts, and one end of fireboxes is hotter than the other, causing leaky tubes from unequal expansion. In very cold weather the engineers take time to muffle up before stepping down at stations; they move slowly as they oil and inspect. Passengers, stiff from waiting on exposed platforms or shrinking from the cold air, move slowly, and, fearing falls, mount and descend the car steps slowly. The baggage and express car crews must work with chilled fingers, and so lose time. In the aggregate these many causes of delays are responsible for much of the poor passenger service in winter. When the temperature drops to 20 degrees above zero, with prospect of further drops, the order goes out to make up freight trains 100 tons short of ordinary loads. As the mercury drops another 10 degrees an order for the dropping of 50 more tons goes out, and by the time the mercury has fallen to zero, trains are hauling but 75 per cent. of their summer loads. This means that five trains are required to do the work of four, and that more train units are scattered along the road to get in the way of each other.

The union station in this city is a fruitful cause of long delays. The trains of three roads must pull into it, and frequently it happens that three or four arrive about the same time and that the two rearmost must wait until the way is clear. The rearmost train is sure to be delayed 20 minutes. The stiff grades and bad curves on the Boston & Albany through the hilly districts do not allow more than a certain speed, and with most of the trains running about as near the limit of safe speed as possible, the chances of regaining lost time in the 200 odd miles between Albany and Boston are poor.

### A Collection of Incandescent Electric Lamps.

The Franklin Institute has published a committee report on a historical collection of incandescent lamps made and exhibited at the St. Louis Exposition of 1904 by William J. Hammer. The collection, a photograph of which is reproduced in the report, is most interesting. It was started in 1879 and now consists of over 1,000 lamps, each of which marks an important step in the development of the art. It covers the period from 1878 to 1904.

## TRADE CATALOGUES.

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*Packings.*—The Crandall Packing Company, Palmyra, N. Y., has issued a catalogue and price list of packings suited to pipes carrying ammonia, gas, steam and water. The company makes ring and coil packing, and also sheets of compound and asbestos reinforced with wire. The catalogue also describes valves, washers, hose, belting and other specialties.

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*Uintah Railway.*—The passenger department of the Denver & Rio Grande is distributing an attractive pamphlet describing the territory served by one of its subsidiary roads, the Uintah Railway. This is a narrow gage road running from a junction with the Rio Grande Western at Mack, Colo., north, 54 miles, to Dragon, Utah. It traverses a most picturesque region, starting in the valley of the Grand river, where arid land has been successfully irrigated, and running from there to good hunting country.

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*Graphite.*—The December issue of *Graphite* published by the Joseph Dixon Crucible Company contains two interesting testimonials to the efficiency of Dixon graphite air-brake and triple valve grease; one is from an engineman, and the other from a railroad

officer who made comparative tests of this lubricant and another compound.

*Couplers.*—The McConway & Torley Company, Pittsburg, Pa., has issued a catalogue showing all draft gears made by it. These products include the Janney-Miller, Janney-Buhoup, Buhoup-Miller couplers, as well as Janney couplers for tenders and locomotives, Kelso pilot and tender couplers, Pitt tender couplers and Buhoup vestibule equipment. Each equipment is clearly described and every part is illustrated and listed. The book, which is 9 in. x 12 in., is bound in cloth. The index is exceptionally good, covering all the details.

### Manufacturing and Business.

The Sullivan Machinery Company, Chicago, has opened a branch office and warehouse at 319 Howard street, San Francisco, Cal. Howard T. Walsh will be manager of the branch.

Robert E. Slagle, for the past three years assistant district superintendent of the Pullman Company at Kansas City, Mo., has gone, as half owner, to the Acme Supply Co., 100 Lake street, Chicago.

The Peoples Line, which operates steamships on the Hudson river between New York and Albany, has ordered a 440-ft. steamboat. The hull will be of steel and the boat will have sleeping capacity for about 2,500 passengers.

Aaron Dean, Jr., heretofore Resident Manager of the Western district of the Federal Railway Signal Company, with office at Chicago, has been made Chief Engineer of the company, with office at its works, Troy, N. Y., succeeding P. G. Ten Eyck, who was recently appointed General Manager of the company at Troy. W. W. Lavarack, assistant to the President, will succeed Mr. Dean, with office at Chicago, in charge of the Western district of the company.

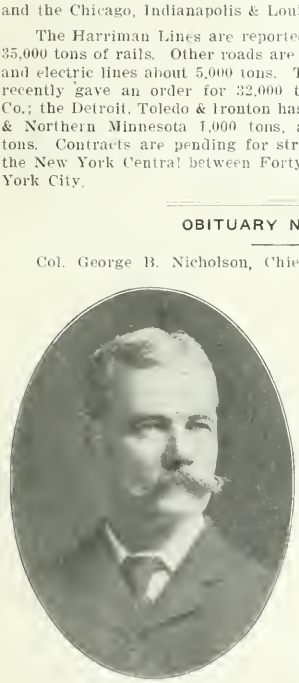
### Iron and Steel.

The Texas Railway has ordered 19,000 tons of rails; the Great Northern, 15,000 tons additional; the Spokane Inland, 7,000 tons, and the Chicago, Indianapolis & Louisville, 5,000 tons.

The Harriman Lines are reported to be in the market for about 35,000 tons of rails. Other roads are trying to buy about 12,000 tons, and electric lines about 5,000 tons. The Georgia Southern & Florida recently gave an order for 32,000 tons to the Pennsylvania Steel Co.; the Detroit, Toledo & Ironton has ordered 6,000 tons; the Duluth & Northern Minnesota 1,000 tons, and the Pacific Traction 1,000 tons. Contracts are pending for structural material to be used on the New York Central between Forty-fifth and Fiftieth streets, New York City.

## OBITUARY NOTICES.

Col. George B. Nicholson, Chief Engineer of the Cincinnati, New Orleans & Texas Pacific, died on December 2 at Covington, Ky. Col. Nicholson was born in 1840 and came to this country when a young man. He served through the Civil War, and then went to Idaho, where he built wagon roads. He was later in charge of lighthouse building on the Gulf of Mexico, and then went into the Phoenix Bridge Company. He later built the New Orleans & Northeastern. Col. Nicholson was a close friend of the late President Samuel Spencer of the Southern, and of John F. Wallace, formerly Chief Engineer of the Isthmian Canal Commission. Some years ago Col. Nicholson refused the offer of the French Government to make him Chief Engineer of the Panama Canal.



G. B. Nicholson.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Franklin Institute.

At a stated meeting of the institute December 19 the program included an address on "The Chesapeake and Delaware Canal," by Prof. Lewis M. Haupt.

### American Society of Civil Engineers.

At a meeting of this society December 19 a paper on "Recent Practice in Hydraulic-Fill Dam Construction," by James D. Schuyler, was presented for discussion. This paper was printed in "Proceedings" for October, 1906.

### Canadian Society of Civil Engineers.

At a meeting of this society, December 13, a paper, "The Description of Stress in Riveted Connections," by C. R. Young; also one, "An Investigation on the Value of the Indentation Test for Steel Rails," by H. K. Dutcher, was read.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Bangor & Aroostook.*—Percy R. Todd, who recently resigned as First Vice-President of the New York, New Haven & Hartford, has been elected Vice-President of the Bangor & Aroostook.

*Peoria & Pekin Terminal.*—See Peoria Railway Terminal.

*Peoria Railway Terminal.*—The officers of this road, recently incorporated to, presumably, succeed the Peoria & Pekin Terminal, are as follows: T. A. Grier, President; W. J. Zonzelman, Vice-President; Frederick H. Smith, Treasurer; Theodore J. Miller, General Manager; William Jack, Secretary and Auditor, and William J. Jack, Counsel.

*Seaboard Air Line.*—L. Sevier, General Freight Agent of the Alabama Great Southern, has been elected Second Vice-President and Traffic Manager of the Seaboard Air Line, effective January 1, succeeding E. F. Cost, resigned to go to the Kansas City Southern.

*Southern.*—John M. Culp, Third Vice-President, has been elected Second Vice-President, succeeding W. W. Finley, promoted. C. H. Ackert, Fourth Vice-President, has been elected Third Vice-President; T. C. Powell, Fifth Vice-President, has been elected Fourth Vice-President; H. B. Spencer, Sixth Vice-President, has been elected Fifth Vice-President. Fairfax Harrison, Assistant to the President, has been elected Vice-President, assisting the President in matters of finance and such other duties as may be referred to him.

*Tehuantepec National.*—W. B. Ryan, General Traffic Manager, has been elected Vice-President, with office at Rincon Antonio, Mex.

### Operating Officers.

*Augusta & Florida.*—J. M. Turner, General Manager of the Raleigh & Charleston, has been appointed General Manager of the Augusta & Florida; the Douglas, Augusta & Gulf; the Millen & Southwestern, and the Valdosta Southern, succeeding Cecil Gabbett, resigned.

*Baltimore & Ohio.*—O. H. Hobbs, Superintendent at Connellsville, Pa., has been appointed Superintendent at Baltimore, Md., succeeding C. W. Galloway, promoted. J. J. Driscol, Trainmaster at Connellsville, succeeds Mr. Hobbs.

See Baltimore & Ohio Southwestern.

*Baltimore & Ohio Southwestern.*—W. M. Greene, General Manager, has resigned, effective January 1. C. C. F. Bent, General Superintendent of the Baltimore & Ohio at Baltimore, Md., succeeds Mr. Greene, with office at Cincinnati, Ohio.

*Canadian Pacific.*—James Oborne, General Superintendent of the Eastern division, has been appointed General Superintendent of the Ontario division, with office at Toronto, succeeding H. P. Timmerman, who takes Mr. Oborne's place at Montreal, Que. The Ontario division will hereafter be operated in three districts. J. R. Nelson is Superintendent of the First district, from Toronto east to Smith's Falls, with office at Toronto. C. Murphy, Superintendent at Toronto, Ont., has been appointed Superintendent of the Second district, from Toronto west to Windsor, with office at London, Ont. A. L. Smith has been appointed Superintendent of the Third district, which comprises lines north of Toronto.

*Chicago & North-Western.*—Frank Walters, Assistant General Manager of the lines west of the Missouri river, has been appointed General Manager, with office at Omaha, Neb., succeeding G. F. Bidwell, resigned on account of ill health.

*Chicago, Rock Island & Pacific.*—D. E. Cain, General Manager of the Southwestern and Choctaw districts, has resigned, effective January 1, and the office has been abolished. The authority of F. O. Melcher, General Manager of the Central and Northern districts, will be extended to include the duties now performed by Mr. Cain.

A. B. Ramsdell has been appointed Trainmaster of the West Iowa division, with office at Des Moines, Iowa, succeeding F. M. Patt, transferred to the Illinois division.

*Denver & Rio Grande.*—A. E. Welby, General Superintendent, has resigned, effective January 1, to go into other business.

*Douglas, Augusta & Gulf.*—See Augusta & Florida.

*Grand Trunk.*—W. E. Costello, Assistant Superintendent at Battle Creek, Mich., has resigned to go to the Oregon Short Line.

*Kansas City Southern.*—See Rio Grande Western.

*Louisville & Nashville.*—J. M. Teague, Assistant Trainmaster at Birmingham, Ala., has been appointed to the new office of Assistant Superintendent at Anniston, Ala.

*Millen & Southwestern.*—See Augusta & Florida.

*Missouri Pacific.*—W. E. Merrifield, Trainmaster at Concordia, Kan., has been transferred to Sedalia, Mo., succeeding J. E. Snedecker, promoted. C. W. Benedict succeeds Mr. Merrifield.

*New York Central & Hudson River.*—F. E. McCormack, Chief Trainmaster of the Rome, Watertown & Ogdensburg division, has been appointed to the new position of Assistant Superintendent of that division, with office at Watertown, N. Y.

*Norfolk & Southern.*—J. A. Glassford has been appointed Trainmaster of the Norfolk and Pamlico divisions, with office at Edenton, N. C.

*Raleigh & Charleston.*—See Augusta & Florida.

*Rio Grande Western.*—B. A. Campbell, Assistant Superintendent at Salt Lake City, has been appointed Trainmaster at Helper, Utah. E. H. Holden, Trainmaster of the Kansas City Southern at Shreveport, La., succeeds Mr. Campbell.

*Valdosta Southern.*—See Augusta & Florida

### Traffic Officers.

*Alabama Great Southern.*—See Seaboard Air Line under Executive, Financial and Legal Officers.

*Cleveland, Cincinnati, Chicago & St. Louis.*—C. J. Brister, Assistant General Freight Agent at Cincinnati, Ohio, has been appointed General Freight Agent, succeeding George H. Ingalls, promoted.

*Delaware, Lackawanna & Western.*—F. P. Fox, Division Passenger Agent at Buffalo, has been appointed Industrial Agent and Advertising Manager, effective January 1, succeeding W. P. Colton, resigned.

*Georgia Railroad.*—C. C. McMillen has been appointed Assistant General Passenger Agent, with office at Augusta, Ga.

*Great Northern.*—S. J. Allison, General Agent at Chicago, has been appointed Assistant General Passenger Agent, succeeding S. G. Yerkes, promoted several months ago.

*Kansas City Southern.*—C. W. Nunn has been appointed Industrial Agent of this company and of the Texarkana & Fort Smith, with office at Kansas City, Mo.

*Lake Shore & Michigan Southern.*—J. W. Daly, Chief Assistant General Passenger Agent, has been appointed General Passenger Agent, with office at Cleveland, Ohio.

*Michigan Central.*—Carl Howe, Assistant General Freight Agent at Buffalo, N. Y., has resigned, effective January 1, to become Traffic Manager of the Merchants' Despatch Transportation Company, succeeding H. B. Tindall, resigned.

*Texarkana & Fort Smith.*—See Kansas City Southern.

### Engineering and Rolling Stock Officers.

*Central of Georgia.*—W. E. Chester, General Master Mechanic, has resigned, and the position has been abolished. F. F. Gaines, who, as noted last week, has been appointed Superintendent of Motive Power, succeeds to the duties heretofore performed by Mr. Chester.

*Duluth, Missabe & Northern.*—C. W. Seddon, Superintendent of the Great Northern shops at Superior, Wis., has been appointed Superintendent of Motive Power and Cars of the Duluth, Missabe & Northern, with office at Proctor, Minn.

*Kansas City Terminal.*—John V. Hanna, Assistant Engineer of Maintenance of Way of the St. Louis & San Francisco, has been appointed Chief Engineer of the recently organized Kansas City Terminal.

*St. Louis & San Francisco.*—See Kansas City Terminal.

*Southern.*—A. Stewart, Mechanical Superintendent, has been appointed to the new office of General Superintendent of Motive Power and Equipment, with office at Washington, D. C., and his former position has been abolished.

## LOCOMOTIVE BUILDING.

*The Norfolk & Western* has ordered 100 freight locomotives.

*The Colorado & Southern* has ordered 32 locomotives from the Baldwin Locomotive Works.

*The Harriman Lines* are figuring on 100 additional locomotives with the Baldwin Locomotive Works.

*The Atlanta, Birmingham & Atlantic* has ordered 25 locomotives from the Baldwin Locomotive Works.

*The New Orleans Great Northern* has ordered two freight locomotives from the American Locomotive Company.

*The Buffalo & Susquehanna* has ordered four freight and two passenger locomotives from the Baldwin Locomotive Works.

*The Des Moines Union* is figuring on buying one six-wheel switching locomotive from the Baldwin Locomotive Works.

*The United Railways of Yucatan* will shortly be in the market for locomotives. The New York purchasing agents are Theband & Company.

*The Chicago, Burlington & Quincy* has ordered 50 Prairie (2-6-2) locomotives and 15 Pacific (4-6-2) locomotives from the American Locomotive Company.

*The Toledo & Ohio Central* has ordered five consolidation (2-8-0) locomotives and three six-wheel switching (0-6-0) locomotives from the American Locomotive Co.

*The Great Northern* has ordered from the Baldwin Locomotive Works for 1907 delivery 25 Mallet compounds, 100 Prairie (2-6-2) type locomotives and 15 Atlantic (4-4-2) type balanced compounds. Possibly some of these last will be Pacific (4-6-2) type.

*The Hocking Valley* has ordered five consolidation (2-8-0) locomotives, five six-wheel switching (0-6-0) locomotives and two locomotives for passenger service from the American Locomotive Co. The specifications for these locomotives are not yet completed.

*The Danville & Western* has ordered two simple 10-wheel (4-6-0) locomotives from the American Locomotive Co., for February, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Types of locomotive | Ten wheel |
| Weight, total | 140,000 lbs |
| Weight on drivers | 110,000 " |
| Diameter of drivers | 56 in. |
| Cylinders | 19 in. x 26 in |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 290 |
| " diameter of tubes | 2 in. |
| " length of tubes | 15 ft. 6 in. |
| Tank capacity | 4,500 gals. |
| Coal capacity | 10 tons |

*The Chesapeake & Ohio* has ordered eight simple Pacific (4-6-2) locomotives and seven simple Atlantic (4-4-2) locomotives from the American Locomotive Co. The specifications are as follows:

*General Dimensions.*

| | Pacific. | Atlantic. |
|---|---|---|
| Type of locomotive | | |
| Weight, total | 211,000 lbs | 179,000 lbs |
| Weight on drivers | 158,000 lbs | 102,000 lbs. |
| Diameter of drivers | 72 in | |
| Cylinders | 22 in. x 28 in. | 21 in. x 26 in. |
| Boiler, type | Straight; wide firebox | |
| " wkg. steam pressure | 200 lbs | |
| " number of tubes | 310 | 396 |
| " material of tubes | Seamless steel | |
| " diameter of tubes | 2¼ in. | 2 in. |
| " length of tubes | 19 ft. 6 in. | 16 ft. |
| Firebox, length | 90 in. | 96⅛ in. |
| " width | 75 in. | 75⅜ in. |
| " material | Worth steel. | |
| " grate area | 47.9 sq. ft. | 50.2 sq. ft. |
| Heating surface, total | 3,755.0 " | 3,178.0 " |
| Tank capacity | 7,000 gals. | |
| Coal capacity | 9 tons. | |

*Special Equipment.*

| | |
|---|---|
| Air-brakes | Westinghouse |
| Bell ringer | Gollmar |
| Brake-shoes | "Perfecto" |
| Couplers | Tower |
| Headlights | Pyle National |
| Injector | Hancock |
| Safety valve | Consolidated |
| Sanding devices | Leach |
| Sight feed lubricators | Nathan |
| Steam heat equipment | Safety |
| Tires, driving wheel | Latrobe |
| " truck wheel | " |
| " tender wheel | " |
| Other specialties | Power fire door opener |

*The Great Northern* is building 10 simple six-wheel switching (0-6-0) locomotives at its Dale street shops, St. Paul. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 135,000 lbs. |
| Diameter of drivers | 49 in. |
| Cylinders | 19 in. x 26 in. |
| Boiler, type | Belpaire |
| " working steam pressure | 200 lbs. |
| " number of tubes | 294 |
| " material of tubes | Shelby steel |
| " diameter of tubes | 2 in. |
| " length of tubes | 11 ft. 3 in. |
| Firebox, length | 98 in |
| " width | 40 " |
| " grate area | 27.22 sq. ft. |
| Heating surface, total | 1,873.5 " |
| Tank capacity | 4,000 gals. |
| Coal capacity | 6 tons |

*Special Equipment.*

| | |
|---|---|
| Bell ringer | "Little Giant" |
| Boiler lagging | Magnesia |
| Brake-beams | Great Northern standard |
| Brake-shoes | Great Northern standard |
| Couplers | Tower |
| Headlights | Adams & Westlake |
| Injector | Ohio |
| Journal bearings | Great Northern standard |
| Piston rod packings | " " " |
| Valve rod packings | " " " |
| Safety valve | Ashton |
| Sanding devices | Leach |
| Sight-feed lubricators | Detroit |
| Springs | Simplex |
| Steam gages | Ashton |
| Tires, driving-wheels | Standard steel |
| " truck wheel | " " |
| " tender wheel | " " |
| Wheel centers | American Steel Foundries |

*The Vandalia* is asking bids on 12 simple freight mogul (2-6-0) locomotives, two simple Atlantic (4-4-2) locomotives and six simple six-wheel switching (0-6-0) locomotives from the American Locomotive Co. and the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | Mogul. | Atlantic. |
|---|---|---|
| Types of locomotive | Mogul. | Atlantic. |
| Weight, total | 187,000 lbs. | 181,500 lbs. |
| Weight, on drivers | 159,300 " | 105,600 " |
| Diameter of drivers | 63 in. | 79 in. |
| Cylinders | 21 in. x 28 in. | 21 in. x 26 in. |
| Boiler, type | Straight. | |
| " wkg. st'm pressure | 200 lbs. | |
| " number of tubes | 390 | 351 |
| " diameter of tubes | 2 in. | |
| " length of tubes | $164\frac{7}{8}$ in. | $190\frac{7}{8}$ in. |
| Firebox, length | $108\frac{1}{8}$ " | $96\frac{1}{8}$ " |
| " width | $69\frac{1}{4}$ " | $75\frac{1}{4}$ " |
| " material | Pennsylvania R. R. specifications. | |
| " grate area | 52 sq. ft. | 50.2 sq. ft. |
| Heating surface, total | 2,935 sq. ft. | 3,100.3 sq. ft. |
| Tank capacity | 7,500 gals. | |
| Coal capacity | 24,000 lbs. | |

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 144,000 lbs. |
| Diameter of drivers | 51 in. |
| Cylinders | 20 in. x 26 in. |
| Boiler, type | Straight |
| " working steam pressure | 180 lbs. |
| " number of tubes | 311 |
| " diameter of tubes | 2 in. |
| " length of tubes | 131 " |
| Firebox, length | $108\frac{5}{16}$ " |
| " width | $41\frac{3}{4}$ " |
| " grate area | 31.4 sq. ft. |
| Heating surface, total | 1,955.1 " |
| Tank capacity | 5,000 gals. |
| Coal capacity | 15,000 lbs. |

## CAR BUILDING.

*The Erie* is asking bids on 4,000 steel hopper and 3,000 box cars.

*The Atlanta, Birmingham & Atlantic* is receiving bids on 300 coal cars.

*The Texas Southern* has bought 50 box cars of 50,000 lbs. capacity.

*The Boston & Albany* has ordered two cafe coaches from the Pullman Company.

*The New York, Chicago & St. Louis* is reported to be figuring on passenger equipment.

*The Northern Pacific* has ordered 1,000 steel gondolas from the Pressed Steel Car Company.

*The Atchison, Topeka & Santa Fe* has ordered one parlor car from the Pullman Company.

*The Chicago, Burlington & Quincy* has ordered four dining cars from the Pullman Company.

*The Delaware & Hudson* has ordered 400 freight cars from the American Car & Foundry Co.

*The Pennsylvania* has ordered 2,500 underframe box cars from the Pressed Steel Car Company.

*The Missouri & North Arkansas* has ordered 30 freight cars from the American Car & Foundry Co.

*The Northern Electric Company*, Chico, Cal., is reported as in the market for about 10 passenger cars.

*The United Verde & Pacific* has ordered 20 flat cars of 40,000 lbs. capacity from the Pullman Company.

*The South & Western* has ordered one 60-ft. first class passenger coach from the Hicks Locomotive & Car Works.

*The Toledo, Peoria & Western* has ordered 50 gondola cars of 80,000 lbs. capacity from the Pullman Company.

*The Missouri, Kansas & Texas* has ordered about 14 passenger cars from the American Car & Foundry Company.

*The Somerset Coal Company* has ordered about 1,000 hopper cars from the Baltimore Steel Car & Foundry Company.

*The National of Mexico* has ordered 565 steel-frame box and gondola cars from the American Car & Foundry Company.

*The Grand Trunk*, as reported in our issue of November 23, has ordered 400 refrigerator cars from the Mt. Vernon Car Company.

*The New Orleans Great Northern* has ordered 300 steel underframe flat cars of 80,000 lbs. capacity from the Pressed Steel Car Company.

*The United Railways of Yucatan* will shortly be in the market for passenger cars. The New York purchasing agents are Thebaud & Company.

*The American Smelting & Refining Company* has ordered 90 tank and mining cars from the American Car & Foundry Company for use in Mexico.

*The Lehigh Valley*, as reported in our issue of December 14, has ordered from the Standard Steel Car Co. 1,000 additional steel underframe box cars.

*The Baltimore & Ohio* has ordered three cafe parlor cars from the Pullman Company. These cars will be 81 ft. long and are to be delivered next spring.

*The Seaboard Air Line*, it is reported, has ordered 1,000 ventilated box cars for July and August, 1907, delivery, and expects to build 50 additional flat cars at its own shops.

*The Buffalo, Rochester & Pittsburg* has ordered 500 all-steel hopper cars of 100,000 lbs. capacity from the Standard Steel Car Company, and 500 box cars of 60,000 lbs. capacity from the American Car & Foundry Company. These are the cars referred to in our issues of November 30 and December 14.

*The Harriman Lines*, as reported in our issue of December 14, have ordered five dining cars for the Southern Pacific, two dining cars for the Louisiana Western, one dining car for Morgan's Louisiana & Texas and one dining car for the Texas & New Orleans from the Pullman Co., for December, 1906, and February, 1907, delivery. These cars will be 70 ft. long, 9 ft. 8 in. wide, over all, and 14 ft. 9 in. high over kitchen smoke jack.

*The Chicago Great Western* has ordered 300 box cars of 70,000 lbs. capacity from the Pullman Company. These cars will weigh 36,000 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements. The special equipment includes:

| | |
|---|---|
| Brakes | Westinghouse |
| Couplers | Janney |
| Doors | Security |
| Roofs | Chicago |
| Trucks | Barber |
| Wheels | Griffin |

*The Pittsburg & Eastern Coal Co.* (M. A. Hanna & Co.), Cleveland, Ohio, has ordered 500 steel hopper cars of 100,000 lbs. capacity from the Cambria Steel Co., for July, 1907, delivery. These cars will weigh about 38,000 lbs., and will measure 30 ft. 5 in. long, 9 ft. 6 in. wide and 10 ft. 9 $\frac{1}{16}$ in. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | Pressed Steel Car Co. |
| Brake-beams | Simplex |
| Couplers | Tower |
| Draft rigging | Westinghouse |

*The New York, New Haven & Hartford*, as reported in our issue of November 16, has ordered from the American Car & Foundry Company 500 refrigerator cars of 60,000 lbs. capacity. These cars will measure 29 ft. $8\frac{1}{4}$ in. long, 8 ft. $4\frac{1}{4}$ in. wide and 7 ft. $11\frac{1}{2}$ in. high, inside measurements, and 37 ft. $3\frac{1}{2}$ in. long, 9 ft. 5 in. wide, and 13 ft. $3\frac{1}{4}$ in. high, over all. The bodies will be of wood and the underframes of metal. The special equipment includes:

| | |
|---|---|
| Axles | Open-hearth steel |
| Bolster (truck) | American Steel Foundry |
| Brakes | Westinghouse |
| Brasses | Magnus Metal Co. |
| Couplers | Climax |
| Draft rigging | Sessions friction, Type C |
| Journal boxes | Franklin |
| Trucks | Diamond |

*The Chicago, Lake Shore & Eastern*, as reported in our issue of December 14, has ordered 200 steel underframe side dump gondolas, 175 steel side dump and 100 steel underframe flat cars, all of 100,000 lbs. capacity, from the American Car & Foundry Co. The steel underframe gondolas will weigh 40,600 lbs., and will measure 33 ft. 5 in. long, 8 ft. 6 in. wide and 8 ft. $8\frac{1}{2}$ in. high, inside measurements. The dump cars will weigh 48,000 lbs., and will measure 40 ft. long, 10 ft. wide and 10 ft. high, inside measurements. The flat cars will weigh 34,000 lbs., and will measure 36 ft. long, 8 ft. 6 in. wide and 4 ft. high. The special equipment for all includes:

| | |
|---|---|
| Axles | Illinois and Carnegie steel. |
| Bolsters | Simplex |
| Brake-beams | Simplex |
| Brakes | Westinghouse |
| Brasses | National-Fulton |
| Couplers | R. F. Janney |
| Draft rigging | Miner |
| Dust guards | Ryan |
| Journal boxes | McCord |
| Trucks | Andrews |
| Wheels | Griffin |

*The Chicago & Eastern Illinois*, as reported in our issue of November 30, has ordered three buffet-library and three chair cars

from the Pullman Co., for July and August, 1907, delivery. These cars will measure 69 ft. 6 in. long and 9 ft. 6 in. wide, inside measurements, and 6 ft. 10 in. high between sill and plate. The special equipment for both includes:

| | |
|---|---|
| Bolsters | Pullman |
| Brake beams | Diamond special |
| Brake-shoes | Lappin |
| Brasses | Hewitt make |
| Couplers | Janney |
| Curtain fixtures | Forsyth |
| Curtain material | Pantasote |
| Door fastenings | Pullman |
| Draft rigging | Westinghouse |
| Dust guards | Positive |
| Heating system | Pullman |
| Paint | Pullman standard |
| Roofs | Pullman standard |
| Vestibules | Pullman standard |
| Wheels | Standard steel tired |

*The Delaware & Hudson*, as reported in our issue of November 16, has ordered for the Quebec, Montreal & Southern 1,400 steel underframe box cars of 60,000 lbs. capacity and 100 steel underframe stock cars of 60,000 lbs. capacity from the Canada Car Company. The box cars will weigh 36,500 lbs., and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 9¼ in. long over sheathing, 9 ft. 11¼ in. wide and 13 ft. 3 in. high over all. The bodies will be of wood. The stock cars will measure 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, inside measurements. The bodies will be of wood. The box cars will have Security doors, Chilton Paint Company's paint, and Chicago roofs. The stock cars will have roofs of double boards and Security door fixtures. The following special equipment is the same for both types of cars:

| | |
|---|---|
| Axles | Cambria steel; Coffin process |
| Bolsters (truck) | Am. Steel Fdy and Gould cast-steel |
| Brake-beams | Simplex |
| Brake-shoes | Diamond "S" |
| Door fastenings | "B" positive; Wankesha Malleable Co. |
| Draft rigging | Miner |
| Springs | Railway Steel Spring Co. |
| Trucks | Arch bar |

## RAILROAD STRUCTURES.

Appin, Ont.—A steel bridge is to be built here to cost $15,000.

Birmingham, Ala.—Contracts are reported let for putting up a combined office and freight house for the New Orleans & Northeastern to cost $30,000.

Bloomington, Ill.—The planing mill at the Chicago & Alton shops was totally destroyed by fire December 18; loss $60,000.

Charlottetown, P. E. I.—Application has been again made by residents of this place to the Canadian Government to build a tunnel under the Northumberland Strait to connect Prince Edward Island with the mainland. The width of the strait between Cape Traverse, P. E. I., and the northeast coast of Westmoreland County, N. B., is about five miles.

Chicago, Ill.—The Chicago, Burlington & Quincy freight house at Harrison and Canal streets was recently damaged by fire; loss about $300,000.

Eldorado & Wesson.—An officer writes that this company has completed grading on 10.19 miles of new road in Union County, Ark., and expects to have the track laid by February 1.

Interborough Rapid Transit.—This company is building a steel viaduct on Broadway, New York City, from the Harlem Ship Canal branch to 242d street, 1.55 miles. T. P. Kingsley has the contract for the foundation work, the American Bridge Co. for the steel structure, and Terry & Trench for the erection of the structure. On the subway extension to Brooklyn from Bowling Green, near the southern end of Manhattan Island, under the East river to Joralemon street, Brooklyn, and thence under that street and Fulton street and Flatbush avenue, 2.55 miles, the work is so far advanced that men have passed through under the river. The contractors are the New York Tunnel Company, of New York, for the river tunnels, and Crawford & McNee, of Brooklyn, for the subway work in Brooklyn. There are to be twin tunnels under the river.

Jacksonville, Fla.—Permission has been granted the Seaboard Air Line to put up a brick warehouse 40 ft. x 510 ft. here.

Kildonan, Man.—The question of building a steel bridge over the Red river, at a cost of $100,000, is to be submitted to the taxpayers on December 18.

Lachine, Que.—It is thought that the Grand Trunk will build a new station here.

Michigan Central.—An officer writes that this company will complete during the present year second track work in Canada aggregating 94 miles as follows: Between Springfield, Ont., and Hagarsville, 46.46 miles; Tilbury and Ridgetown, 30.48 miles; Welland and Bridgebury, 17.29 miles.

Minneapolis, Minn.—It is said that a new passenger station will be put up at this place during 1907.

New York, N. Y.—Bids were recently opened by Bridge Commissioner Stevenson for the construction of the foundation, abutment core and metal work of the steel viaduct Queens approach of the Blackwell's Island bridge across East river. The Buckley Realty Construction Company, of New York, was the lowest bidder, offering to do the work for $797,804. The other bidders were: Snare & Triest Company, $885,830; American Bridge Company, $918,098; Terry & Tench, $919,500; Carbon Steel Company, $945,319; Williams Engineering & Contracting Company, $1,035,592, and King Bridge Company, $1,157,443. The Bridge Commissioner will make the award as soon as possible. Commissioner Stevenson plans to have the bridge completed by December, 1908.

Parry Sound, Ont.—The Canadian Pacific is to build a steel bridge over the Seguin river, at a cost of $300,000.

Portage la Prairie, Man.—A large station and freight sheds are to be put up here by the Grand Trunk Pacific and Midland Railways.

Quebec, Que.—The Canadian Pacific has definitely decided to replace the Chateau Frontenac with a modern structure at a cost of $1,000,000.

St. Paul, Minn.—According to local reports, plans are being made for a new union passenger station to be put up at this place. William L. Darling, President of the Union Depot Co., will soon make public plans for the proposed improvements.

Stratford, Ont.—Plans are being made for additions to the Grand Trunk shops here to cost $200,000.

Superior, Wis.—The Wisconsin Central, it is said, has bought ground at this place, also at Duluth, Minn., as a site for terminals, shops and new yards for its Superior division.

Winnipeg, Man.—The provincial government, through the Minister of Public Works, has granted the request of Winnipeg and St. Boniface for a grant of $125,000 for the building and acquiring of bridge communication between the two cities.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—At a recent meeting of the directors of this company in Topeka, Kan., an increase in the capital stock was authorized, part of the proceeds of which are to be used for building a line from Texico, N. Mex., to Brownsville, Tex., and a number of other small lines.

Barrie & Orillia.—Application will be made by W. A. Boys, solicitor, of Barrie, Ont., for authority for this company to build lines from Grenfell to Barrie, Barrie to Orillia, and branches.

Burrard-Westminster Boundary Railroad & Navigation.—Under this name a company is applying to Parliament for a charter to build a line from Vancouver, B. C., to Burrard Inlet, with a number of branches. Tupper & Griffen, Vancouver, B. C., are the solicitors for the company.

Canadian Northern.—Notice is given that application will be made to the Dominion Parliament for authority to build the following lines:

A branch from a point at or near Humboldt, Sask., southwesterly to Township 29, west of the third meridian, then westerly and southwesterly to Calgary, Alberta; a branch from a point in Township 29, west of the third meridian, southwesterly to a point on the Qu'Appelle, Long Lake & Saskatchewan Railroad's line between Craik and Bladworth; an extension of the lines authorized by Chapter 52 of the statutes of Canada, 1901, section 5, subsection (a), westerly to a point in Township 5, west of the second meridian, thence northwesterly to Township 16, west of the second meridian; a branch from a point at or near Humboldt, Sask., northwest to a point in Township 13, west of the second meridian; a branch from a point at or near South Battleford, Sask., westerly to a point in Township 14, Range 27, west of the third meridian; a branch from a point at or near North Battleford, Sask., northwesterly to a point in Township 59, west of the fourth meridian; a branch from Strathcona, Alb., southerly to Calgary; a branch from Regina, Sask., southwesterly to a point on the international boundary; from a point at or near Saskatoon, Sask., southwesterly to a point on South Saskatchewan river; from a point at or near Edmonton, thence by the most feasible route to a point on the Pacific coast; from a point near the forks of the Athabasca and McLeod rivers in Alberta southwesterly to the headwaters of the McLeod river; from Battleford westerly 100 miles; a branch from a point at or near Strathcona southwesterly to Pigeon Lake, Alberta; a branch from a point south of Neepawa, Man., northwesterly, joining the main line at or near the crossing of the South Saskatchewan river.

Canadian Northern Ontario.—The first train was run on Nov

19 over the line from Parry Sound to Toronto, formerly known as the James Bay Railway.

See Canadian Northern.

CANADIAN ROADS.—A company is seeking permission to build a line from the northern boundary of the Province of British Columbia to Dawson City, Yukon. Henry Blitz and Louis Aurebach, Boston, Mass., are the applicants.

CHARTIERS SOUTHERN.—Incorporated in Pennsylvania with $200,000 capital to build a line through Cecil, North and South Strabane, Somerset and West Bethlehem townships in Washington County, approximately 18 miles. E. B. Taylor of Sewickley is President and S. E. Scott of the same place is a Director. The other Directors include Joseph Wood, J. W. Renner, James McCrea, J. J. Turner and A. P. Burgwin, of Pittsburg. All these are connected with the Pennsylvania Railroad.

CHICAGO & NORTH-WESTERN.—See South Dakota Roads.

CHICAGO & NORTH-WESTERN.—The new line of this company, the Pierre, Rapid City & North-Western, between Rapid City and Pierre, S. Dak., has been opened for traffic from Fort Pierre to Midland, 49.1 miles, and from Rapid City to Owanka, 44 miles.

The line between Green Bay, Miss., and Gillett, 32.86 miles, has been opened for traffic.

CHICAGO, BURLINGTON & QUINCY.—According to reports from Themopolis, this company has given contracts to Bishop Crosby, head of the Mormon Church in northern Wyoming, for grading the Frannie-Worland branch from Worland, Wyo., south to Thermopolis, about 40 miles. The line will pass through the canyon of the Big Horn, and it will be necessary to blast a roadbed through much solid rock; also to cross and recross the Big Horn river several times. The work is to be completed to Thermopolis in about two years.

CHICAGO, MILWAUKEE & ST. PAUL.—See South Dakota Roads.

CLEVELAND, ALLIANCE & MAHONING VALLEY (ELECTRIC).—This company has been organized in Ohio to build an electric line from Cleveland through Ravenna to Alliance, with a branch from Ravenna to Newton Falls. The company has leased a line for its branch between these points from the Baltimore & Ohio for 15 years, with the privilege of buying during the first five years. David Morrison is President; F. H. Townsend, Treasurer, and C. R. Morley, Secretary.

CLEVELAND & SHARON TRACTION.—This company, which was recently incorporated with $2,500,000 capital, has completed its organization by electing officers as follows: President, Francis B. Morgan, Cleveland, Ohio; Vice-President and Secretary, John Blake, Brooklyn; Treasurer, C. F. Clendenning, New York; Assistant Secretary and Treasurer, P. M. Morgan, Cleveland, Ohio. This company purposes to build a line from Middlefield, Ohio, to Sharon, Pa.

CRAWFORD BAY & ST. MARY'S.—Application has been made to the Dominion Parliament by J. B. T. Garon on behalf of this company, to build a line from Lethbridge, Alb., to Hartney, Man.

EDMONTON (ALB.) STREET RAILROADS.—The city council has rejected the offer of the Canadian White Co., Montreal, to build, equip and operate an electric street railroad at Edmonton, and will build the line by contract and the city will own and operate it.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—This company has applied to Parliament for incorporation to build a line from Edmonton, Alb., to Fort George, B. C. Pringle & Guthrie, solicitors, are making the application.

GLEN MARY RAILWAY COMPANY.—Incorporation has been granted this company in Tennessee, with $50,000 capital, to build a line from a connection with the Cincinnati Southern near Glen Mary, Scott County, through Morgan and Roane counties to Oliver Springs. The incorporators include J. N. Scott, G. N. Chandler, H. M. Cain, R. N. Jones and Robert Walton, of Roane County.

KANSAS CITY, MEXICO & ORIENT.—See article on this road elsewhere in this issue.

KLONDYKE MINES.—This company has applied to the Dominion Parliament, through McGivern & Dadon, for an extension of time in which to build its line.

MINNEAPOLIS & ST. LOUIS.—See South Dakota Roads.

MISSISSIPPI CENTRAL.—An officer writes that this company has recently completed and put in operation its road from Brookhaven, Miss., southeast to Hattiesburg, 83 miles. Track has been laid from the latter place southeast for 10 miles, and eight miles additional has been located, part of which is under construction. Bowles & Hemingway are the contractors. On the Natchez & Eastern, under which name the western extension of this road is being built from its northern terminus at Brookhaven west to Natchez, a length of 66 miles has been located and 45 miles of this under contract. Additional contracts are to be let at once for the remaining 21 miles. Contracts for all steel bridges have also been let. F. L. Peck is President, and James Archbald, Chief Engineer, of Hattiesburg, Miss. (Nov. 2, p. 123.)

NATCHEZ & EASTERN.—See Mississippi Central.

NEW BRUNSWICK ROADS (ELECTRIC).—According to reports from Fredericton, N. B., James Burgess and J. F. Tweedie, both of Victoria county, are applying for incorporation of a company to build an electric line from St. Johns, N. B., to Grand Falls, about 130 miles.

NEWCASTLE & NEW WILMINGTON.—Incorporated in Pennsylvania with $60,000 capital to build a 10 mile line in Lawrence County. J. H. Veazey is President; J. J. Ashenhurst, C. Freeman, C. E. Trainor and G. N. Nealy, of New Wilmington, and others, are Directors.

NEW ORLEANS & GREAT NORTHERN.—A contract has been given by this company to C. D. Smith & Co., of Memphis and Birmingham, for extending its road up the west bank of Pearl river from Jackson to Edinburg, on the eastern border of Leake County. The proposed extension will follow the survey outlined by the Pearl River Valley Railroad, which was chartered early this year, and has since been absorbed by the N. O. & G. N. Work is to be started early next year.

OKLAHOMA, TEXAS & GULF.—An officer writes that this company, which was recently incorporated in Texas, will ask bids next month for building its proposed line. The route is from Clarendon, Tex., through Balir, Roosevelt, Apache, Marlow, Ardmore and Lehigh, Okla., to Hope, Ark., approximately 350 miles. The work includes heavy trestle over North Fork and the Salt Fork of Red river. (Nov. 23, p. 145.)

PENNSYLVANIA.—It is reported that the company is considering the construction of a freight line over the Susquehanna River at Sunbury and down the west side of the river to a connection with the yards at Selinsgrove and Enola.

The construction of the new line along the Middle Division between Newton Hamilton and Ryde has progressed to a surprising degree, considering the nature of the work. The Drake & Stratton Co. has been pushing its forces night and day and a large amount of earth has been transferred from the deep cut between Mount Union and Newton Hamilton to other portions requiring a fill. The Eyre-Shoemaker Construction Co. expects to complete the new stone arch bridge over the Juniata river just east of Mt. Union by January 1. The grading part will take another year to finish. There is a big fill from the river east of Mt. Union to the mouth of Jack's Narrows, as much as 40 ft. in places. The subways at Division and Jefferson streets, Mt. Union, are completed, and the foundation for the new station at the same place is being laid. The completion of this big piece of work will do away with several bad curves. There will be four tracks on the new line.

See Chartiers Southern.

QUEBEC CITY RAILROADS.—The committees appointed to report upon the best system of communication between the Quebec bridge and the city will recommend the construction of a railroad with docks built out into the stream to 55 ft. of water. The line would run from the bridge parallel with Champlain street, with a union station at Champlain market. The estimate for the improvements along the river front, with the proposed terminals, is $15,000,000.

SAN DIEGO & ARIZONA.—According to reports from San Diego, Cal., John D. Spreckels and associates have decided to build a line from San Diego, Cal., east across the state and through the Imperial valley to Yuma, Ariz. Articles of incorporation of the company have been filed in California. The company is capitalized at $6,000,000.

SOUTH DAKOTA ROADS.—While the winter weather is hampering railroad work in this state, some of it is being pushed along regardless of cold and snow. The Chicago & North-Western work west from Pierre on its extension to the Black Hills has rails laid and trains operating from this place west to Midland, 50 miles. This is to be the principal point between this place and the Black Hills. From the western end at Rapid City line has been completed and is in operation to Dakota City on Cheyenne river, about 40 miles. While this is as far as they will attempt any operating work for the winter they are pushing along with their track, and expect to finish their relay from this end before they quit, to a point 20 miles west of Midland. The contractors, Roberts Bros., of St. Paul, also have a contract for about 200 miles on the Milwaukee line west from Mobridge and want to put their outfits on that work as soon as they can begin in the spring, which accounts for their rushing cold weather work. From the west end the work will be pushed about six miles down the valley of the Cheyenne river from Dakota City to the location of the bridge across the Cheyenne river so that work can begin on that structure, and that be ready to cross on in the spring to push ahead with the work. With these projects completed the North-Western will have about 40 miles left to complete in the spring from the eastern part of the state to the Black Hills. The new line is being surfaced with gravel as fast as it is com-

pleted, and will be in shape for continuing work as soon as spring opens, as the gravel surface will give them a roadbed on which they can work regardless of weather. In the spring the company will begin the construction of a twenty five stall roundhouse and extensive shops at Pierre on a tract which was purchased for that purpose early this year. Excavation work has also been started for a large stone station and office building which is to be erected next year. Work on the bridge here is progressing slowly, and while the contract calls for a completed bridge by the first of June the chances are that it will not be done by that time, as but two caissons out of eight have yet been sunk, and work is just beginning on two more.

The extension of the Chicago, Milwaukee & St. Paul's line from Chamberlain to the Black Hills is at a standstill at present, with the exception of the work in some of the heavier cuts. Track has been laid for about 70 miles out of Chamberlain, but only a small part of it is graveled. The line is in operation as far as Murdo from the river, and track has been laid for some distance west of that place. Work trains are being run west of Murdo. From Rapid City most of the grading is completed, except the heavy cuts, as far as Cheyenne river, and rails laid for about 15 miles from that place; track laying has been discontinued until the spring.

The Minneapolis & St. Louis has completed its line from Watertown to Aberdeen, and is operating this part of its system which will be in this state. No attempt to build from Aberdeen to Leola on its northwest line will be made before spring, or on its line west to the river. This company has been doing the most rapid construction work of any of the roads in the state this year, but have been building over a comparatively level country, with no large streams to cross.

It is expected that the Great Northern will start work in the spring to reach a point on the Missouri river; there is a good grade at their disposal between Pierre and Aberdeen, that is looked upon as the most probable route they will take. Representatives of that system have been traveling over that grade several times in the past few months.

The Yankton & Gulf, in which Senator Gamble is interested, projected from Yankton to the Gulf, will not be much of a Dakota road if built. The Cincinnati parties who are backing it are active in preliminaries, and may build the line.

Texas Railway Company.—The Hipp Construction Company, which has the contract to build part of this company's proposed line from Port O'Connor, on the gulf coast to San Antonio, with a branch to Gonzales, a total of about 250 miles, has resumed grading work on the first division between Victoria and Yoakum. The old grade of the Guadalupe Valley between Victoria and Port O'Connor, which was never used by its original builders, has been acquired by the new company and is being restored preparatory to track laying. (April 13, p. 116.)

Yankton & Gulf.—See South Dakota Roads.

## RAILROAD CORPORATION NEWS.

Buffalo, Rochester & Pittsburg.—The directors of this company have sold the $3,999,500 stock of the Rochester & Pittsburg Coal & Iron Company to the Mahoning Investment Co., incorporated in Maine with $4,200,000 capital stock. The railroad company receives in payment $4,125,000 stock of the Mahoning Investment Co. This last named stock is to be distributed to the holders of the $10,500,000 common stock and $6,000,000 preferred stock of the B., R. & P. at the rate of one share of Mahoning Investment Co. for every four shares of B., R. & P. stock held on December 20, 1906.

Chesapeake & Ohio.—Scott & Springfellow, Richmond, Va., representatives of the minority stockholders who have been trying to get an increased dividend, have issued a circular maintaining that the railroad company's reasons for not paying higher dividends are insufficient. The railroad company declared that there were not enough funds on hand to warrant any increased distribution, but Scott & Springfellow answer that according to balance sheets for the seven years previous to 1906 the excess of current liabilities over current assets during that period ranged from $1,000 to $758,000; therefore, according to the argument of the railroad management, no dividends should have been paid at all during those years. The circular argues that the dividend rate is a question of earnings and not of the temporary condition of the treasury. It agrees that the company needs more capital.

Chicago, Milwaukee & St. Paul.—At a meeting on December 17, the directors decided to offer at par until January 10 to stockholders of record December 19, $66,327,100 preferred stock and $33,183,740 common stock at the rate of one share of common and two shares of preferred for every four shares of either class already held. There is now outstanding $49,654,400 preferred and $82,986,700 common stock. It has for some time been believed that on September 29 increases of $75,000,000 in authorized preferred and $75,000,000 in authorized common stock were made. Of the proceeds of the sale of the new stock, $75,000,000 is for the extension from Evarts, S. Dak., west to the Pacific coast, and the remainder is for contingencies.

Chicago, Rock Island & Pacific Railway.—This company has declared a quarterly dividend of 1 per cent, payable January 2 to stockholders of record on December 27. In July, 1906, 1 per cent. was paid; in April, 1½ per cent., and in January, 1½ per cent. from the earnings of five months. The annual rate during 1905 was 6¼ per cent.

Lehigh Valley.—The directors have declared on the $40,334,800 common stock the regular semi-annual dividend of 2 per cent. and an extra dividend of 1 per cent., payable January 12 to holders of record December 29. The annual rate has been 1 per cent. since 1904, when 1 per cent. was paid; nothing was paid during the ten years previous.

Mahoning Investment Co.—See Buffalo, Rochester & Pittsburg.

Manila Railroad.—See Manila Railway.

Manila Railway.—Under this name a company has been incorporated in Great Britain as a holding company for all the bonds and stocks issued by the Manila Railroad Co., which is building about 120 miles of road on the Island of Luzon, Philippine Islands, and will also take over the Manila & Dagupan, 208 miles long. The new company will have $10,000,000 5 per cent. non-cumulative preferred stock, $10,000,000 common stock, $15,000,000 4 per cent. "A" debenture bonds and $15,000,000 4 per cent. "B" debenture bonds.

Mexican Central.—Announcement has been made that the negotiations for the consolidation of the Mexican Central and the National Railroad of Mexico, and the acquisition by the Mexican Government of control of the consolidated company have been closed. The Government now owns about 47 per cent. of the $65,350,000 outstanding stock of the National of Mexico; there are four classes of stock: common, first preferred, second preferred and deferred. The road has outstanding $48,449,000 mortgage bonds and $8,500,000 collateral notes, the last named being due October 1, 1907. The Mexican Central has $59,454,300 outstanding stock; $66,874,000 consolidated mortgage 4 per cent. bonds of 1911, $32,178,200 income bonds and some $32,000,000 collateral trust bonds and notes. It is believed that the consolidated company will issue prior lien bonds and second mortgage bonds to fund the present indebtedness of the two companies, and that the Mexican Government will guarantee the interest and sinking fund on the new second mortgage bonds.

New England Investment & Security Company.—This company, organized some months ago as a holding company for the New York, New Haven & Hartford electric lines in Massachusetts, has declared an initial dividend of 2 per cent. on the $20,000,000 4 per cent. cumulative preferred stock. (Sept. 21, p. 76.)

Northern Pacific.—A meeting of the stockholders has been called for January 7 to ratify an increase of capital stock from $155,000,000 to $250,000,000. Of the additional stock, $93,000,000 is to be offered to stockholders of record December 31 for subscription at par on or before January 15 to the extent of 60 per cent. of their present holdings. The proceeds of the new stock are to be used for improvements and new lines.

Pennsylvania Eastern.—This is the new name of the Quakertown & Eastern, which runs from Quakertown, Pa., to Riegelsville, 15 miles, and has $180,000 outstanding stock and $180,000 outstanding first mortgage 5 per cent. bonds of 1927.

Pittsburg & Lake Erie.—A meeting of the directors has been called for February 28 to act on a proposition to increase the capital stock from $10,000,000 to $30,000,000. The proceeds of the sale of the additional stock are to be used to pay for the four-tracking of the road from Pittsburg, Pa., to Youngstown, Ohio, 68 miles; for new freight terminals in Pittsburg; for a bridge over the Ohio river and for rolling stock.

Quakertown & Eastern.—See Pennsylvania Eastern.

Richmond, Fredericksburg & Potomac.—A scrip dividend of 25 per cent. has been declared on the $1,360,950 common stock and the $1,072,000 "dividend obligations," which receive the same dividend as the common stock. It is payable January 3 to holders of record December 20.

Toluca & San Juan.—See Toluca, Tenango & San Juan.

Toluca & Tenango.—See Toluca, Tenango & San Juan.

Toluca, Tenango & San Juan.—This company, incorporated with $500,000 capital stock, is a consolidation of the Toluca & Tenango and the Toluca & San Juan. The two roads operated 35 miles of road in the province of Mexico, Mex.

# GENERAL NEWS SECTION

## NOTES.

The New York, Philadelphia & Norfolk Railroad will reduce local passenger fares January 1.

The Southern Pacific has bought a large tract of land in San Francisco, south of its ferry terminal, which is to be converted into docks for ocean steamers.

The Southern Car Service Association has been organized at New Orleans to take the place of the Louisiana Car Service Association; the manager is Seely Dunn.

Chicago newspapers say that the Central Freight Association has asked the Eastern lines once more to join it in an effort to agree on a uniform freight classification.

The State Railroad Commission of Indiana has ordered a general reduction in freight rates on all classes on the Vandalia Railroad between Indianapolis and Terre Haute.

An advance of two cents an hour in the pay of all machinists, with a maximum of 37 cents and a minimum of 35 cents, has been announced by the Chicago & Eastern Illinois.

The clerks of the Sixtieth street, New York, freight station of the New York Central & Hudson River are going to hold a ball under the name "New York Central Lions" at the Murray Hill Lyceum on January 8.

The Erie Railroad now has one ferryboat running between New York and Jersey City on which no teams are carried, the whole of the space on the main deck being given up to passenger rooms. The seating capacity has been increased from 226 to 505.

A Pittsburg dispatch says that 12 barges now being loaded with coal at that city are to be floated down the Ohio and Mississippi rivers to New Orleans, and thence towed direct to Havana. The barges are of steel and carry each about 12,000 bushels of coal.

An officer of the Burlington at Chicago is quoted as saying that the company cannot afford to continue running a fast mail train between Chicago and Omaha if the government carries out its rumored intention of giving a part of the through mail to a competing railroad.

William A. Lindsay, engineman in charge of a locomotive at the Grand Central Station, New York City, which recently ran over a man, was required by the coroner to give $10,000 bail. The coroner holds that the imposition of heavy bonds will be a good way to reduce the number of fatal accidents.

The Chicago, Burlington & Quincy is to put on an additional train between Minneapolis and LaCrosse for the purpose of relieving the Chicago day express, so that the fast time of this schedule through to Chicago can be made without the excessive speed which would be made necessary by the long stops at stations.

It appears that some of the recent delay in shipping coal to the suffering cities of the northwest was due to a reduction of 20 per cent. in rates, which shippers heard of 30 days before it went into effect. Knowing that the cost of transportation could be reduced by waiting a month, shippers took the risk of postponing their orders.

It is reported in Chicago that the Chicago, Milwaukee & St. Paul is to reduce by 10 per cent. the freight rates, on all classes of goods, from Chicago to all points in the Northwest, to meet recent reductions made by the Great Northern and the Northern Pacific which have given St. Paul, Minneapolis and Duluth advantage over Chicago.

Pennsylvania newspapers say that after this month employees of the Pennsylvania Railroad will have to buy their coal of regular retail dealers, the privilege of buying it at the railroad companies' mines being cut off. It is estimated that the employees have saved annually hundreds of thousands of dollars by reason of this favor from the company.

According to the Salt Lake *Tribune*, a plan, which has been agitated considerably, to establish a state railroad commission in Utah, has been put to a sudden death by an order from President Joseph Smith, who is a director of the Union Pacific Railroad, and, at the same time a political boss. He does not want any railroad commission established.

The Louisville & Nashville and the Louisville & Eastern have paid $1,400 each to the state of Kentucky in consideration of the withdrawal of indictments for requiring employees to work on the Sabbath, which is unlawful. The indictments were returned by the grand jury on account of work done on Sunday when each of these roads was trying to prevent the other from laying track on disputed ground.

A St. Paul paper prints a story to the effect that the railroads have this year delayed making rates to move grain from Minnesota and North Dakota to Lake Superior until the close of navigation, so that a longer rail haul could be secured; that this prevented the movement of cars, westbound as well as eastbound, and therefore was the cause of the recent scarcity of coal in North Dakota. No specific statements of facts are given to substantiate this story.

Lucius Tuttle, arbitrator in the long-pending dispute concerning passenger fares from Chicago eastward, has decided that the Michigan Central ought to charge a rate about midway between that of the standard lines and that of the so-called differential lines. For example, first class, Chicago to New York, standard, $20; differential lines, $18; Michigan Central, $19. On business going to Boston, Mr. Tuttle classes the Michigan Central as a standard line, so far as first-class passengers are concerned, but the second-class rate he makes $18, or $1 less than the standard rate.

The Metropolitan Street Railway, New York City, will no longer have men stationed at intersections of lines to give free transfers to passengers, but will require passengers in every case to secure the transfer from the conductor when paying fare. An officer of the road says that the cheating due to the giving of transfers, in crowds, to people who have not paid fare has amounted to a loss of $100,000 a year. Many persons have secured two transfers, one from the conductor and another at the junction. In such cases one of the transfers is frequently traded for a newspaper.

The Interstate Commerce Commission, amending its circular of October 12, No. 5A, holds that it will be proper for railroads to accept a guarantee of an association so that return tickets, at reduced rates, on the certificate plan, may be issued on the first day of a convention or meeting, without waiting to see whether there will be enough passengers to justify the reduction; it being understood that the railroad will in good faith require the society to pay the difference agreed upon. Concerning the permission given in circular No. 5A to reduce through rates to the sum of locals on only one day's notice, the Commission extends the time indefinitely; that is to say, such changes may be made without limit, until further notice from the Commission.

A large percentage of the brotherhood firemen on the Southern Pacific lines in Texas and Louisiana struck and left their engines on Sunday last, and their leaders threatened to tie up the road, if necessary to gain their ends; but, according to press despatches of Tuesday, the passenger trains were kept running, with no great delays, and, according to an officer of the road, a large percentage of the freight was moved. Many of the engines on these lines burn oil, and, according to the statement of one officer of the road, "a new fireman becomes proficient in a single trip." The grievance on which the strike is based is that enginemen who belong to the brotherhood of firemen, but who do not belong to the brotherhood of engineers, are obliged to have their complaints settled through a committee of the engineers' brotherhood—a truly desperate situation!

The Southern Railway and the brotherhood representing the machinists in its shops who struck a few months ago have reached an agreement on wages, which is to be in effect from September 1, 1906, to November 5, 1907. At most of the shops the rate is increased 2 cents an hour over the former rate. At Birmingham and Sheffield the increase is 1½ cents. The trainmen, enginemen and yardmen of the Western Maryland have received an advance in pay, said to be about 10 per cent. The firemen of the Long Island road have had their pay increased 12 per cent. The enginemen of the same road are said to have had an increase, but the rate is not given.

The Brotherhood of Railway Trainmen, after protracted conferences, announces that the railroads terminating at New York harbor have agreed to pay their conductors and brakemen in yard service in New York City territory 4 cents an hour more than heretofore, and have agreed to the arbitration of the demand of the Brotherhood for 1 cent an hour additional. The New York Central and the New York, New Haven & Hartford some weeks since granted the demand of these men for an increase of 5 cents an hour, and the officers of the brotherhood announced last week that on all of the other roads they were going to strike, because those roads refuse to grant the 5-cent increase. They even sent an ultimatum on Thursday threatening to stop work on Saturday, December 22, but from this position they appear to have backed down. The officers of the railroads say that already in the last three years these classes of employees had received increases of 33 to 50

per cent. The number of yard men affected by the present increase is variously stated at from 1,700 to 3,500.

### Sixty-five Mile Interurban Line in Texas.

Contracts have been let by the Texas Traction Company for the equipment of a 65-mile electric road between Dallas and Sherman, Texas. The new line will parallel the existing steam road between the two cities and will be one of the longest electric roads in the state. While the apparatus is standard direct-current throughout, the equipment, in some respects, presents several features of interest.

The country through which the new line is laid out is flat and rolling, there being no grades exceeding 1 per cent., and a maximum curvature of but 3 deg. In order to have a clear headway for operating cars, a private right-of-way has been established by the company, so that the run between Dallas and Sherman will be made in 2 hours and 30 minutes. This schedule includes a 15-minute run within the city limits of Dallas, where the cars must necessarily be operated at lower speeds. While the main traffic will be of an express nature, stops have been provided about every two miles to take care of the local travel.

Fifteen car equipments will be provided to maintain the initial schedule. These will be of the standard interurban type, each 50 ft. long, and equipped with four GE-73 (75 h.p.) standard direct-current motors equipped with the Sprague-General Electric Type M system of multiple unit control. Each car will be further provided with General Electric air-brakes and compressors.

Power for the new road will be generated by steam at McKinney, a town located about midway between Dallas and Sherman. The main power station equipment will include two 1,000-k.w. Curtis steam turbo-generators working under a steam pressure of 150 lbs. at the throttle with 125 deg. superheat. The turbines will operate condensing current, will be generated at 2,200 volts and 25 cycles, and stepped up for transmission to 19,100 volts. For exciting the fields, two 35-k.w. generator sets will be provided. The compactness and low maintenance charges of these machines adapt them particularly for exciting units.

The three-phase current from each of the turbo-generators will be transformed in a set of three 330-k.w., air blast transformers. One transformer of the same capacity will be installed as a reserve. To supply air for cooling, duplicate blower sets will be furnished, one set being driven by an induction motor, the other by a direct-current motor. Each blower will have a capacity of 10,000 cu. ft.

One of the special features of interest in the new road lies in the rotary converter equipment. Six substations will be provided, including one at the main station, and a portable equipment consisting of a special car containing a 300-k.w. rotary converter, air blast transformers and suitable switching apparatus for cutting into the transmission system wherever necessary. The portable substation renders unnecessary the duplication of rotary converters at the fixed substations for the portable equipment can be shifted to various parts of the line and used as an emergency station or auxiliary in case of need.

Regular substation equipments are to be provided at the main station and at four points distributed along the railroad. Each of these substations will be equipped with a 300-k.w., 600-volt rotary converter with the necessary switchboards, oil-cooled transformers and lightning arresters.

The substations will be interconnected by high tension transmission lines, operated initially at 19,100 volts. Eventually, however, a transmission potential of 33,000 volts will probably be used, and for this purpose taps will be provided for Y connection of the transformers. With the few exceptions noted the new line follows, in general, the standard direct-current practice of the General Electric Company.

### The Russian-Asiatic Railroad.

Col. Beresford, formerly English military attaché at St. Petersburg, recently delivered an address in London on the lines of railroad that are projected by Russia towards British India. Of the lines completed, the one from Orenburg to Tashkend is of the greatest present importance, as it puts Russia in direct communication from St. Petersburg to Kush-Port, on the Afghanistan frontier. It is 1,230 miles from St. Petersburg to Orenburg; 1,500 miles from Orenburg to Tashkend, and 150 miles from Tashkend to Kush-Port, or 3,180 miles in all. The projects include an extension of the Central Asiatic Railway and the construction of a line across Persia toward India. The first will have its terminus at Kerki, a point located a few miles north of the Afghan frontier; while the second, passing beyond the point where English and Russian lines are forbidden by treaty in the dominion of the Shah, follows the old caravan route to Meschedi and Kush-Port, thence reaching Hérat and Farah it bifurcates towards Seistan and Kandahar, the strategic importance of which was emphasized.—*Le Journal des Transports.*

### Report on Canadian Transcontinental Railway.

The report of the Transcontinental Railway Commission for the year ended June 30, 1906, recently issued, states that the Grand Trunk Pacific is the first railroad in Canada over 300 miles long that has laid out its line for construction with grades not exceeding 0.4 of 1 per cent. adverse to eastbound, and 0.6 of 1 per cent. adverse to westbound traffic, with curves of a minimum radius of 1,133 ft., except in a few instances where curves of 955 ft. radius have been obtained. These easy grades necessitated a large amount of extra work, and the cost of construction will be considerably greater than had 1 per cent. grades been used, but the immense advantage in operation is regarded as sufficient to warrant the additional outlay. Chief Engineer Lumsden has reported to the Commission as to the character of the country through which the line will pass. From Weymontachene on the St. Maurice river, Que., for the first 100 miles westward it is rough and broken, and moderately so for 50 miles more. After crossing the head waters of Obaska lake, the land is much flatter, and construction work from that point to the boundary between Quebec and Ontario for about 120 miles will be comparatively easy. West of the boundary for 402 miles to a point near Kashkagama river the work will be lighter, with the exception of approaches to river crossings. Very little rock occurs in this section, but owing to the number of streams a considerable amount of bridging will have to be done. This area contains plenty of good land suitable for settlement. A tract of rough and broken land follows, extending from the Kashkagama river westerly to the junction with the Grand Trunk Thunder Bay branch, including numerous lakes and rocky ridges, and from the junction west for 185 miles the work will be very heavy, consisting largely of timber trestle work. The country for some 65 miles east of Winnipeg is prairie, and the work will be light.

At Prince Rupert, the Pacific coast terminus of the Grand Trunk Pacific (National Transcontinental) line, work is well under way. A number of buildings are going up and a force of 200 men are engaged in survey and hydrographic work. The population is about 400, nearly all of whom are in the employ of the company.

### Decrease in Exports of Canned Meats.

A recent Consular and Trade Report reviews the exports of meat products for the first nine months of the current year. All classes except canned meats during this period made large gains over previous years. The foreign sales of canned meats were as follows:

| | First nine months. | | |
|---|---|---|---|
| | 1906. | 1905. | 1904. |
| Canned beef ..... | $3,060,983 | $5,178,827 | $3,325,208 |
| Canned pork ..... | 498,955 | 685,770 | 651,428 |
| Other canned meats.. | 972,811 | 1,424,886 | 1,420,501 |
| Total ..... | $4,532,749 | $7,289,283 | $5,397,137 |

The real loss in the American canned meat trade abroad has not been so heavy as would appear from these figures. The purchases of Japan from the United States for the first nine months of 1905 in canned beef alone amounted to $1,307,415. These were evidently almost entirely for armies in the field, since the Japanese purchases of these goods for the same period of this year were only $9,820. Thus with the deduction of the Japanese item, the net loss of the American canned meat trade for 1906 up to September 30, amounts to $1,458,929. The sales of American canned beef increased greatly in Germany, Central America and South Africa during this period.

The United States Consul at Cardiff, Wales, writes as follows in regard to the effect of the packing-house scandals on the market for United States meats in the United Kingdom:

> When the meat scandals were made public last summer, many British papers exploited them and very exaggerated statements were published broadcast. This was due to national rivalry, a natural prejudice which springs up between competitors, and, above all, to commercialism of the penny press. But when, a few weeks later, the more reliable journals began to expose the meat scandals of the home market, a reaction set in, and the cablegram of the President to retail grocers of the Kingdom assisted materially in restoring confidence in American meats. Notwithstanding the general hue and cry against canned meats the American article has come out comparatively unscathed from all tests made. For instance, in Stepney, where an average of one ton a day of tinned goods has been condemned for five years past, only a very small quantity of American meats were included. Indeed, the sudden falling off in the sale of canned goods during the summer was due as much to English exposures as to the news from America.

### The Crime of the Railroads.

Mr. Roosevelt's hatred of the railroads, which has reached the proportions of an intellectual obsession, bids fair to bear substantial fruit in the not distant future. Indeed, it is quite certain that we shall all have to pay deeply for the sins of the railroads.

The prospective penalty impresses us as being too inclusive. We favor the severest punishment for the crime of secret and fraudulent rebating, which we take to be the root and genesis of the whole evil. We should be content to see the giver and the receiver of the dishonest rebate both fined and sent to prison as a just penalty and deterrent, and we sincerely deplore the laxity and inefficiency with which the statutes have been enforced.

The public has now had time for reflection and perceives the unreasonableness if not the dishonesty of rate regulation as a remedy for malpractice. However much astray the public may be led by clamor and sophistry, it will not always remain misled, and it will very soon be aware that there is no connection between rate regu-

lation and criminal rebating. In the long run common sense will settle all such questions, because it is at the bottom of public opinion, and public opinion is still the governing power in this country.

The transportation rates of the United States are the lowest in the world and are a scientific wonder. They have been achieved by the railroads themselves without any legislation or Government interference. There is no page in the history of commerce that is so wonderful as that which records the fall in the cost of railroad transportation during the last thirty-five years. Natural causes brought it about, and if natural causes are not checked in their operation by fatuous and ignorant meddling rates will go lower yet. If they are checked, and there is a reckless and mischievous effort now on foot to do so, then disaster will ensue as surely as the night follows the day, and with disaster will come increased cost of transportation.

The last quarter of the year has seen over $100,000,000 added to the wages of railroad employees. (Likewise the greatest decrease in the efficiency of labor ever noted in this or any other country.) The record of the prices of railroad supplies, rails alone excepted, during the year shows the greatest advance ever known in a like period. The condition of all around apparent prosperity is the most ominous disclosed in our annals.

In these conditions a 10 per cent. horizontal reduction in rates of transportation by the joint forces of the Interstate Commerce Commission and special enactment is proposed, and it suggests at once to the sane and competent observer that Mr. Bryan's idea of Government ownership of all the railroads was wiser and more equitable and implied a decenter regard for the rights of property. It would seem as if the intention was to go Mr. Bryan one better, or go him one worse.

In the face of this menace, what are the railroads to do? Where are they to get the money to buy the additional trackage, the need of which is now so painfully apparent; the money for additional rolling stock; the money for more motive power, and the money for enlarged terminals? The pressure to acquire all these is the most acute that has ever existed in our railroad history. How can the money be forthcoming in the presence of the destructive plans of the Federal Government? What is the prospect for the wage earners? As a highly privileged class they have some interest in knowing whence these things are to come. The apparent prosperity of the present must give way before the certain paralysis of the railroads. As it is, we see no signs of building the new trackage. Indeed, we are disturbed by the ominous fact that in spite of the well known and obvious conditions the market for steel rails is slackening. It could not possibly do so if the railroads were doing what under normal circumstances they could have no choice but do.

The outlook for the railroads is serious. Such a clamor was never before heard as has arisen for more cars. Consignees won't unload the cars sent to them, and there is no way to compel them to do so. Indeed, some State Railroad Commissioners, quick to emulate Mr. Roosevelt's example, forbid the railroads from imposing demurrage charges for delay. The roads are between Mr. Roosevelt and the deep sea. The gross earnings are suffocating them, the net earnings are steadily vanishing, and behind all is the spectre of an intolerable usurpation which means only bankruptcy and disaster. Communities are howling for coal; farmers are distracted for means to get their grain to market; merchandise of all kinds encumbers the sidings and chokes the railroad yards, and only open weather palliates the immediate prospect.

But never mind the railroads. They have earned and they fully deserve the punishment that is coming to them. If the laws are not enforced we must make new laws. But what we want to know is, How does a paternal and illustrious ruler propose to provide for the unemployed millions who will presently appeal to his omnipotence for succor?—*New York Sun.*

### An Antagonistic Government.

The cost of operating and maintaining railroads has been increasing with leaps and bounds. To add to the anxiety, the owners of railroad properties are threatened with loss, possible confiscation, by the people who are to an extent debauched by the leaders, who, for selfish reasons, denounce corporations, especially railroad corporations, falsely charging them with ruling the country.

The attitude of the Government and its administrators is antagonistic to railroads. President Roosevelt has in two annual messages to Congress sharply criticised two of the Federal judges, a coordinate department of Government, because they have, in the performance of their duties, rendered decisions unsatisfactory to him. He and the Department of Justice have in effect pursued a course of intimidation not heretofore attempted.

When it is considered that the President appoints the judges, which includes their promotion, it is not too much to characterize his conduct as dastardly. His plaint is that the government has not the right of appeal and that the decisions which he denounces were final. Are the judges at fault because the laws of the country do not provide for an appeal in criminal cases? As I am advised, since the creation of the government the law has been that a man acquitted of crime and acquitted cannot be again tried for the same offense. The justice of such a law will not, I think, be denied.—*Milton H. Smith, President of the Louisville & Nashville, in a speech at New Orleans.*

### Government Regulation.

"Where's the president of this railroad?" asked the man who called at the general offices.

"He's down in Washington, attendin' th' sessions o' some kind uv an investigatin' committee," replied the office boy.

"Where's the general manager?"

"He's appearin' before th' Interstate Commerce Commission."

"Well, where's the general superintendent?"

"He's at th' meetin' o' th' Legislature, fightin' some new law."

"Where's the head of the legal department?"

"He's in court, tryin' a suit."

"Then, where is the general passenger agent?"

"He's explainin' t' th' commercial travelers why we can't reduce th' fare."

"Where is the general freight agent?"

"He's gone out in th' country t' attend a meetin' o' th' grange an' tell th' farmers why we ain't got no freight cars."

"Who's running the blame railroad, anyway?"

"Th' newspapers."—*Pittsburg Press.*

### Nine Passengers Killed in Mexico.

Press despatches of December 19 report the wreck of a passenger train on the Mexico Southern Railroad near Tlacotepac in which nine passengers and two trainmen were killed and 20 passengers injured.

### Ten Persons Killed in a Collision at Enderlin, N. Dak.

On the morning of December 23 about 2 o'clock, a passenger train of the Minneapolis, St. Paul & Sault Ste. Marie Railway collided with a switching engine in the yard at Enderlin, N. Dak., and several of the passenger cars were overturned and wrecked. The wreck took fire and was burnt up. Ten persons were killed and 30 more injured, six of them fatally. It is said that the switching engine, with a few freight cars attached, was leaving the main track for a siding, but had not quite cleared it. All of the injured persons were rescued before the flames reached them. All of the fatalities occurred in the smoking car.

### Government Prescribing Forms of Railroad Records.

Prof. Henry C. Adams, chief statistician of the Interstate Commerce Commission, has issued his first circulars looking to the preparation of a complete schedule, under authority of the revised interstate commerce law, for the guidance of railroads in keeping the records of all their doings. They are circulars 1 and 2, "special report series," requiring full and correct information concerning intercorporate relationship. Circular 1 is addressed to controlling or operating companies and circular 2 to subsidiary companies. The information is required to be furnished under oath. It may be classified as covering, first, every corporation in which on June 30, 1906, the company had any interest and which on that date had existence in contemplation of law, even though the corporation was then inactive; second, every corporate security, whether the said interest was legal or equitable, complete or partial, absolute or qualified. The circulars define certain terms, the object of which terms is to make clear what is included under the term "control" and what is the difference between direct and indirect control.

### Profit Sharing.

The employees of the Bourne Mills, Fall River, Mass., have just received their 34th semi-annual dividend. It is four per cent. of their wages. Treasurer Chace says to the employees: "I sincerely hope there may never be another reduction of wages here. There ought not to be. The business should be adjusted to this schedule." The Board of Directors has unanimously authorized him to announce the experiment of a vacation week in August, 1907. The mills will close Saturday noon, August 24, and reopen Tuesday morning, September 3, thus allowing ten days of rest and recreation. In lieu of regular pay employees will receive an extra dividend upon their wages, payable just before the vacation, of 50 per cent. of the average weekly wages earned during the present profit sharing term, closing next June. These dividends are paid upon the single condition of continuous faithful efficient service. The August dividend will be in addition to the regular Fourth of July dividend.

### A Santa Claus Train.

Henry K. McHarg, President of the Virginia & Southwestern Railway, having sold out his interest in the property, gave to the employees this week farewell gifts aggregating nearly $50,000 in cash. Heads of departments each received a check equal to one year's salary, while all other employees received the equal of one month's pay. The company sent a special train to deliver the checks to the men along the road. The conductor was attired as

Santa Claus and the train was designated in orders as the "Santa Claus train." A feature of its trip was the presentation of stockings full of toys to children of the section men.

This is the second time in recent years Mr. McHarg has distributed thousands of dollars in presents among his employees. When he sold the Atlanta, Knoxville & Northern, he presented his manager, John B. Newton, with $25,000. Mr. Newton received a liberal gift this time, too.

### The Salton Sea Still Unsubdued.*

Early in December the Colorado River again broke through the barriers which had been built to keep its waters out of the Imperial Valley, Southern California, and the Southern Pacific Company has again taken up the task of building a dyke which will stand. It is estimated that the work will cost $2,500,000. The $1,000,000 or more heretofore spent appears to have been all thrown away. Over 1,000 piles were driven and 100,000 sacks of sand used, as well as a great quantity of gravel and brush, and the flood, which had been pouring into the Salton sink for 18 months, was stopped on November 4; but now the work must be done over again. It appears that at a depth of 10 feet or more beneath the surface there are immense masses of driftwood through which water percolates. President Roosevelt has been negotiating with the Mexican Government with a view to having the United States Reclamation Service take a hand in the work of restoration, most of which has to be done on the Mexican side of the boundary. Mr. Harriman says that the Southern Pacific Company has determined to rebuild its railroad line on higher ground, whatever may be done about stopping the rise of the Salton Sea. Although the Southern Pacific is not responsible for the acts of the California Development Company, which caused the original trouble, he will proceed at once with efforts to repair the break, trusting that the Government will later decide to assist the road with the burden.

### Proposed New Bill of Lading.

At a two-day conference recently held in New York a formal decision on a uniform bill of lading was reached by the joint committee of shippers and railroad men appointed at the suggestion of the Interstate Commerce Commission two years ago. The wording will be revised for the purpose of correcting language that might be subject to indefinite construction, and the bill will be again considered early in January. The committee consists of Levy Mayer, counsel; A. J. Toomey, of the New York Produce Exchange, and F. Bently, of the Illinois Steel Company, representing shippers, and Vice-President Caldwell, of the Lackawanna; Mr. Brownell, of the law department of the Erie; Mr. Paterson, of the law department of the Pennsylvania, and Commissioner McCain, of the Lake Lines Association, representing the railroads.

The new bill does not carry out in full the ideas of the Bill of Lading Committee of the American Bankers' Association. There seems to be sharp antagonism between the railroads and the bankers. Some of the banks presenting drafts attached to bills of lading are protecting themselves by printing on them the following by means of a rubber stamp:

> The . . . bank hereby notifies all parties concerned that it will not be responsible for quantity, quality, condition or delivery of goods covered by this bill of lading or otherwise.

The reason this stamp is being used, it is understood, is that courts, in certain states have decided that banks presenting drafts are liable for the quality and quantity of shipments, although acting merely as collection agents. Bankers at a recent conference with the Interstate Commerce Commission were especially anxious to have the bills made uniform by law, and to have at least a partial quality of negotiability bestowed upon them. They also are very urgent that the present law shall be altered so that they will be able to take possession of consignments when obliged to realize upon the security, even though the goods may have been falsely described in the bill of lading. At present, if there be an error in the bill of lading the banks have no legal title even to the consignment, such as it is, though they may have been misled as to its nature when they granted credit on the strength of it. They are still anxious to have the rules of law relating to the delivery of bills of lading made more stringent.—*New York Journal of Commerce.*

### Alaska-Yukon-Pacific Exposition.

The Alaska-Yukon-Pacific Exposition is to be held in Seattle, Wash., beginning June 1, 1909, and closing October 15 of that year. The company in charge of it was incorporated several months ago, and $650,000 capital stock has been subscribed to. J. C. Olmsted, who laid out the Chicago and Portland expositions, is now at work on the arrangement of the buildings. The purpose of the fair is to exploit the resources of Alaska, Yukon and the Northwest. It is to show what things Alaska can produce aside from gold. It is estimated that the fair will cost $10,000,000, and the United States Government and the state of Washington are to appropriate one-fourth of this amount; it is expected that the remainder will be made up by appropriations by other states and by concessions to exhibitors. The fair is to be held on the campus of Washington University, and many of the buildings are to be permanent, remaining the property of the University.

*The flooding of the Salton Sink, Southern California, was described in the *Railroad Gazette*, Aug. 17, page 144, and an account of the reclamation work in the issue of Nov. 9, page 420.

### Great Northern Stock Issue Enjoined.

The state of Minnesota, through E. T. Young, Attorney-General, on December 26 filed injunction proceedings in the district court at St. Paul to restrain the Great Northern Railroad from making its proposed $60,000,000 stock issue, recently announced, until the company shall have applied to the State Railroad and Warehouse Commission and procured its consent.

The Attorney-General, after reciting the fact that the Great Northern is a corporation of the state of Minnesota and that its original authorized capital stock was $30,000,000, that being the limit fixed by its charter, says:

> "That between Feb. 1, 1890, and Mar. 1, 1906, the defendant made several large increases of its capital stock, until on Mar. 1, 1906, its capital stock aggregated substantially $150,000,000.
>
> "That all these increases were made without application for the consent of the Railroad and Warehouse Commission, as required by statute.
>
> "That prior to December, 1906, the defendant decided to increase its capital stock to $210,000,000, by an additional issue of $60,000,000, notice of which was served on its stockholders by its president, James J. Hill, who invited them all to subscribe for their pro rata share.
>
> "If the defendant increases its stock as now proposed the aggregate thereof will be $210,000,000; that the defendant has been and it is now paying annual dividends at the rate of 7 per cent. on all of its capital stock, and will pay dividends at the same rate on all of its present capital stock if this increase is consummated as now intended; that this increase of $60,000,000 if effected will therefore increase the fixed annual charges of the defendant by the sum of $4,200,000, a greater portion of which will have to be paid by the defendant's Minnesota patrons as charges on freight and passenger traffic local to Minnesota; and that it is further alleged that if these plans are consummated they will be effected without the surveillance or the consent of the State of Minnesota."

## TRADE CATALOGUES.

*Electric Motors and Equipment.*—Recent bulletins of the General Electric Company are as follows: No. 4473, describes the type GE 81 railway motor; No. 4466 is devoted to remote control field rheostats for railway generators and rotary converters; No. 4470 describes and illustrates electric motors for saw mill work; No 4467 describes in detail the emergency straight air brake system

*Mines and Quarry.*—The November issue of *Mines and Quarry*, published by the advertising department of the Sullivan Machinery Co., Chicago, contains an article on the progress of the building of the Tidewater Railway, with particular attention to the tools and methods used in the open cut and tunnel work on that road.

*Mercury Vapor Lamps.*—The Cooper-Hewitt Electric Co. sends a pamphlet showing different styles of mercury vapor lamps for direct current and for alternating current as well as interior views of factories and other plants where these lamps are used.

*Drills.*—The November issue of *Ideal Power*, published in the interest of the Chicago Pneumatic Tool Co., has an interesting article on the relative efficiency and cost of gas engines, followed by a bibliography intended to act as a guide for further study on the subject.

*Roofing.*—F. W. Bird & Son, East Walpole, Mass., makers of Paroid roofing, sends a neat colored blotter referring to a large order for Paroid for buildings at Newport News, Va.

*William E. Hoyt*, Patent Sales Specialist, 290 Broadway, New York, issues a pamphlet describing the methods of placing patents in the market.

### Manufacturing and Business.

John C. Sesser, Engineer of Construction of the Chicago, Burlington & Quincy, has resigned to become General Superintendent of the E. S. Johnson Co., Davenport, Iowa, with office at Norris City, Ill.

The New York, New Haven & Hartford has bought, for $350,000, the property of the Consolidated Gas Company on Commercial street, Boston. The railroad plans extensive dock building on the property as a terminal for its steamship lines.

Robert M. Burns & Co., Chicago, have sold 20 gondolas, of 80,000 lbs. capacity, and five tank cars to the American Car & Equipment Company; five tank cars to the Alfalfa Meal Co.; one American (4-4-0) type locomotive to the Chicago Mill & Lumber Co.; 16 tank cars to the Union Oil Co. of California; 6 tank cars to the Louisville Cotton Oil Co.; 25 flat cars to the Pan-American Railroad, and

100 tons of rails, five flat cars and one box car to the Engle Land & Lumber Company.

George M. Basford has been made Assistant to the President of the American Locomotive Co. Mr. Basford's identity with railroad work dates back to July, 1889, when he entered the Charlestown (Boston) shops of the Boston & Maine. The following year he left to go with the Chicago, Burlington & Quincy as draftsman. Between that time and February, 1895, when he became an Editor of the *Railway and Engineering Review*, Mr. Basford served in the motive power department of the Union Pacific and Chicago, Milwaukee & St. Paul. In May, 1897, Mr. Basford was appointed Editor of the *American Engineer and Railroad Journal*, and stayed there until placed in charge of the Publicity Department of the American Locomotive Co., Sept. 1, 1905.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Railway Signal Association.

The next meeting of this Association will be held at the Grand Union Hotel, New York, at 10 a.m., Tuesday, January 8. The subjects for discussion are those left unfinished at the October meeting in Washington, principally the following; and they are scheduled by hours, as follows:

10 a.m. to 11 a.m. D.—"How to remedy the effects of Foreign Currents on Automatic Block Signals."

11 a.m. to 1 p.m. H.—"Committee on Interlocking and Block Signals."

2.30 p.m. to 3.30 p.m. L.—"Circuits for Interlocked Signals."

3.30 p.m. to 4.30 p.m. A.—"General Specification for Electric Interlocking."

Members desiring to take part in the discussion of any particular subject are requested to hand their names to the presiding officer before such discussion begins. Members are requested to bring copies of the reports.

A number of requests have been made by members to have their 1906 Proceedings bound in cloth, and the Executive Committee has decided to provide a limited edition. These will be sold to members at 70 cents each, including postage. Remittance should be made to Secretary C. C. Rosenberg, Bethlehem, Pa., before January 8, so that he may know what members desire the cloth instead of the paper covered volume.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Alabama Great Southern.*—See Cincinnati, New Orleans & Texas Pacific.

*Cincinnati, New Orleans & Texas Pacific.*—W. W. Finley, President of the Southern, has been elected also President of the C., N. O. & T. P., and the Alabama Great Southern.

M. F. Molloy, Auditor, has been appointed Comptroller of both roads. R. F. Heath succeeds Mr. Molloy. The offices of both are at Cincinnati, Ohio.

*Denver & Rio Grande.*—D. E. Cain, General Manager of the Southwestern and Choctaw districts of the Chicago, Rock Island & Pacific, has been appointed Assistant to the Vice-President in charge of operation of the D. & R. G., effective January 1.

*Norfolk & Southern.*—M. J. Perry, President, has been elected Chairman of the Board. F. S. Gannon, Vice-President, has been elected President, with office at New York. M. K. King and G. W. Roper, both of Norfolk, Va., and C. O. Haines, of Raleigh, N. C., are Vice-Presidents.

*Pennsylvania.*—Henry C. Frick has been elected a Director, succeeding Amos R. Little, deceased.

### Operating Officers.

*Atlantic Coast Line.*—Five new operating districts have been created, making 17 in all, and officers appointed, as follows, effective January 1: Wilmington, N. C., district, E. Phenneger, Superintendent, B. J. Hughes, Trainmaster; Chadbourne, S. C., district, J. A. Fountain, Superintendent, M. L. Stover, Trainmaster; Columbia, S. C., district, C. L. Porter, Superintendent, B. T. Jones, Trainmaster; Darlington, S. C., district, B. H. Hare, Superintendent, M. A. Cole, Trainmaster; Norfolk district, George B. McClellan, Superintendent, and C. M. Brand, Trainmaster. W. M. Dove, Trainmaster of the Charleston & Northern Carolina at Augusta, has been appointed Superintendent of the Savannah district, succeeding W. H. Wright, resigned to go to the Central of Georgia.

*Canadian Pacific.*—D. E. Brown has been appointed General Superintendent of this company's trans-Pacific steamship service, with office at Vancouver, B. C.

*Chicago Great Western.*—J. P. Houston, chief train despatcher of the Northern division, has been appointed Trainmaster at St. Paul, Minn., succeeding C. R. Johnston.

*Chicago, Rock Island & Pacific.*—See Denver & Rio Grande, under Executive, Financial and Legal Officers.

*New York Central & Hudson River.*—The Western division is to be operated after January 1 in three divisions, as follows: The Buffalo division consists of the main line from Depew, N. Y., west to Buffalo, including the terminals at that place and branch lines. L. H. Van Allen, Superintendent of Terminals at Buffalo, has been appointed Superintendent in charge of this division. The Western division will consist of the main line from Syracuse to Depew, and the West Shore line from Syracuse to East Buffalo. F. W. Everett, now Superintendent of the Western division, will be Superintendent of the new Western division, with office at Syracuse. The Rochester division will comprise the "Falls Road" from Suspension Bridge, N. Y., to Rochester, and the Auburn branch from Rochester to Syracuse, the Charlotte branch from Rochester to Charlotte, and the branch from North Tonawanda to Canandaigua. S. R. Payne, Assistant Superintendent at Syracuse, will be Superintendent of the Rochester division.

*Southern.*—E. T. Lamb, general agent at Norfolk, Va., has been appointed Superintendent of the Norfolk division.

*Southern in Mississippi.*—H. H. Thatcher, Secretary to the Vice-President, has been appointed Assistant Superintendent.

### Traffic Officers.

*Alabama Great Southern.*—See Cincinnati, New Orleans & Texas Pacific.

*Bangor & Aroostook.*—G. M. Houghton, general agent at Stockton Harbor, Me., has been appointed, effective January 1, Passenger Traffic Manager, succeeding to the duties of C. C. Brown, heretofore General Passenger and Ticket Agent, resigned to go to another company.

*Cincinnati, New Orleans & Texas Pacific.*—E. J. Lythe, Chief Clerk to the General Passenger Agent, has been appointed Assistant General Passenger Agent of this road and of the Alabama Great Southern.

*Great Northern.*—Archibald Gray, Assistant General Passenger and Freight Agent at Sioux City, Iowa, has been appointed Assistant General Freight Agent at Seattle, Wash., effective January 1.

*Lehigh & New England.*—T. J. Fretz, division freight agent of the Lehigh Valley at South Bethlehem, Pa., has been appointed General Freight and Passenger Agent of the L. & N. E.

*Lehigh Valley.*—A. W. Nonnemacher, General Baggage Agent, has, at his own request, been relieved from active duty and appointed Special Passenger Agent, reporting to the General Passenger Agent. G. W. Hay succeeds Mr. Nonnemacher, with office at South Bethlehem, Pa., effective January 1.

### Engineering and Rolling Stock Officers.

*Alabama Great Southern.*—See Cincinnati, New Orleans & Texas Pacific.

*Atchison, Topeka & Santa Fe.*—H. W. Jacobs, engineer of shop methods and tools, has been appointed Assistant Superintendent of Motive Power of the Atchison, Topeka & Santa Fe System. Mr. Jacobs was for seven years an apprentice in machine shop, boiler, foundry and structural iron work; he spent three years as a journeyman machinist in marine engine work. After spending some years in the Sprague Electric Co., R. Hoe & Co., Crocker-Wheeler Co. and other shops, he went to the Chicago, Burlington & Quincy as a machinist. He was made round house foreman on this road, and then went into the Union Pacific shops at Omaha, where he was made general tool room foreman, and soon after, general shop demonstrator. He went to the Atch

H. W. Jacobs.

con, Topeka & Santa Fe in 1904 to take the position from which he has recently been promoted.

*Cincinnati, New Orleans & Texas Pacific.*—H. E. Warrington, Principal Assistant Engineer, has been appointed Chief Engineer, with office at Cincinnati, Ohio, succeeding G. B. Nicholson, deceased. J. C. Nelson, Division Engineer of the Alabama Great Southern at Birmingham, Ala., has been appointed Assistant Chief Engineer, with office at Cincinnati, Ohio, of the C., N. O. & T. P. and the Alabama Great Southern.

*Lehigh Valley.*—See New York, New Haven & Hartford.

*New York, New Haven & Hartford.*—E. T. James, Superintendent of Shops of the Lehigh Valley at Sayre, Pa., has been appointed Master Mechanic of the New York, New Haven & Hartford at New Haven, Conn.

### Purchasing Agents.

*Lake Shore & Michigan Southern.*—See New York Central Lines.

*Mexican Central.*—W. Till, Assistant Purchasing Agent, has resigned.

*New York Central Lines.*—F. H. Greene, Purchasing Agent of the Lake Shore & Michigan Southern, has been appointed General Purchasing Agent of all New York Central Lines, with office at New York City, effective January 1.

## LOCOMOTIVE BUILDING.

*The Atlantic Coast Line* is about to order 80 locomotives.

*The Harrisburg & Ohio River* will shortly contract for locomotives through D. E. Baxter & Co., New York.

*The Peru Southern* is about to contract for several locomotives through W. R. Grace & Co., 1 Hanover Square, New York City.

*The Morelia & Tacambaro* will shortly be in the market for several locomotives. The New York address is A. J. Peyton & Company, 111 Broadway.

*The Chicago, Burlington & Quincy*, as reported in our issue of December 21, has ordered 50 simple Prairie (2-6-2) type locomotives and 15 simple Pacific (4-6-2) type locomotives from the American Locomotive Company. The specifications are as follows:

*General Dimensions.*

| | Prairie | Pacific |
|---|---|---|
| Types of locomotive | | |
| Weight, total | 216,000 lbs. | 228,000 lbs. |
| Weight on drivers | 152,000 lbs. | 150,000 lbs. |
| Diameter of drivers | 69 in. | 74 in. |
| Cylinders | 22 in. x 28 in. | |
| Tank capacity | 8,000 gals. | |
| Coal capacity | 13 tons | |

*The Las Vegas & Tonopah* has ordered three simple ten-wheel (4-6-0) type locomotives from the Baldwin Locomotive Works for February, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Ten-wheel |
| Weight, total | 187,000 lbs. |
| Weight on drivers | 142,000 lbs. |
| Diameter of drivers | 57 in. |
| Cylinders | 21 in. x 26 in. |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 303 |
| " diameter of tubes | 2 in. |
| " length of tubes | 15 ft. 5½ in. |
| Firebox, length | 96 in. |
| " width | 66 in. |
| " grate area | 43 sq. ft. |
| Heating surface | 2,958 sq. ft. |
| Tank capacity | 6,000 gals. |

*The Chicago, Milwaukee & St. Paul*, as reported in our issue of December 14, has ordered two balanced compound Atlantic (4-4-2) locomotives from the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Atlantic |
| Weight, total | About 193,000 lbs. |
| Weight on drivers | About 107,000 lbs. |
| Diameter of drivers | 85 in. |
| Cylinders | 15 and 25 in. x 28 in. |
| Boiler, type | Extended wagon top |
| " Working steam pressure | 220 lbs. |
| " number of tubes | 270 |
| " diameter of tubes | 2¼ in. |
| " length of tubes | 19 ft. |
| Firebox, length | 102 in. |
| " width | 66 " |
| " grate area | 46 sq. ft. |
| Heating surface, total | 3,182 " |
| Tank, capacity | 7,000 gals. |
| Coal capacity | 10 tons. |

*Special Equipment.*

| | |
|---|---|
| Bell ringer | Golmar |
| Boiler lagging | Magnesia |
| Brake-beams | Monarch |
| Injector | Nathan and Simplex |
| Piston rod packings | Edwards metallic |
| Valve rod packings | Edwards metallic |
| Safety valve | Richardson |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan Bull's-eye |

*The Delaware & Hudson* has ordered from the American Locomotive Co. 15 simple ten-wheel (4-6-0) locomotives and five simple switching (0-6-0) locomotives. The specifications are as follows:

*General Dimensions.*

| | Ten-wheel. | Switching. |
|---|---|---|
| Type of locomotive | | |
| Weight on drivers | 124,800 lbs. | 140,000 lbs.* |
| Total weight | 186,000 lbs | 140,000 lbs.* |
| Diameter of cylinders | 21 in. | 19 in. |
| Stroke of pistons | 26 in. | 24 in. |
| Diameter of drivers | 63 in. | 51 in. |
| Boiler, type | Wooten. | |
| " wkg. stm. pressure | 200 lbs. | 180 lbs. |
| Boiler tubes, No. | About 308 | 270 |
| " material & maker | Steel (Shelby for 8 engines). Worth Bros. for 7 engines. | Spellerized. |
| " outside diameter | 2 in. | 2 in. |
| " length | 15 ft. | 11 ft. 5¾ in. |
| Firebox, length | 119⅞ in. | 106 in. |
| " width | 102 in. | 96 in. |
| " grate area | 84.85 sq. ft. | 74.0 sq. ft. |
| Heating surface, total | 2,583.9 sq. ft | 1,785.32 sq. ft. |
| Tank capacity | 6,800 gals. | 4,200 gals. |
| Coal capacity | 13½ tons. | 8 tons. |

*Special Equipment.*

| | |
|---|---|
| Bell ringer | Samson. |
| Boiler lagging | Magnesia sectional, Keasbey & Mattison |
| Brake-beams | Simplex |
| Brake shoes | Perfecto |
| Couplers | Gould |
| Headlights | Dressel |
| Injector | Hancock, for switching and 10 ten-wheelers; Sellers Composite for 5 ten-wheelers |
| Piston rod packings | Trojan |
| Valve rod packing | Trojan |
| Safety valve | Consolidation for ten-wheelers |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan |
| Springs | National |
| Steam gages | Ashcroft |
| Steam heat equipment | Consolidated, for ten-wheelers |
| Tire, driving wheel | Midvale |
| " truck wheel | Midvale |
| " tender wheel | Midvale |

## CAR BUILDING.

*The Union Pacific* is in the market for 500 furniture cars.

*The Norfolk & Western* is about to build 1,500 freight cars at its Roanoke shops.

*The Pennsylvania* has ordered 2,000 box cars from the American Car & Foundry Co.

*The Pan-American* has ordered 25 flat cars from Robert M. Burns & Co., Chicago.

*The Temiskaming & Northern Ontario*, it is reported, is in the market for a number of cars.

*The Georgia Railroad* is asking prices on 500 freight cars, including stock, flat and box cars.

*The Georgia Northern* is figuring on two coaches, one baggage car and some freight equipment.

*Argentine Railroads* have ordered 25 box and 25 gondola cars from the Middletown Car Works.

*The Gulf & Ship Island* has ordered about 300 freight cars from the American Car & Foundry Co.

*The Atlantic Coast Line* is about to place orders for 3,250 freight cars and 50 passenger cars.

*The Nashville, Chattanooga & St. Louis* has ordered 500 box cars from the American Car & Foundry Co.

*The Peru Southern* is about to place contracts for several cars through W. R. Grace & Co., 1 Hanover Square.

*The Harrisburg & Ohio River* will shortly place a contract for several cars through D. E. Baxter & Co., New York.

*The Seattle Electric Company* has ordered ten 36-ft. flat cars of 50,000 lbs. capacity from the Hicks Locomotive & Car Works.

*The Stratford Railway Construction Co.*, Lima, Ohio, has ordered 20 ballast cars from the Hicks Locomotive & Car Works.

*The McCloud River* has ordered one combination observation and sleeping car, with buffet, from the Hicks Locomotive & Car Works.

*The Seaboard Air Line* is building at its Portsmouth shops 250 flat cars of 60,000 lbs. capacity; these cars will measure 40 ft. long, and 8 ft. 11 in. wide, over all. Bodies and underframes will be of wood. The special equipment includes: Farlow draft gear, Symington journal boxes and Tower couplers; other special equipment will be Seaboard Air Line standard.

*The United Verde & Pacific*, as reported in our issue of Decem-

ber 21, has ordered 20 wooden flat cars of 50,000 lbs. capacity from the Pullman Company for March, 1907, delivery. These cars will measure 26 ft. long, 7 ft. wide and 4 ft. high. The special equipment includes:

| | |
|---|---|
| Axles | Pullman |
| Bolsters | American Steel Foundry |
| Couplers | Janney |
| Journal boxes | McCord |

*The Chicago, Milwaukee & St. Paul* will build 1,000 box cars of 80,000 lbs. capacity at its West Milwaukee shops. These cars will be 41 ft. long, 8 ft. 6 in. wide and 8 ft. $8\frac{1}{2}$ in. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | Bettendorf |
| Brake-beams | Wood "Trussed" |
| Brake-shoes | Congdon |
| Brasses | Hewitt |
| Door fastening | Western car |
| Doors | Security |
| Draft rigging | Westinghouse |
| Roofs | Chicago Improved Winslow |
| Trucks | Bettendorf |

*The Duluth, Missabe & Northern* has ordered 1,150 steel hopper cars from the Pressed Steel Car Co. and 600 steel hopper cars from the Standard Steel Car Co., all of 100,000 lbs. capacity, for May and June, 1907, delivery. All cars will weigh 32,000 lbs. and measure 24 ft. long, over all; 8 ft. 6 in. wide and 9 ft. high, inside measurements. The special equipment for all includes:

| | |
|---|---|
| Axles | Carnegie |
| Bolsters | Simplex |
| Brake-beams | Pressed steel |
| Brake-shoes | Streeter |
| Brakes | Westinghouse |
| Brasses | Duluth Brass Works |
| Couplers | Latrobe, Climax, Major and R. E. Janney |
| Draft rigging | Westinghouse friction |
| Journal boxes | Symington and McCord |
| Paint | Illinois Steel Co. |
| Springs | Railway Steel-Spring Co. |
| Trucks | Arch bar |
| Wheels | Griffin |

*The Indianapolis, New Castle & Toledo Electric*, as reported in our issue of December 7, has ordered through the Electrical Installation Co., Chicago, eight interurban and two express cars from the Jewett Car Co., for May, 1907, delivery. The interurban cars will weigh 80,000 lbs., and measure 60 ft. 8 in. long and 9 ft. 3 in. wide, over all; height of body, 9 ft. 9 in. The express cars will measure 50 ft. long and 9 ft. wide, over all; height of body, 9 ft. 6 in. The special equipment for both includes:

| | |
|---|---|
| Brakes | Christensen |
| Brasses | Streeter |
| Couplers (for interurban cars) | Van Dorn |
| Curtain fixtures (for interurban cars) | Curtain Supply Co. |
| Curtain material (for interurban cars) | Pantasote |
| Heating system (for interurban cars) | Peter Smith |
| Journal boxes | Symington |
| Seats (for interurban cars) | Hale & Kilburn |
| Trucks | Baldwin |
| Wheels | Standard Steel Works |

*The Delaware & Hudson* has ordered six passenger cars from Barney & Smith, and 20 passenger coaches, five baggage cars and three horse cars from the American Car & Foundry Co. The cars ordered from Barney & Smith will measure 70 ft. long over end sills and 9 ft. 8 in. wide over side sills. Bodies and underframes will be of wood. The other passenger cars will be 61 ft. long over end sills and 9 ft. 8 in. wide over side sills, with wooden bodies and steel underframes. The baggage cars will measure 60 ft. long, 9 ft. $\frac{1}{4}$ in. wide and 7 ft. $6\frac{1}{8}$ in. high, inside measurements, and 60 ft. $11\frac{3}{4}$ in. long, 9 ft. $9\frac{3}{4}$ in. wide and 13 ft. $10^{7}_{16}$ in. high, over all. Bodies will be of wood and underframes of steel. The horse cars will measure 65 ft. long and 9 ft. $\frac{1}{4}$ in. wide, inside measurements, and 65 ft. 11 in. long and 9 ft. $9\frac{3}{4}$ in. wide, over all; they will have wooden bodies, steel underframes, folding doors, and the interior will be divided into 18 stalls. The special equipment includes:

| | |
|---|---|
| Axles | Cambria Steel Coffin Process (all except horse cars) |
| Brake-beams | Simplex |
| Brake-shoes | Diamond S (all except horse cars) |
| Couplers | Gould (Am. C. & F. coaches) |
| Curtain material | Pantasote (Am. C. & F. coaches) |
| Draft rigging | Gould (all passenger cars) |
| Dust guards | Symington (Am. C. & F. coaches) |
| Heating system | Consolidated (passenger and baggage cars) |
| Journal boxes | Symington (all except Barney & Smith cars) |
| Light | Pintsch |
| Paint | D. & H. Standard (Am. C. & F. coaches) |
| Platforms | Gould |
| Side bearings | Miner (baggage and horse cars) |
| Springs | Railway Steel-Spring Co. (all except horse cars) |
| Trucks | 4-wheel pedestal (Am. C. & F. coaches and baggage cars); 6-wheel (Barney & Smith cars) |
| Vestibules | Gould (passenger cars) |
| Wheels | Paige steel-tired (all except horse cars) |

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

ALABAMA RAILWAY & POWER COMPANY.—Incorporation has been granted a company under this name in Alabama to build a line from Chattanooga through Albertville, Hamilton County, Tennessee, and Dade County in Georgia, and Jackson, DeKalb, Blount, St. Clair and Jefferson counties in Alabama, to Birmingham. The incorporators include H. T. Henderson, of Durango, Colo.; J. P. Montgomery, of Ashville, Ala., and C. L. Young, Jr., of Fort Payne, Ala.

ATCHISON, TOPEKA & SANTA FE.—The Denver, Enid & Gulf, which has been extended to Sun City, Kan., is under construction from the latter place to Belvidere, 10 miles.

BALTIMORE & OHIO.—This company during the year 1906 has laid second, third and fourth track on its various divisions as follows: Baltimore division, second track between Gaithersburg, Md., and Germantown, Md., 4.19 miles; and second track between Barnesville, Md., and Dickerson, Md., 2.59 miles. Wheeling division, second track at Wheeling, 0.30 miles; and second track, Bridgeport, Ohio, yard, 2.61 miles. Cleveland division, track improvements at Lorain, Ohio, yard, etc., 5.71 miles; track improvements at Cleveland, Ohio, yard, etc., 19.74 miles. Newark division, third track between Central City, Ohio, and Ontville, Ohio, four miles; and from Summit to Big Walnut, third track, five miles. Connellsville division, first track, relocation of approach to new F., M. & P. bridge, near Fairmont, W. Va., 2.54 miles; and first track on Hickman Run branch, .85 miles. Pittsburg division, third and fourth track between Wheeling Junction and Rankin, Pa., 4.65 miles; and third and fourth track between Braddock, Pa., and Dexter, Pa., 0.32 miles. New Castle division, second track between Sterling, Ohio, and Nova, Ohio, 7.52 miles. Chicago division, second track between Avilla, Ind., and Cromwell, Ind., two miles. Ohio division (B. & O. S. W. R. R.), second track between Madeira, Ohio, and O'Bannon, Ohio, 7.40 miles; and second track from Byers Junction, Ohio, to West Junction, Ohio, 8.10 miles. Sidings have been built aggregating 10.20 miles.

BEAVERTON & WILLSBURG.—See Southern Pacific.

BROXTON AIR LINE.—An officer writes that this company, which is being organized in Georgia, will not let contracts earlier than next summer for the work. The proposed route is from Broxton via McRae to Helena, about 30 miles, and will cross the Ocmulgee at Barrow's Bluff, 11 miles north of Broxton, where a drawbridge is to be built. The company may buy 11 miles of existing road from Broxton to the river. W. R. Frier, of Broxton, Ga., is President. (Dec. 7, p. 160.)

CHICAGO & NORTH-WESTERN.—On the Chicago and State Line and the Milwaukee & State Line Railroads this company has laid third and fourth tracks during the present year northbound 28.65 miles, and southbound 26.02 miles, between Lake Bluff, Ill., and St. Francis, Wis.

CHICAGO & WABASH VALLEY.—This company is building an extension of its road from Dunwiddie, Ind., the present terminus, to Gary, 20 miles, and is making surveys from Dunwiddie to Crown Point.

CHICAGO, BURLINGTON & QUINCY.—This company has given contracts to the Kilpatrick Bros. & Collins Construction Co. of Beatrice, Neb., for building a line from Lincoln, Neb., to Nulford, 20 miles, to get rid of grades in the existing line.

CHICAGO, CINCINNATI & LOUISVILLE.—This company recently extended its road to Hammond, Ind., and is building an extension from that place to a connection with the Chicago Terminal Transfer Company's line, three miles.

CLEVELAND & SHARON TRACTION.—This company, which was recently incorporated with a capital of $2,500,000, recently completed its organization at Sharon, Pa., by electing the following officers: President, Francis B. Morgan, Cleveland, Ohio; Vice-President and Secretary, John Blake, Brooklyn, N. Y.; Treasurer, C. F. Clendenning, New York; Assistant Secretary and Treasurer, P. F. Morgan, Cleveland, Ohio. The company proposes to build a line from Middlefield, Ohio, to Sharon. At Middlefield connection is to be made with the Cleveland & Eastern, giving a direct line from Sharon, Pa., to Cleveland.

DENVER, ENID & GULF.—See Atchison, Topeka & Santa Fe.

ERIE.—This company, which is building a line from Highland Mills, N. Y., to Guymard, 42 miles, also one from Hunt to Cuba, N. Y., 33 miles, and another from Lakewood, N. Y., to Columbus, Pa., 23 miles, has given contracts for the work between Highland Mills and Guymard as follows: Newburgh Junction to Woodbury, Sundstrom & Stratton, New York; Woodbury to Moodna Creek, John F. Shields, Richmond Hill, Long Island; Moodna Creek viaduct, metal work is being done by company's forces. Masonry work, Smith-McCormick Co., Belfast, N. Y.; Moodna Creek to Otterkill, Ferguson Construction Company, New York City; Campbell Hall to Stony Ford, Lathrop, Shea & Henwood Co., Scranton, Pa.; Otter Kill to Campbell Hall, Lathrop, Shea & Henwood Co., Scranton, Pa.; Stony Ford to Mechanicstown, F. H. Clement & Co., Philadelphia, Pa.; Mechanicstown to Howells, F. H. Clement & Co., Philadelphia, Pa.

On work from Hunts to Cuba contracts have been let as fol-

lows: From Tunnel to Rossburg, Millard Construction Co., Philadelphia, Pa. Rossburg to Fillmore, to Cancadea, to Rockville; Rockville to Black Creek, W. H. Coverdale & Co., New York; Black Creek to Cuba, Bennett & Smith, Wilkinsburg, Pa.

On work from Lakewood N. Y., to Columbus, Pa., contracts have been let as follows: From Lakewood to Grant, Burke Brothers, Scranton, Pa., from Grant to Columbus, J. G. White & Co., New York

Fourche River Valley & Indian Territory.—This company, which recently extended its road to Camp D, in Arkansas, has given contracts to Robert G. Jenkins, of Fourche, for a further extension from that point to the west line of Perry County, 38 miles.

Georgia Roads (Electric).—The Macon & Albany Securities Co. has been organized in Georgia to build electric lines to connect Macon, Americus and Albany and to run in connection with the interurban road from Atlanta to Macon, surveys for which have been made. N. J. Cruger is President, J. S. Davis Vice-President and W. J. Massee, Secretary and Treasurer.

Illinois Central.—Contracts have been given by this company to Smith & Scott and the Talley-Bates Construction Co., of Memphis, Tenn.; also to the L. E. Myers Co., and the Lorimer & Gallagher Co., of Chicago, for work from Corinth, Miss., to Haleyville, Ala., 80.23 miles; and from Atoka to Kerrville, 5.50 miles, a total of 85.73 miles.

Indianapolis & Louisville.—This company, which has completed 18 miles of its road between Wallace Junction, Ind., and Victoria, has given contracts to Dickason Construction Co. for building the remainder of the line between these places, about 29 miles.

Manila & Southwestern.—This company, which recently completed five miles of its road to Lunsford, Ark., is building with its own force an additional 12½ miles from that place to Hancock, and is making surveys from the latter place to Manila, 6½ miles further.

Minneapolis & St. Louis.—Contracts have been given by this company for extending the Minnesota, Dakota & Pacific from Chelsea, S. Dak., the present terminus, to Le Beau, 83.42 miles. Winston Bros. & Co. are the contractors.

Missouri Pacific.—This company has given contracts for extending its lines as follows: On the Gurdon & Fort Smith from a point near Caddo Gap, Ark., to a point near Black Springs, 9.62 miles, to the Dalhoff Construction Company, Little Rock, Ark.; Wabash Southern from five miles northeast of Zeigler, Ill., to Benton, 4.37 miles, to the J. A. Ware Construction Co., of St. Louis, Mo.; Marion & Johnston City from Marion, Ill., to Johnston City, 9.44 miles, to T. E. Newell, of Marion, Ill.; and on the Springfield Southwestern from Crane, Mo., to Springfield, 34.36 miles, to the Willier Construction Company, of Springfield, Mo.

Nevada-California-Oregon.—This line has been extended from Madeline, Cal., north nine miles, and surveys are being made to extend it to Alturas, a total of 40 miles.

New Castle & New Wilmington.—This company has been granted a charter in Pennsylvania to build a line 10 miles long in Lawrence County. The company is capitalized at $60,000, and the officers are: President, J. H. Veazey; Directors, J. H. Veazey, J. J. Ashenhurst, C. E. Trainor, Charles Freeman, G. N. Nealy, H. M. Kirk and W. B. Clendenin.

New Orleans Great Northern.—This company, which has extended a section of its road north as far as May's Creek, Miss., has given contracts to W. J. Oliver, of Knoxville, Tenn.; Smith & Scott, Memphis, Tenn.; the Worthington Construction Co., of Alabama; E. W. Hanlon, of New Orleans, La., and to Shea & Ford, Buffalo, N. Y., for building various sections of its line as follows: May's Creek, Miss., to Jackson, 84 miles; Lawrence Creek, La., to Tylertown, Miss., 23 miles, and from Slidell, La., via Mandeville to Abita Springs, 26 miles.

New York, New Haven & Hartford.—This company, under the name of the Providence Terminal Company, is building a line from Providence, R. I., to East Providence, 2.70 miles. This includes the tunnel under the city.

Pacific & Idaho Northern.—Surveys are being made by this company for an extension of its road from Evergreen, Idaho, to which point it has recently been extended, to Meadows, 16 miles.

Pacific Railway & Navigation Company.—This company is building an extension of its road, recently completed to Twenty-Mile post, from that point to Tillanook, Oregon, 68 miles; also from Twenty-Mile post to Venonia, an additional 13½ miles. Surveys are also being made for a further extension from Astoria to Newport.

Payette Valley.—An extension of this road is to be built from its present southern terminus at New Plymouth, Idaho, to a point near Emmett, 15 miles.

Peoria, Bloomington & Champaign (Electric).—This company has filed a mortgage to secure an issue of $3,000,000 worth of 30 year, 5 per cent. bonds, to be due in 1936, with the Central Trust Company of Chicago. By the terms of the instrument, $2,000,000 is to be available at once and $1,000,000 is held in reserve for construction and extensions. These sums are to be used in the building and maintaining of the McKinley line between Peoria, Ill., and Bloomington.

Providence Terminal Company.—See New York, New Haven & Hartford.

Rio Grande Western.—This company is building an extension of its road from Revere, Utah, to Bingham Mines, 15 miles.

Southern Pacific.—The Beaverton & Willsburg, which was recently organized to build an auxiliary line for this company in Oregon, is to connect the west side, Yamhill and east side divisions of this company by a line to be built from Beaverton to Willsburg, 13½ miles long, crossing to be made over the Willamette river by a high bridge. (Nov. 30, p. 152.)

Vallejo & Northern (Electric).—An officer writes that this California company, which was recently incorporated with $2,500,000 capital, is now making location surveys, and securing the necessary rights of way; and it expects to let contracts early next spring for the work. The proposed route is from Vallejo northeast via Fairfield, Vacaville and Winters to Woodland, with a number of branches, a total of about 70 miles. The office of the company is at 327 Georgia street, Vallejo, Cal. The work will be heavy in the mountain pass, but the balance will have light grades and easy curves. Melville Dozier, Jr., 649 Mariposa street, Oakland, Cal., is President and Chief Engineer. (Nov. 30, p. 153.)

Woodlawn Street Railway (Electric).—Application has been made in Pennsylvania for a charter for this company by J. F. Reed, of Beaver. The company proposes to build a line from the Pittsburgh & Lake Erie station at Beaver to New Sheffield, about six miles. The general offices of the company will be at Aliquippa. The incorporators include D. G. Dugan, S. J. Dugan, James A. Newell, J. E. Wilson and R. Burgher.

Yazoo & Mississippi Valley (Ill. Cent.).—Contracts have been given by this company to N. J. Roach & Co. and P. H. Rogers, of Memphis, Tenn., and to J. D. Lynch, of Monmouth, Ill., for work from Holly Bluff, Miss., to Kelso, 13.3 miles; Etter, Tenn., to Lake View, Miss., 6.7 miles; Leland, Miss., southwest 10.8 miles, and Philipp, Miss., to Charleston, 27.6 miles; a total of 58.4 miles.

## RAILROAD CORPORATION NEWS.

Chicago, Peoria & St. Louis.—The July 1 interest on the 5 per cent. consolidated mortgage 30-year bonds of this company was paid on December 18. (July 13, p. 12.)

Connecticut Railway & Lighting Co.—See Consolidated Railway.

Consolidated Railway (N. Y., N. H. & H. Electric Lines).—This company has agreed to buy the Connecticut Railway & Lighting Co., which is a consolidation of a dozen street railways operating 198 miles of road in and between towns in the southwestern part of Connecticut. It is understood that the property has been leased to the New York, New Haven & Hartford. (Nov. 9, p. 130.)

Delaware Railroad.—A semi-annual dividend of 4 per cent. on the $2,987,225 stock has been declared. The annual rate has been 6 per cent. since 1898. The road is controlled by and leased to the Philadelphia, Baltimore & Washington.

New York, New Haven & Hartford.—This company has bought the $12,000,000 outstanding stock and $6,881,000 outstanding bonds of the Rhode Island Securities Company, exchanging for these securities 4 per cent. debentures of a subsidiary, the Providence Securities Company. The Rhode Island Securities Company controls the street railways, gas and electric light properties in and near Providence, R. I. See Consolidated Railway.

Philadelphia, Baltimore & Washington.—See Delaware R. R.

Providence Securities Company.—See New York, New Haven & Hartford.

Rhode Island Securities Company.—See New York, New Haven & Hartford.

Wabash.—At a special meeting of the Board of Directors on December 22, the plan for retiring the $3,500,000 6 per cent. non-cumulative debenture "A" bonds, and the $26,500,000 debenture "B" bonds was approved. Each $1,000 "A" bond is to be exchanged for $775 new 4 per cent. mortgage bonds, $560 par value preferred stock and $560 par value common stock. Each $1,000 "B" bond is to be exchanged for $700 new bonds, $500 par value preferred stock and $500 common stock. (Oct. 26, p. 116.)

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